RESOLUTION NO. 2010-226

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ELK GROVE ADOPTING A MITIGATED NEGATIVE DECLARATION AND MITIGATION MONITORING AND REPORTING PROGRAM FOR THE TRANSIT YARD AND CORPORATION YARD FACILITIES MASTER PLANS PROJECT

WHEREAS, the City of Elk Grove adopted the 2008-13 Capital Improvement Program which identified several City facility projects that would improve City services and efficiency, including the Corporation Yard Facilities Master Plan (CB0012); and

WHEREAS, on May 28, 2008 the City Council considered information provided by the Corporation Yard Facilities Master Plan study and directed selection of potential sites for environmental review; and

WHEREAS, the City of Elk Grove prepared the Transit Yard Master Plan and the Corporation Yard Facilities Master Plan, determined that both required review pursuant to the California Environmental Quality Act (CEQA), Public Resources Code section 21000 et seq., prepared an initial study, and determined that a Mitigated Negative Declaration was necessary; and

WHEREAS, the City determined that the mitigation measures identified in the Initial Study / Mitigated Negative Declaration, attached hereto as Exhibit A and incorporated herein by reference, would reduce environmental impacts to a less than significant level; and

WHEREAS, a Mitigation Monitoring and Reporting Program (MMRP) has been prepared in accordance with CEQA, attached hereto as Exhibit B and incorporated herein by reference, which is designed to ensure compliance with the identified mitigation measures during project implementation and operation; and

WHEREAS, the City distributed the Notice of Intent to Adopt the Mitigated Negative Declaration on June 16, 2010, and the Notice was published in the *Elk Grove Citizen*, posted at the Sacramento County Clerk's Office, distributed through the State Clearinghouse, and posted at the City offices, pursuant to CEQA Guidelines, Section 15072. A 30-day review and comment period for the Mitigated Negative Declaration opened on June 16, 2010 and closed July 15, 2010. The Mitigated Negative Declaration was made available to the public during this review period; and

WHEREAS, the City received one written comment letter within the 30-day public review period and responded to that comment letter in the project staff report; and

WHEREAS, the City has considered the comments received during the public review period, and they do not alter the conclusions in the Initial Study and Mitigated Negative Declaration; and

WHEREAS, the City Council has considered the written and oral comments on the proposed project and the Mitigated Negative Declaration; and

WHEREAS, the City of Elk Grove, Development Services Planning Department, located 8401 Laguna Palms Way, Elk Grove, California 95758 is the custodian of documents and other materials that constitute the record of proceedings upon which the decision to adopt the Mitigated Negative Declaration is based; and

WHEREAS, the City Council has reviewed the Initial Study, the Mitigated Negative Declaration, and the Mitigation Monitoring and Reporting Program and finds that these documents reflect their independent judgment.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Elk Grove hereby adopts the Mitigated Negative Declaration and the Mitigation Monitoring and Reporting Program for the Transit Yard and Corporation Yard Facilities Master Plans Project based on the following findings:

1) On the basis of the whole record, there is no substantial evidence that the Project as designed, conditioned and mitigated, will have a significant effect on the environment. A Mitigated Negative Declaration has been prepared and completed in accordance with the California Environmental Quality Act (CEQA). The Mitigated Negative Declaration reflects the independent judgment and analysis of the City; and

2) Pursuant to Public Resources Code, Section 21081 and CEQA Guidelines, Section 15091, all of the proposed mitigation measures described in the Mitigated Negative Declaration are feasible, and therefore will become binding upon the City and affected landowners and their assigns or successors in interest when the Project is approved; and

3) To the extent that these findings conclude that various proposed mitigation measures outlined in the Mitigated Negative Declaration are feasible and have not been modified, superseded or withdrawn, the City Council hereby binds itself, all landowners within the Project area, and their assigns and successors in interest to implement those measures. These findings are not merely informational but constitute a binding set of obligations that will come into effect when the City Council issues the Project entitlements set forth above. The actual implementation of the mitigation measures hereby adopted shall occur by having them included as conditions of approval on subsequent discretionary entitlements granted within the Project area.

Evidence: Pursuant to CEQA and the CEQA guidelines, City staff prepared an initial study evaluating the potential environmental effects of the Transit Yard and Corporation Yard Facilities Master Plans project. The Initial Study identified potentially significant adverse effects in the areas of Air Quality, Biological Resources, Cultural Resources, Greenhouse Gas Emissions, Hazards and Hazardous Materials, Hydrology and Water

Quality, and Noise. Mitigation measures that avoid or mitigate the potentially significant effects to a point where no significant effects would occur were identified in the Initial Study and a Mitigated Negative Declaration was prepared. The Initial Study / Mitigated Negative Declaration was distributed for a 30-day review and comment period between June 16, 2010 and July 15, 2010. The City received one written comment letter within the 30-day public review period and responded to that comment letter in the project staff report. The City has considered the comments received during the public review period, and they do not alter the conclusions in the Initial Study and Mitigated Negative Declaration. A Mitigation Monitoring and Reporting Program (MMRP), which is incorporated herein by this reference has been prepared to ensure compliance during project implementation. The City of Elk Grove, Development Services Planning Department, located 8401 Laguna Palms Way, Elk Grove, California 95758 is the custodian of documents and other materials that constitute the record of proceedings upon which the decision to adopt the Mitigated Negative Declaration is based.

PASSED AND ADOPTED by the City Council of the City of Elk Grove this 27th day of October, 2010.

SOPHIA SCHERMAN, MAYOR of the
CITY OF ELK GROVE

ATTEST:

JASON LINDGREN, CITY CLERK

APPROVED AS TO FORM:

SUSAN COCHRAN, CITY ATTORNEY

CERTIFICATION
ELK GROVE CITY COUNCIL RESOLUTION NO. 2010-226

STATE OF CALIFORNIA)
COUNTY OF SACRAMENTO) ss
CITY OF ELK GROVE)

I, Jason Lindgren, City Clerk of the City of Elk Grove, California, do hereby certify that the foregoing resolution was duly introduced, approved, and adopted by the City Council of the City of Elk Grove at a regular meeting of said Council held on October 27, 2010 by the following vote:

AYES :	COUNCILMEMBERS:	Scherman, Cooper, Davis, Hume
NOES:	COUNCILMEMBERS:	None
ABSTAIN :	COUNCILMEMBERS:	None
ABSENT:	COUNCILMEMBERS:	Detrick

Jason Lindgren
Jason Lindgren, City Clerk
City of Elk Grove, California

EXHIBIT A

CITY OF ELK GROVE

CORP YARD MASTER PLAN AND TRANSIT YARD MASTER PLAN PROJECT

INITIAL STUDY/MITIGATED NEGATIVE DECLARATION

Prepared for:

CITY OF ELK GROVE
8380 LAGUNA PALMS WAY
ELK GROVE, CA 95758

Prepared by:

PMC®
2729 PROSPECT PARK DRIVE, SUITE 220
RANCHO CORDOVA, CA 95670

JUNE 2010

CITY OF ELK GROVE
CORP YARD MASTER PLAN AND TRANSIT YARD MASTER PLAN PROJECT
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JUNE 2010

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

A. PURPOSE OF THE INITIAL STUDY/MITIGATED NEGATIVE DECLARATION

This document is an Initial Study and Mitigated Negative Declaration (MND) prepared pursuant to the California Environmental Quality Act (CEQA), for the Corporation Yard Facilities Master Plan and the Transit Yard Facilities Master Plan Project (referred to as the proposed project). This MND has been prepared in accordance with CEQA, Public Resources Code Sections 21000 et seq., and the CEQA Guidelines found in Chapter 14 of the California Code of Regulations.

An Initial Study is conducted by a lead agency to determine if a project may have a significant effect on the environment. In accordance with the CEQA Guidelines, Section 15064 (a)(1), an environmental impact report (EIR) must be prepared if there is substantial evidence in light of the whole record that the proposed project under review may have a significant effect on the environment. A negative declaration may be prepared instead, if the lead agency finds that there is no substantial evidence, in light of the whole record that the project may have a significant effect on the environment. A negative declaration is a written statement describing the reasons why a proposed project, not exempt from CEQA, would not have a significant effect on the environment and, therefore, why it would not require the preparation of an EIR (CEQA Guidelines Section 15371). According to CEQA Guidelines Section 15070, a negative declaration shall be prepared for a project subject to CEQA when either:

a) The Initial Study shows there is no substantial evidence, in light of the whole record before the agency, that the proposed project may have a significant effect on the environment, or

b) The Initial Study identified potentially significant effects, but:

    (1) Revisions in the project plans or proposals made by or agreed to by the applicant before the proposed mitigated negative declaration and initial study is released for public review would avoid the effects or mitigate the effects to a point where clearly no significant effects would occur, and

    (2) There is no substantial evidence, in light of the whole record before the agency, that the proposed project as revised may have a significant effect on the environment. If revisions are adopted into the proposed project in accordance with the CEQA Guidelines Section 15070(b), a mitigated negative declaration (MND) is prepared.

LEAD AGENCY

The lead agency is the public agency with primary responsibility over a proposed project. In accordance with CEQA Guidelines Section 15051(b)(1), "the lead agency will normally be the agency with general governmental powers, such as a city or county, rather than an agency with a single or limited purpose..." In this case, the City of Elk Grove will serve as the lead agency for the Corporation Yard Facilities Master Plan and the Transit Yard Facilities Master Plan Project.

B. TECHNICAL STUDIES

Technical studies referenced in this IS/MND are listed below. The technical studies are available at the City of Elk Grove Development Services Department at 8401 Laguna Palms Way, Elk Grove, CA 95758.

Fehr & Peers. May 2010. *Transportation Impact Study for the Proposed Elk Grove Transit Facilities.*

Kleinfelder. March 1, 2004. *Phase I Environmental Site Assessment, 10250 Iron Rock Way, Elk Grove, California.*

Taber. April 10, 2007a. *Phase II Site Assessment Report, Kalwani Property, 10401 Grant Line Road, Elk Grove, California.* Prepared for PSOMAS.

C. ACRONYMS USED

The following acronyms have been or may have been used in the preparation of this IS/MND:

1991 Air Quality Attainment Plan (AQAP)
1994 Ozone Attainment Plan (OAP)
acre-feet/year (af/y)
Assembly Bill (AB)
California Air Resources Board (CARB)
California Clean Air Act (CCAA)
California Department of Fish and Game (DFG)
California Endangered Species Act (CESA)
California Environmental Protection Agency (Cal/EPA)
California Highway Patrol (CHP)
California Natural Diversity Data Base (CNDDB)
California Native Plant Society's (CNPS)
Carbon monoxide (CO)
Chlorofluorocarbons (CFCs)
Clean Air Act (CAA)
Compressed Natural Gas (CNG)
Cosumnes Community Services District (CCSD)
Department of Defense (DOD)
Department of Toxic Substance Control (DTSC)
Elk Grove Police Department (EGPD)
Elk Grove Unified School District (EGUSD)
Endangered Species Act (ESA)
Environmental Impact Report (EIR)
Environmental Site Assessment (ESA)
Farmland Mapping and Monitoring Program (FMMP)
Federal Emergency Management Agency (FEMA)
Federal Express (FedEx)
Federal Implementation Plan (FIP)
Federal Transit Administration (FTA)
Greenhouse Gases (GHG)
Integrated Groundwater Surface Water Model (IGSM)
Intergovernmental Panel on Climate Change (IPCC)
Leaking Underground Storage Tank (LUST)
Low Carbon Fuel Standard (LCFS)
Methane (CH4)
miles per hour (mph)
million gallons per day (mgd)
National Ambient Air Quality Standards (NAAQS)
National Historic Preservation Act (NHPA)
National Pollutant Discharge Elimination System (NPDES)
National Register of Historic Places (NRHP)
Nitrogen Dioxide (NO2)

Nitrous Oxide (N2O)
North Central Information Center (NCIC)
Northern Sacramento Valley Air Basin (NSVAB)
Office of Historic Preservation (OHP)
Particulate Matter (PM)
Reactive Organic Gases (ROG)
Regional Water Quality Control Board (RWQCB)
Sacramento Area Sewer District (SASD)
Sacramento County Water Agency (SCWA)
Sacramento Metropolitan Air Quality Management District (SMAQMD)
Sacramento Regional County Sanitation District (SRCSD)
Spills-Leaks-Investigations-Cleanups (SLIC)
State Implementation Plan (SIP)
State Route (SR)
Sulfur Dioxide (SO2)
Toxic Air Contaminants (TACs)
Underground Storage Tank (UST)
United Nations Environment Programme (UNEP)
University of California Museum of Paleontology (UCMP)
U.S. Army Corps of Engineers (USACE)
U.S. Environmental Protection Agency (EPA)
Vehicle Miles Traveled (VMT)
Volatile Organic Compound (VOC)
World Meteorological Organization (WMO)

2.0 PROJECT DESCRIPTION

A. PROJECT LOCATION AND SETTING

The proposed project is located in the City of Elk Grove (City) in Sacramento County (County), California (**Figure 1**). The proposed project includes three separate sites in the southeast industrial area of the City, east of State Route (SR) 99 near the intersection of Waterman Road and Grant Line Road. Where appropriate, this IS/MND refers to these three sites collectively as the "proposed project sites". The proposed project sites include the City Corporation Yard/Jackson Property Site consisting of the existing City Corporation Yard at 10250 Iron Rock Way and an adjacent vacant parcel referred to as the Jackson Property and two other potential project sites for the relocated transit yard referred to as the Iron Rock Way Site and the Grant Line Road Site. Each of the proposed project sites is described in more detail below.

City Corporation Yard/Jackson Property Site – The City Corporation Yard/Jackson Property Site totals 13.5 acres and comprises the existing City Corporation Yard at 10250 Iron Rock Way (APN: 134-0630-037) and an adjacent parcel to the west referred to as the Jackson Property (APN: 134-0630-064). The City's transit facilities are currently located within the City Corporation Yard at 10250 Iron Rock Way (**Figure 2**). The Corporation Yard currently consists of 11.2 acres and includes a 60,000 square foot warehouse/maintenance building and a 7,000 square foot Police Field operations building and fueling area. The Corporation Yard also includes a parking area and a metal awning structure acting as a covered bus washing area. As the City's Transit fleet includes Compressed Natural Gas (CNG)-powered buses, slow-fill CNG is provided on the Corporation Yard site. The Jackson Property, which is contiguous to the existing Corporation Yard on the west, is a 2.3-acre vacant parcel that fronts onto Iron Rock Way.

Iron Rock Way Site – (APN(s): 134-0630-001, -006, -050, -051, -052, -053, -054, -055, -240) The approximately 20-acre Iron Rock Way Site is located near the City Corporation Yard and includes nine separate parcels (**Figure 2**). Eight of the parcels are contiguous and are located directly east of Iron Rock Way. The ninth parcel is located directly west of Iron Rock Way. These nine parcels are surrounded to the north, west, and south by light industrial uses and to the east by the Union Pacific rail line and a large cement batch plant. Access to the site is currently provided from SR 99 by way of Grant Line Road to East Stockton Boulevard to Elkmont Way to Iron Rock Way. However, the City plans to widen Grant Line Road at some point in the future. Following construction of the Grant Line Road Widening Project, East Stockton Boulevard will be realigned to the north, at which point it will align with Survey Road at the Grant Line Road/Survey Road intersection. East Stockton Boulevard will continue to connect Grant Line Road to Elkmont Way following its realignment (EDAW, 2009, p. 3-1).

Grant Line Road Site – The Grant Line Road site consists of approximately 21 acres located directly northeast of Survey Road, southeast of Grant Line Road, and west of the Union Pacific rail line (APN: 134-0220-022) (**Figure 2**). Approximately seven acres of the site were historically used for the Transcon truck terminal. The developed portion of the site is currently used as a pallet processing facility (Super Pallet) and a Federal Express (FedEx) truck storage site. The remaining portion of the site is undeveloped. A 50-foot wide by 20-foot deep storm water drainage canal borders the site along its western and southern edges. The site is bound to the north and west by commercial and light industrial uses, to the south by a cement batch plant, and to the east by the Union Pacific rail line and agricultural land uses in unincorporated Sacramento County. Access to this site is currently provided from Grant Line Road. Following construction of the Grant Line Road Widening Project, access to the site would likely be provided from Survey Road by way of a new access road that would extend directly west from the southern tip of the site to Survey Road (EDAW, 2009, p. 3-1).

B. PROJECT BACKGROUND AND HISTORY

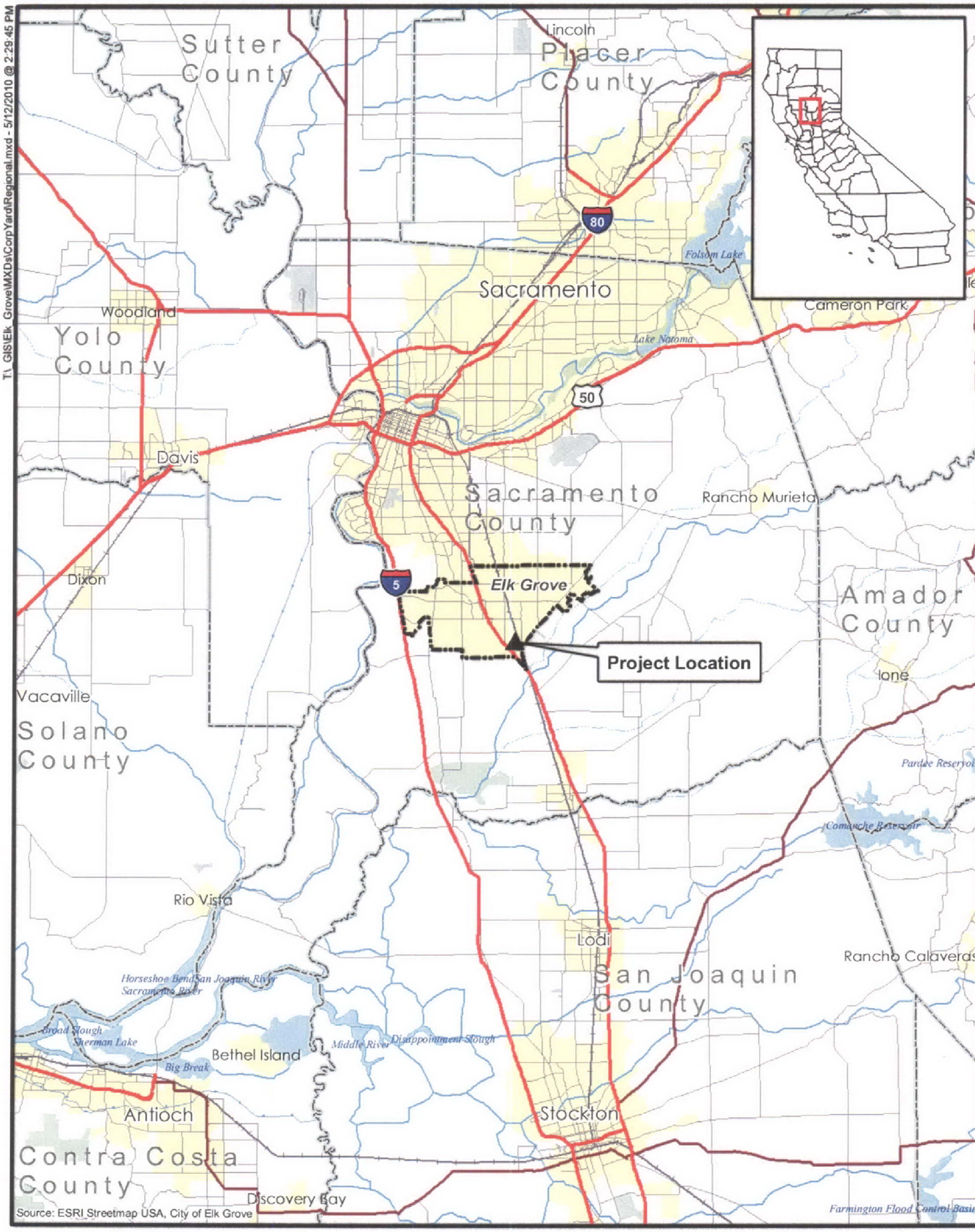
The City of Elk Grove's transit facilities are currently located within the City Corporation Yard at 10250 Iron Rock Way. The Corporation Yard currently provides office space, vehicle maintenance areas, and fleet parking facilities for the City's local public transit services, as well as some non-transit uses as discussed below.

The City began providing local transit services on January 1, 2005, at which time there were 24 Transit vehicles and 39 Transit contractors/staff. As ridership increased, service was expanded and the number of vehicles in the City's Transit fleet and the number of Transit contractors/staff increased. In 2007, the number of Transit vehicles had more than doubled to 67 and the number of Transit contractors/staff had increased to 102. Currently, the size of the buses, the bus turning radii, and the number of vehicles in the fleet has resulted in a "take over" of much of the paved parking area of the existing Corporation Yard. Furthermore, continued significant growth of Transit services is anticipated, with nearly 200 Transit vehicles and 130 contractors/staff projected by the year 2030. Relocation to a dedicated Transit Yard would allow proper development of specifically designed facilities, as well as sufficient and safe turning, enhanced security in compliance with Federal Transit Administration (FTA) recommendations, and dedicated parking areas for vehicles, public, and employees/staff.

The non-transit uses at the Corporation Yard, which consist of warehouse, offices and maintenance facilities for the City's Animal Services, Field Services, Public Works and Police Departments, will need to be expanded to accommodate the operations of those Departments at future City General Plan buildout.[1] With the relocation of transit facilities to a separate Transit Yard, the needs of the other City departments will be accommodated within the existing Corporation Yard site and the Jackson Property. The City has identified two potential sites that may be able to accommodate the expanded needs of the City Transit Yard – the Iron Rock Way Site and the Grant Line Road Site. As detailed above, both of the potential sites are located within the City's southeast industrial area so as not to conflict with retail commercial or residential development. An Environmental Impact Report (EIR) completed in 2009 for the City's Transfer Station Project evaluated the two potential sites being considered for the relocation of the Transit Yard. Therefore, this IS/MND utilizes the background information and environmental analysis contained in the *Elk Grove Transfer Station Draft EIR* (EDAW, 2009), as well as the technical studies prepared for that EIR, to analyze potential environmental impacts associated with the relocation of the City's transit facilities to the Iron Rock Way Site or the Grant Line Road Site.

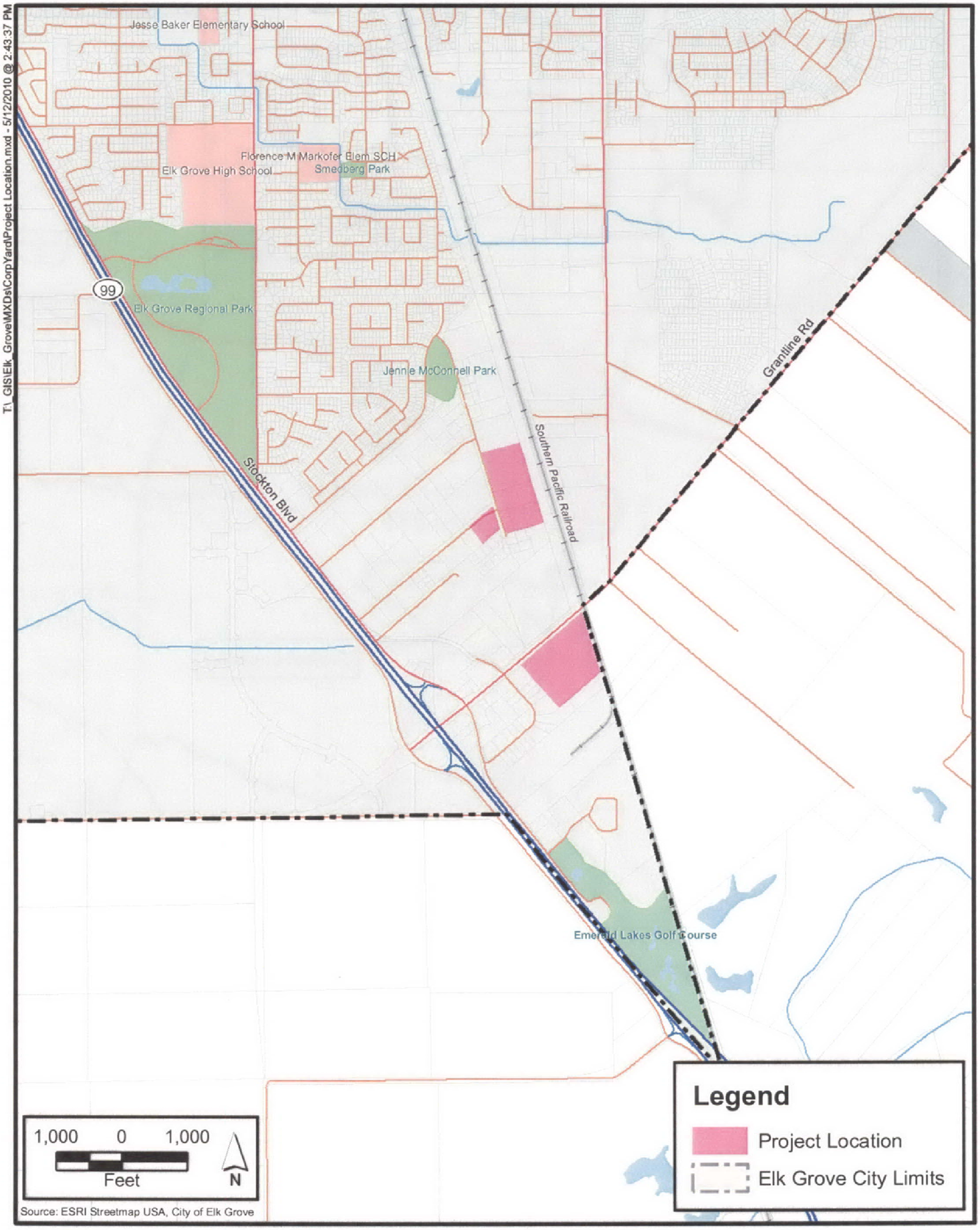
In order to assist in the long-range planning of expansion of the Corporation Yard and relocation of the Transit Yard, the City has prepared two Master Plans – the Corporation Yard Facilities - Master Plan and the Transit Yard Facilities Master Plan. The purpose of these Plans is to provide strategic planning documents designed to identify facilities and other assets available to provide required services to the City and to create a blueprint to expand, improve and protect these assets for the future.

[1] It should be noted that while Code Enforcement functions are currently consolidated within Elk Grove City Hall at 8401 Laguna Palms Way, the proposed Corporation Yard Facilities Master Plan contemplates this Department, or another City Department, occupying space at the Corporation Yard Site at buildout of the City.



City of Elk Grove
Development Services

Figure 1
Regional Location Map



City of Elk Grove
Development Services

Figure 2
Project Location Map

C. PROPOSED ACTIONS ADDRESSED IN THE IS/MND

The proposed project consists of the adoption and approval of the Corporation Yard Facilities Master Plan and the Transit Yard Facilities Master Plan. Given the mid- to long-range timeframes of the Master Plans, this Initial Study/MND addresses the environmental impacts of the proposed project at a programmatic level. The City anticipates that additional project-level environmental reviews may be appropriate at a future date when project details are finalized.

CORPORATION YARD FACILITIES MASTER PLAN

The Corporation Yard Facilities Master Plan provides for the expansion of various services that will re-utilize and add to current facilities within the 13.5-acre City Corporation Yard/Jackson Property Site as shown in **Table 1** below. The proposed Corporation Yard Facilities Master Plan diagram is shown in **Figure 3** and lays out circulation, parking, and use areas for the expanded Corporation Yard.

TABLE 1
CORPORATION YARD FACILITIES MASTER PLAN

Service	Existing Square Footage	Expansion Identified in Master Plan[1]	Square Footage After Expansion
PD Field Services and K-9	8,943	Expand existing office, assembly, and locker / shower area to accommodate future needs. Provide additional patrol vehicle parking as necessary	24,315
Animal Services and Field Services	1,112	Expand Animal Services and Field Services as necessary.	13,604
Public Works and Code Enforcement	10,559	Expand Public Works and Code Enforcement as necessary. Provide parking for Public Works and other City fleet vehicles. Provide inside and outside yard storage space for Public Works and other City departments.	59,059
All Field Service Groups and Police		Provide 160 employee and 30 public parking spaces.	

[1] It should be noted that while Code Enforcement functions are currently consolidated within Elk Grove City Hall at 8401 Laguna Palms Way, the proposed Corporation Yard Facilities Master Plan contemplates this Department, or another City Department, occupying space at the Corporation Yard Site at buildout of the City.

Source: City of Elk Grove. January 10, 2010. City of Elk Grove Corporation Yard Facilities Master Plan.

In total, it is projected that the needs for the expansion of the existing Corporation Yard facilities after relocation of the transit facilities will grow to 343,000 square feet, or approximately 8 acres by the year 2030. Site circulation and landscaping are projected to require an additional 200,000 square feet, or approximately 4.5 acres, for a total of 12.5 acres. The remaining 1 acre would provide a small area of use contingency for minor adjustments in the projected 12.5-acre need.

TRANSIT YARD FACILITIES MASTER PLAN

Facilities required to support Transit operations include office space for Transit management and support staff; lockers/showers and driver assembly spaces; Transit vehicle maintenance bays, including tire, welding, and battery repair bays; a parts room; new and scrap tire storage;

hazardous material and used fluid storage; and Transit vehicle parking. Due to the various vehicle sizes within the Transit fleet, both large and small vehicle maintenance bays with appropriately sized lifts along with some overhead crane capability are required. Local repair, body, and paint shops provide required bodywork, vehicle painting, and major vehicle repair services. Delivery trucks of various sizes will also regularly off-load and pick-up large bus parts and fluids.

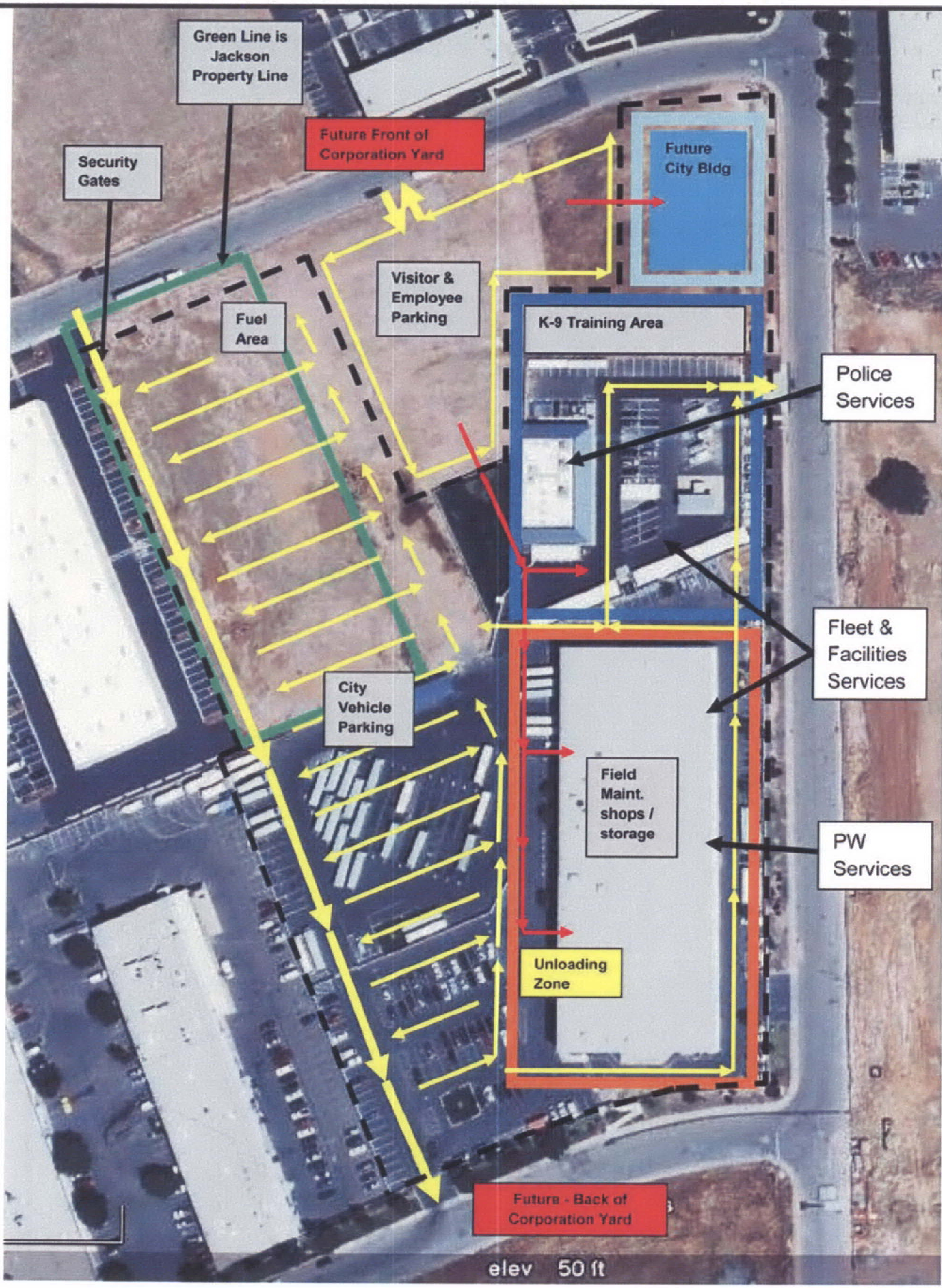
The Transit Yard Facilities Master Plan would accommodate the following Transit facilities needed to meet demand through the year 2030. These facilities would be provided on either the Iron Rock Way Site or the Grant Line Road Site as shown in **Figures 4** and **5**. Therefore, this IS/MND analyzes the environmental impacts of the following facilities on both of the potential sites.

- Public counter, administrative offices and support space, including staff locker, shower, and assembly facilities totaling approximately 20,000 square feet;
- Vehicle maintenance staging area for approximately 10% of fleet;
- Vehicle maintenance and shop space totaling approximately 25,000 square feet;
- Vehicle fueling and wash facilities sufficient fixtures to match up with total vehicle count;
- 210 spaces of employee and public parking; and
- Ready-for-service vehicle parking for 193 buses and vans.

PROJECT OBJECTIVES

The proposed project includes the following objectives:

- To provide convenient, cost-effective and environmentally sound field operation, transit operation, and maintenance services to the citizens of Elk Grove,
- To control the rising costs of managing and operating field services and transit for the City,
- To reduce regional vehicular traffic and associated air pollution,
- To comply with AB 32 (California Global Warming Solutions Act of 2006) by reducing greenhouse gas emissions,
- To establish a long term transit operational location (property) and a long term field services operational location consistent with long term transit capital funding, and
- To provide new employment opportunities to the residents of the City of Elk Grove and the surrounding areas.

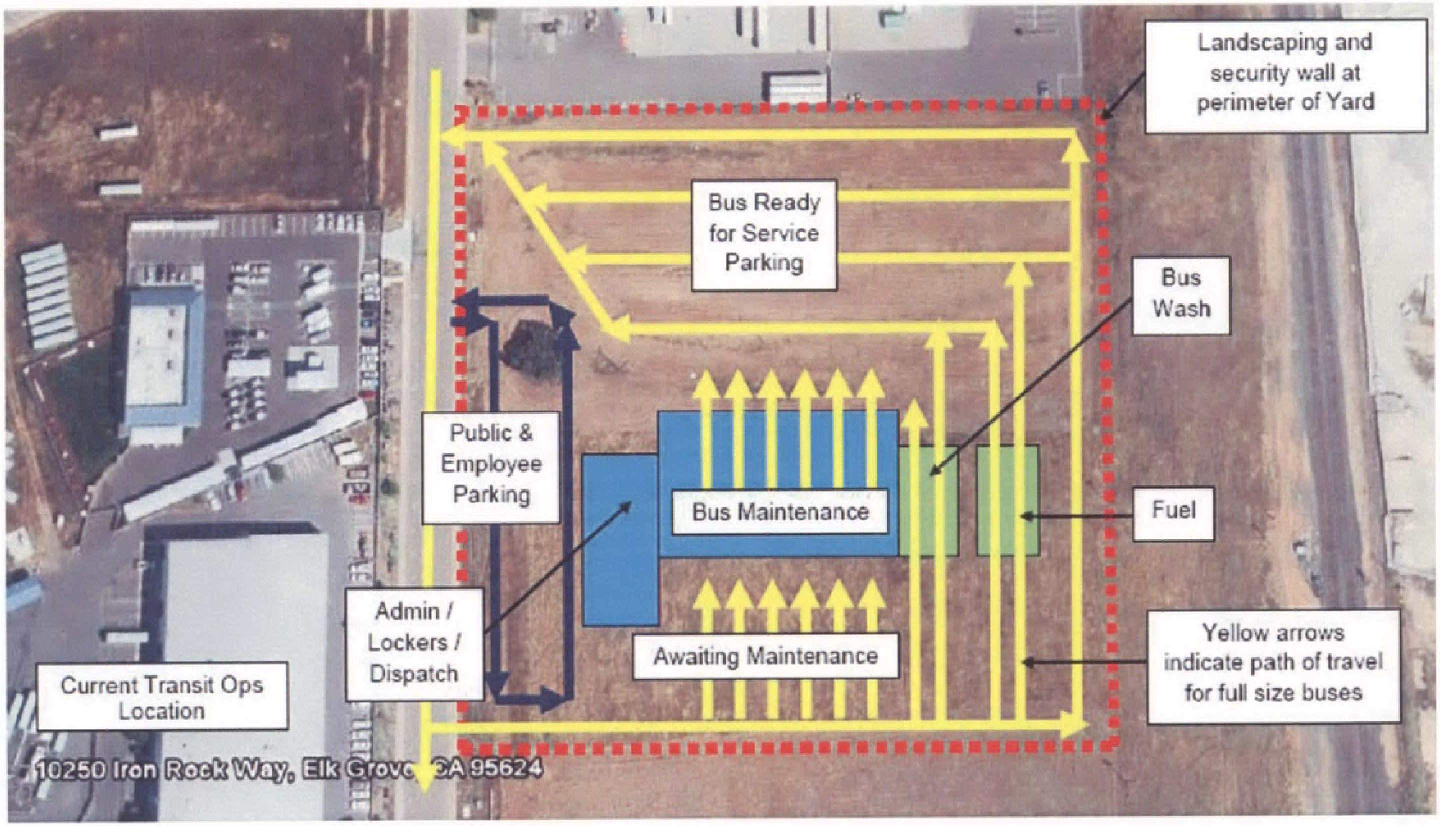


Source: City of Elk Grove, 2010

City of Elk Grove
Development Services

FIGURE 3
Proposed Corporation Yard Master Plan Diagram

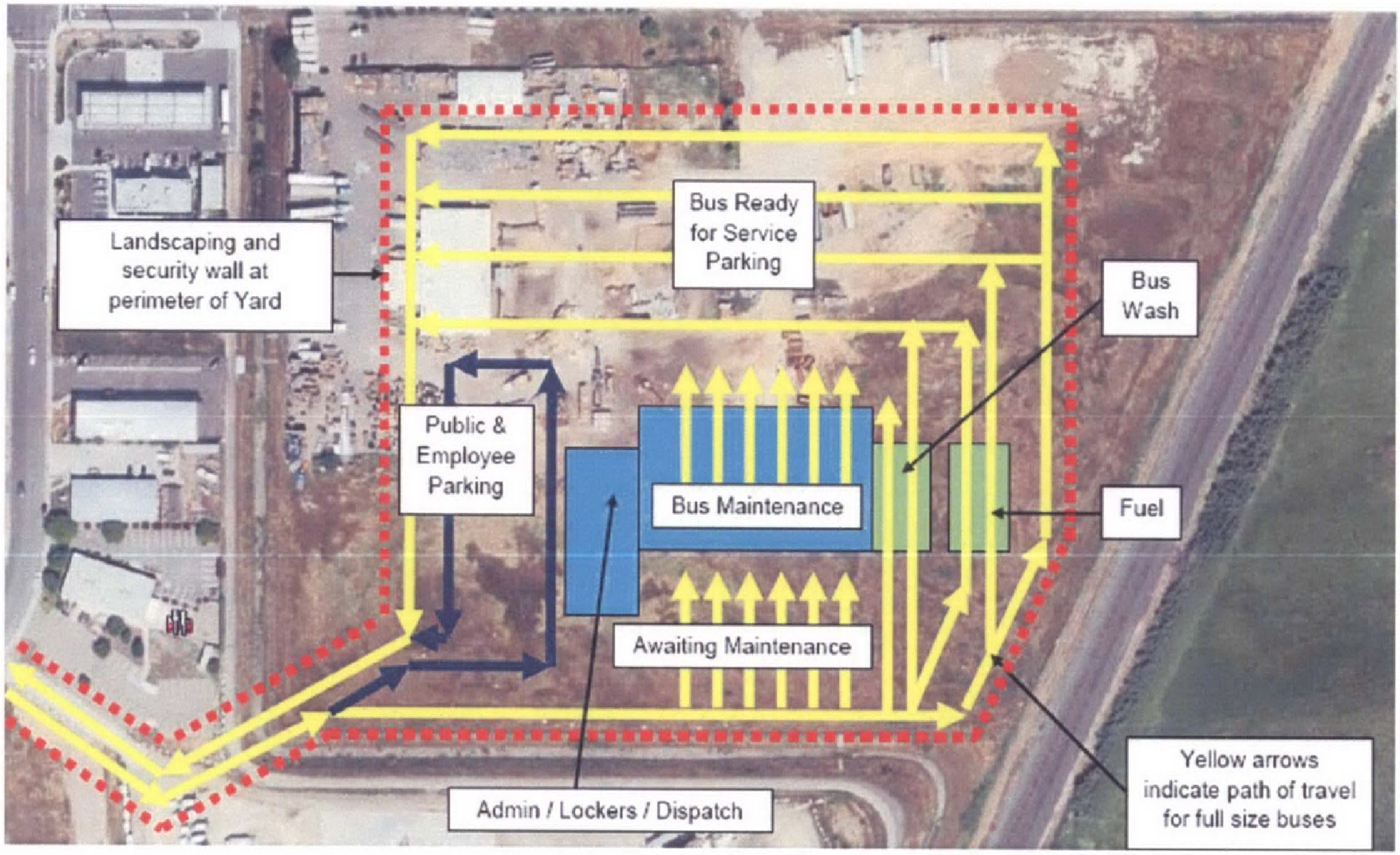
T:_CS\Work\Elk Grove, City of\Corp Yard IS - MND\Figures



Source: City of Elk Grove, 2010

City of Elk Grove
Development Services

FIGURE 4
Iron Rock Way Transit Yard Master Plan



Source: City of Elk Grove, 2010

City of Elk Grove
Development Services

FIGURE 5
Grant Line Road Transit Yard Master Plan

T:_CS\Work\Elk Grove, City of\Corp Yard IS - MND\Figures

D. REGULATORY REQUIREMENTS, PERMITS, AND APPROVALS

Additional subsequent approvals and permits that may be required from local, regional, state, and federal agencies in the processing of the proposed project that this MND may be used to support include, but are not limited to, the following:

- Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers (USACE);
- Endangered Species Act–Section 7 Consultation with the U.S. Fish and Wildlife Service (USFWS);
- Clean Water Act Section 401 Certification from the Regional Water Quality Control Board (RWQCB);
- Construction activity storm water permit from the RWQCB;
- National Pollutant Discharge Elimination System (NPDES) permit from the RWQCB; and
- Authority to Construct/Permit to Operate from the Sacramento Metropolitan Air Quality Management District (SMAQMD).

3.0 ENVIRONMENTAL CHECKLIST

A. BACKGROUND

1. Project Title:

Corporation Yard Facilities Master Plan and Transit Yard Facilities Master Plan Project

2. Lead Agency Name and Address:

City of Elk Grove
Development Services Department
8401 Laguna Palms Way
Elk Grove, CA 95758

3. Contact Person and Phone Number:

Taro Echiburú
(916) 478-3619

4. Project Location:

The proposed project is located in the City of Elk Grove in Sacramento County, California. The proposed project includes four separate project sites in the southeast industrial area of the City, east of State Route (SR) 99 near the intersection of Waterman Road and Grant Line Road. The proposed project sites include the existing City Corporation Yard at 10250 Iron Rock Way (APN: 134-0630-037) and an adjacent vacant parcel to the west referred to as the Jackson Property (APN: 134-0630-064)., as well as two potential sites for the relocated transit yard, referred to as the Iron Rock Way Site (APN(s): 134-0630-001, -006, -050, -051, -052, -053, -054, -055, -240)and the Grant Line Road Site (APN: 134-0220-022).

5. Project Sponsor's Name and Address:

City of Elk Grove
8401 Laguna Palms Way
Elk Grove, CA 95758

6. General Plan Designation:

Heavy Industrial, Light Industrial

7. Description of Project:

The proposed project consists of the adoption and approval of the Corporation Yard Facilities Master Plan and the Transit Yard Facilities Master Plan. The Master Plans anticipate the redevelopment of the City at the existing Corporation Yard, as well as the acquisition and development of additional land, to accommodate the operations of various City Departments at future City General Plan buildout.

8. Surrounding Land Uses and Setting:

Industrial, Commercial, Agricultural

9. Other Public Agencies Whose Approval Is Required:

In CEQA, the term "responsible agency" includes all public agencies other than the lead agency that may have discretionary actions associated with the implementation of the proposed project. Therefore the following agencies may have some role in implementing the proposed project and have been identified as potential responsible agencies:

- U.S. Army Corps of Engineers (USACE);
- U.S. Fish and Wildlife Service (USFWS);
- Regional Water Quality Control Board (RWQCB);
- Sacramento Metropolitan Air Quality Management District (SMAQMD).

B. ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental factors checked below would be potentially affected by this project, as indicated by the checklist and corresponding discussion on the following pages.

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

C. DETERMINATION

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because of the incorporated mitigation measures and revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature	Date
Printed Name	Title

D. EVALUATION OF ENVIRONMENTAL IMPACTS

The following requirements for evaluating environmental impacts are cited directly from the State CEQA Guidelines Appendix G.

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources cited. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards.

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

3) A "Less than Significant Impact" applies when the proposed project would not result in a substantial and adverse change in the environment. This impact level does not require mitigation measures.

4) "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect is significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

5) "Potentially Significant Unless Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less than Significant Impact." The initial study must describe the mitigation measures and briefly explain how they reduce the effect to a less than significant level.

4.0 ENVIRONMENTAL ANYALYSIS

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
1. AESTHETICS. Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcrops, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

EXISTING SETTING

AESTHETIC CHARACTER OF THE PROJECT SITES

The aesthetic character of the project sites can generally be described as urban and industrial. The City Corporation Yard/Jackson Property Site consists of developed industrial buildings and associated improvements, as well as vacant land. The developed portion of the site is characterized by a large warehouse/maintenance building and a smaller Police Field operations building and fueling area. Both buildings are industrial in appearance. The Corporation Yard/Jackson Property Site also includes a parking area and a metal awning structure. The north and northwest portions of the existing Corporation Yard, as well as the entirety of the Jackson Property, are vacant and unpaved with exposed soils and ruderal vegetation. The Iron Rock Way Site is characterized by exposed soils and ruderal vegetation and there are no visible structures on the site. A paved road is visible on the site extending east from Elkmont Drive to the Union Pacific rail line along the site's eastern boundary. The Grant Line Road Site is partially developed with industrial buildings, including a pallet processing facility and a FedEx truck storage site. The remainder of the site contains exposed soils, ruderal vegetation and a dirt road. A drainage canal border the Grant Line Road site to the south (EDAW, 2009, p. 4.6-1).

Those most likely to view the project sites would be travelers on Grant Line Road. From Grant Line Road looking north, the view includes the concrete barrier, razor wire fence, and large white propane tanks of Suburban Propane in the foreground and the industrial buildings on the existing Corporation Yard in the background. The Iron Rock Way Site is not clearly visible from Grant Line Road. From Grant Line Road looking south, the undeveloped portion of the Grant Line Road Site is visible in the foreground and the pallet processing facility, including several stacks of pallets and a blue industrial building, are visible in the background. In addition, large trees planted along Grant Line Road to screen the industrial uses from motorists are visible (EDAW, 2009, p. 4.6-1).

Views of the project sites from SR 99 are limited due to the slightly elevated grade of the Grant Line Road/SR 99 on- and off-ramps, which partially screen the view of both north- and south-bound travelers on SR 99. Intervening vegetation, such as shrubs and some evergreen trees, as well as a vacant lot, are visible looking from SR 99 toward the project sites.

The project sites are visible in the distance from the Hampton Village residential subdivision to the north and the Newton Ranch and Sonoma Creek subdivisions to the east. Although the views from these subdivisions looking south and southwest towards the project sites are dominated by agricultural uses, the industrial buildings on the project sites and surrounding area can be seen in the distance, along with electricity transmission lines.

AESTHETIC CHARACTER OF THE SURROUNDING AREA

The project sites are located in an industrial/commercial area. As such, the visual character of the surrounding area is considered urban and industrial. However, the Grant Line Road Site is adjacent to agricultural uses in unincorporated Sacramento County, and is thus at a location where the visual character of the area transitions from industrial and urban to agricultural and rural. The aesthetic character of Grant Line Road, which provides the main arterial access to the area, includes a mix of light and heavy industrial and commercial development close to SR 99 and a transition to agricultural and rural residential uses to the east.

SCENIC VISTAS AND STATE SCENIC HIGHWAYS

There are no scenic vistas in the City of Elk Grove (City of Elk Grove, 2003b). Furthermore, there are no officially-designated state scenic highways in the City of Elk Grove or in the surrounding area (DOT, 2010). However, scenic corridors that extend 660 feet on each side of the right -of-way protect all freeways within Sacramento County, including SR 99 from the Calvine Road exit to the juncture of SR 99 and the Cosumnes River south of Grant Line Road. The purpose of the corridor is to beautify the freeways to make road travel more pleasant and to create a more attractive image of the urban areas in Sacramento County. Additionally, SR 99 is also designated as a Special Sign Corridor by the Elk Grove Zoning Code, which regulates the type, size and location of signs within the view of the traveling public (City of Elk Grove, 2003b, p. 4.13-2). The project sites are not within the scenic corridor surrounding the I-5 right-of-way. In addition, none of the project sites are clearly visible from SR 99 due to freeway off-ramps, which screen the view of both north- and south-bound travelers on SR 99.

NIGHTTIME LIGHTING CONDITIONS

The current nighttime lighting conditions on the developed portion of the project sites and in the vicinity of the project sites are industrial in nature, which includes mainly security lighting on the industrial buildings and in the parking lots. Some of the existing industrial uses have high pole lighting that can produce large amounts of light and glare (EDAW, 2009, p. 2-4).

REGULATORY FRAMEWORK

The following state and local regulations, plans, programs, and guidelines are applicable to the proposed project:

- State Laws and Regulations
  - California Scenic Highway Program
  - Nighttime Sky-Title 24 Outdoor Lighting Standards
- Local Laws, Regulations, and Policies
  - City of Elk Grove Zoning Code

- City of Elk Grove Design Guidelines

PROJECT IMPACTS AND MITIGATION MEASURES

a) **No Impact.** The City of Elk Grove General Plan (2003a) does not identify any scenic vistas within the City. Therefore, the proposed project would not adversely affect a scenic vista and **no impact** would occur.

b) **No Impact.** There are no officially-designated state scenic highways in the City of Elk Grove. Therefore, implementation of the proposed project would not damage scenic resources within a state scenic highway. Furthermore, none of the project sites are clearly visible from SR 99 due to freeway off-ramps, which screen the view of both north- and south-bound travelers on SR 99. Therefore, the expansion of the Corporation Yard facilities on the existing site and relocation of the Transit Yard to either the Iron Rock Way Site or the Grant Line Road Site would result in **no impact** associated with the scenic corridor along SR 99.

c) **Less Than Significant Impact.** Implementation of the proposed project would accommodate the future expansion of the Corporation Yard facilities on the City Corporation Yard/Jackson Property Site and relocation of the Transit Yard to either the Iron Rock Way Site or the Grant Line Road Site, which would alter the visual character of each of the project sites.

Expansion of the Corporation Yard would alter the visual character of the City Corporation Yard/Jackson Property Site by developing the currently vacant portions of the site with parking areas, a fuel area, and an industrial building. Expansion of the Corporation Yard would also include expansion of the existing industrial uses on the site.

Relocation of the Transit Yard to the Iron Rock Way Site would alter the visual character of the site by introducing industrial buildings, Transit vehicle maintenance bays, tire storage, hazardous material and used fluid storage, and Transit vehicle parking to the currently vacant site. Relocation of the Transit Yard to the Grant Line Road Site would similarly alter the visual character of the site by converting the existing pallet processing and truck storage facilities into industrial buildings, Transit vehicle maintenance bays, tire storage, hazardous material and used fluid storage, and Transit vehicle parking.

Although implementation of the proposed project would allow for future development that would alter the visual character of the project sites as described above, each of the project sites would be located in an industrial area with industrial uses similar to those envisioned in the proposed Master Plans. Therefore, future development on the project sites would be aesthetically consistent with the surrounding area, and would not substantially degrade the existing visual character of the project sites or surroundings. Furthermore, additional project-level environmental reviews would require any proposed development and/or improvements to be consistent with the City's Zoning Code, which regulates setbacks, building height, landscaping, parking, and signs on industrial properties and seek to protect surrounding properties from objectionable views (City of Elk Grove, 2006a). Any proposed development would also be required to be consistent with the City's Design Guidelines, which encourage sound industrial site development practices, including controlled site access, service areas located at the sides and rear of buildings, convenient public access and visitor parking, screening of storage, work areas, and mechanical equipment, storage and service area screen walls, and an emphasis on the main building entry and landscaping (City of Elk Grove, 2003c, p. 134). Given that implementation of the proposed project would allow for future industrial development in an established industrial area and that future development would be required to comply with the City's Zoning Code and Design Guidelines, impacts would be considered **less than significant**.

d) **No Impact.** As described above, implementation of the proposed project would allow for future development that would expand existing industrial uses or introduce new industrial uses into a currently industrial area. Therefore, lighting associated with future development on the project sites would be similar in function (for security purposes on the exterior of buildings and within the project sites) and design to lighting currently utilized in the surrounding area. As the proposed Master Plans are programmatic in nature, project-specific lighting plans are not currently available. Additional project-level environmental reviews would require any proposed development and/or improvements to be consistent with the City's Zoning Code, which includes standards for outdoor lighting in order to limit glare and light pollution and to ensure adequate safety, night vision, and comfort. The Zoning Code includes shielding requirements, limits on the maximum level of illumination, and limits on the height of outdoor light fixtures. Future development on the project sites would also be required to comply with the City of Elk Grove Design Guidelines, which require lighting to be designed so that light is not directed off site and the light source is shielded downward from direct off-site viewing. Therefore, while the proposed project would allow for future development that would create new sources of light and glare, these would be consistent with the existing lighting conditions in the area and would not be expected to adversely affect day or nighttime views in the area. Further, there are no immediate residential areas that would be impacted by nighttime lighting. Therefore, **no impact** would occur.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
2. AGRICULTURE AND FOREST RESOURCES. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act Contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526, and by Government Code Section 51104(f)), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☒	☐

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland.

In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.

REGIONAL SETTING

As of 2006, Sacramento County contained approximately 372,090 acres of agricultural land as designated by the Farmland Mapping and Monitoring Program (FMMP). FMMP is a non-regulatory program within the California Department of Conservation (DOC) that produces Important Farmland maps and statistical data used for analyzing impacts on California's agricultural resources. The Important Farmland maps identify five agriculture-related categories - prime farmland, farmland of statewide importance, unique farmland, farmland of local importance, and grazing land - rated according to soil quality and irrigation status. Each is summarized below (DOC, 2004, pp. 6-7):

- PRIME FARMLAND (P): Farmland with the best combination of physical and chemical features able to sustain long term agricultural production. This land has the soil quality, growing season, and moisture supply needed to produce sustained high yields. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.

- FARMLAND OF STATEWIDE IMPORTANCE (S): Farmland similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to store soil moisture. Land must have been used for irrigated agricultural production at some time during the four years prior to the mapping date.

- UNIQUE FARMLAND (U): Farmland of lesser quality soils used for the production of the state's leading agricultural crops. This land is usually irrigated, but may include nonirrigated orchards or vineyards as found in some climatic zones in California. Land must have been cropped at some time during the four years prior to the mapping date.

- FARMLAND OF LOCAL IMPORTANCE (L): Land of importance to the local agricultural economy as determined by each county's board of supervisors and a local advisory committee.

- GRAZING LAND (G): Land on which the existing vegetation is suited to the grazing of livestock. The minimum mapping unit for Grazing Land is 40 acres.

- URBAN AND BUILT-UP LAND (D): Land occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel. This land is used for residential, industrial, commercial, institutional, public administrative purposes, railroad and other transportation yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment, water control structures, and other developed purposes.

- OTHER LAND (X): Land not included in any other mapping category. Common examples include low density rural developments; brush, timber, wetland, and riparian areas not suitable for livestock grazing; confined livestock, poultry or aquaculture facilities; strip mines, borrow pits; and water bodies smaller than 40 acres. Vacant and nonagricultural land surrounded on all sides by urban development and greater than 40 acres is mapped as Other Land.

- WATER (W): Perennial water bodies with an extent of at least 40 acres.

Table 2 below tabulates the acres of land area in Sacramento County by FMMP category in 2006, along with the changes in designations between 2004 and 2006. As shown, the largest portion of the County's Important Farmland is Prime Farmland (106,667 acres) and the largest decrease of Important Farmland between 2004 and 2006, was for Farmland of Statewide Importance. One of the basic underlying premises of agricultural conversion is that the proximity of agricultural land to urban uses increases the value of the agricultural land either directly through formal purchase offers or indirectly through recent sales in the vicinity, and through the extension of utilities and other urban infrastructure into productive agricultural areas. Between 2004 and 2006, approximately 6,366 acres of Important Farmland in Sacramento County were converted to other uses and approximately 6,198 acres of Grazing Land were converted. These conversions resulted in a total decline in agricultural land of 12,564 acres in Sacramento County between 2004 and 2006 (DOC, 2006a).

TABLE 2
FMMP LAND USE AND CONVERSION IN SACRAMENTO COUNTY
2004 - 2006

Land Use Category	Acreage		2004 to 2006 Acreage Changes
	2004	2006	
Prime Farmland	110,278	106,667	-3,611
Farmland of Statewide Importance	56,141	51,217	-4,924
Unique Farmland	15,187	15,268	81
Farmland of Local Importance	39,873	41,961	2,088
IMPORTANT FARMLAND SUBTOTAL	221,479	215,113	-6,366
Grazing Land	163,175	156,977	-6,198
AGRICULTURAL LAND SUBTOTAL	384,654	372,090	-12,564
Urban and Built-up Land	165,630	175,523	9,893
Other Land	67,548	70,242	2,694
Water Area	18,253	18,230	-23
TOTAL AREA INVENTORIED	636,085	636,085	0

Source: DOC, 2006a.

LOCAL SETTING

The majority of agricultural land uses within the City of Elk Grove are considered fallow (vacant or underutilized). Few crops are grown in the City itself and no major commercial agricultural operations occur within the City limits, though small family farms do exist. Much of the remaining agricultural land uses are expected to be converted to urban land uses as the City continues to develop. Although the City's General Plan designates a large area of the City (generally east of Bradshaw Road) for rural uses, the small parcel sizes in this area will most likely limit agricultural uses to "hobby" farming, the raising of animals either for personal enjoyment or on a small commercial scale, or the growing of specialty crops such as nursery plants. In 2000, the Important Farmland Map for Sacramento County indicated that the City contained 175 acres of Prime Farmland, 5,893 acres of Farmland of Statewide Importance, and 3,997 acres of Farmland of Local Importance (City of Elk Grove, 2003b).

The 2006 Important Farmland Map for Sacramento County designates the proposed project sites and the majority of the surrounding sites as Urban and Built Up Land (DOC, 2006b). However, as shown in **Figure 6**, the land adjacent to the Grant Line Road Site on the east is designated as Farmland of Statewide Importance (DOC, 2006b). Additionally, land east of the Union Pacific rail line and west of SR 99 is designated as Farmland of Statewide Importance.

REGULATORY FRAMEWORK

The following state and local regulations, plans, programs, and guidelines are applicable to the proposed project:

- State Laws and Regulations

- Williamson Act – The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, is a non-mandated state program, administered by counties and cities to preserve agricultural land and discourage the premature conversion of agricultural land to urban uses. The Williamson Act enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use and, in return, landowners receive property tax assessments which are much lower than normal because they are based upon farming and open space uses as opposed to full market value (DOC, 2010). It should be noted that in July 2009, the state legislature passed several bills to balance the state budget. Included in these bills was a provision that temporarily cuts local funding for the implementation of the Williamson Act Program by approximately $35 million, effectively eliminating the program until funding is restored.

  As of 2008, Sacramento County had 245,682 acres under Williamson Act Contract. The proposed project sites are not under Williamson Act contracts. Land to the east of the project sites is in nonrenewal, a 9-year process to terminate the Williamson Act contract (Sacramento County, 2009, p. 3-8).

- Local Laws, Regulations, and Policies

  - Right-to-Farm Ordinance

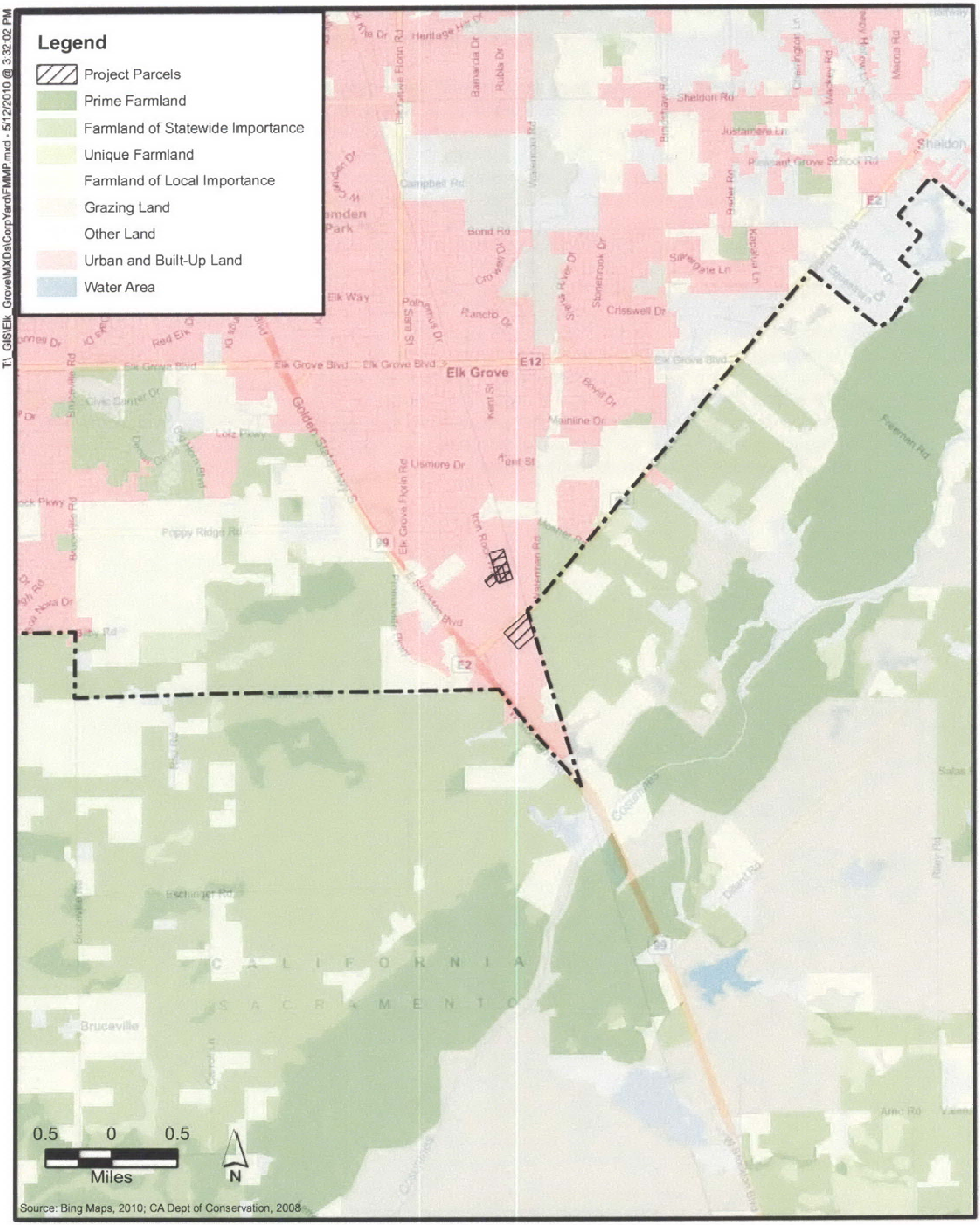
PROJECT IMPACTS AND MITIGATION MEASURES

a) No Impact. The City Corporation Yard/Jackson Property and Grant Line Road Sites are currently zoned and utilized for industrial uses. The Iron Rock Way Site is currently vacant, but is zoned for industrial uses and surrounded by existing industrial operations. All of the proposed project sites are designated by the Department of Conservation FMMP as Urban and Built Up Land. Therefore, implementation of the proposed project would not directly convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to a nonagricultural use and **no impact** would occur.

b) No Impact. The proposed project sites are zoned a combination of Heavy and Light Industrial by the City of Elk Grove Zoning Code. None of the project sites are under a Williamson Act contract. Lands to the east of the Grant Line Road Site are under Williamson Act Contracts that are in nonrenewal. However, implementation of the proposed project would accommodate the future expansion and relocation of industrial uses in an industrial area, which would not be expected to interfere with nearby zoning for agricultural uses or Williamson Act contracts. Therefore, implementation of the proposed project would result in **no impact** associated with conflicts with existing zoning for agricultural uses or a Williamson Act Contract.

c) No Impact. Neither the City of Elk Grove nor Sacramento County contains any land zoned for forest land, timberland, or Timberland Production. Therefore, **no impact** would occur.

d) No Impact. Neither the City of Elk Grove nor Sacramento County contains any forest land other than urban forest. Therefore, **no impact** would occur.



City of Elk Grove
Development Services

Figure 6
Important Farmland Map

e) **Less Than Significant.** As discussed above, the placement of nonagricultural uses adjacent to agricultural uses can result in conflicts that inadvertently place growth pressure on agricultural lands to convert to urban uses. Although the project sites consist of Urban and Built Up Land and do not include any farmland, lands to the east of the project sites in unincorporated Sacramento County are designated by the DOC FMMP as Farmland of Statewide Importance. Even so, implementation of the proposed project would not be expected to place pressure on this farmland to convert to nonagricultural uses, as proposed uses on the sites primarily include expansion of existing buildings and parking areas. The proposed project sites are located in an industrial area that transitions from industrial to rural residential and agricultural moving away from the City limits to the east. Therefore, industrial uses are currently operated adjacent to farmland. The City Corporation Yard/Jackson Property site and the Iron Rock Way site are surrounded by other industrial uses. The Grant Line Road site is adjacent to Farmland of Statewide Importance; however, implementation of the proposed project would accommodate the future conversion of the site from one industrial use to another. Therefore, the proposed project would not involve changes in the existing environment which could indirectly result in the conversion of farmland to non-agricultural use and this impact would be considered **less than significant**.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
3. AIR QUALITY. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☒	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?	☐	☒	☐	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☒	☐	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☒	☐	☐

REGIONAL SETTING

The project site is located within the Sacramento Metropolitan Air Quality Management District (SMAQMD), which is part of the Sacramento Valley Air Basin. The Sacramento Valley Air Basin comprises all of Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo, and Yuba counties, the western portion of Placer County, and the eastern portion of Solano County. The Sacramento Valley Air Basin has been further divided into Planning Areas called the Northern Sacramento Valley Air Basin (NSVAB) and the Greater Sacramento Air region, designated by the U.S. Environmental Protection Agency (EPA) as the Sacramento Federal Ozone Non-attainment Area. The Nonattainment area consists of all of Sacramento and Yolo counties, and parts of El Dorado, Solano, Placer, and Sutter counties.

LOCAL SETTING

SMAQMD is responsible for limiting the amount of emissions that can be generated throughout Sacramento County, which includes the City of Elk Grove, by various stationary and mobile sources. Concentrations of the following air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable and fine particulate matter (PM_{10} and $PM_{2.5}$, respectively), and lead are used as indicators of ambient air quality conditions. Specific rules and regulations have been adopted by the SMAQMD Board of Directors that limit the emissions that can be generated by various uses and/or activities, and identify specific pollution reduction measures that must be implemented in association with various uses and activities. These rules not only regulate the emissions of the six criteria pollutants listed above, but also toxic emissions and acutely hazardous materials. Emissions sources subject to these rules are regulated through the SMAQMD's permitting process. Through this permitting process, the SMAQMD also monitors the amount of stationary emissions being generated and uses this information in developing new clean air plans. The proposed project would be subject to SMAQMD rules and regulations to reduce specific emissions and to mitigate potential air quality impacts.

Sacramento County, which encompasses the City, is a known area of non-attainment for state and federal standards for ozone as well as state and federal standards for particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) (SMAQMD, 2009a). Implementation of the project would result in increases in both construction emissions of $PM_{2.5}$ and increases in reactive organic gases (ROG) and NO_x, which are precursor components of ozone and PM_{10}. The region has been designated as a nonattainment area for the national (8-hour) ozone standard with an attainment deadline of 2019. SMAQMD has recently completed the *Sacramento Metropolitan Area 8-Hour Ozone Attainment Plan* (2009). This plan proposes to use updated emissions inventories, existing control strategies, and approved control measure commitments to achieve emission reductions necessary for compliance with the Clean Air Act (SMAQMD, 2009b).

REGULATORY FRAMEWORK

The following state and local regulations, plans, programs, and guidelines are applicable to the proposed project:

- **Federal Laws and Regulations** – The federal Clean Air Act (CAA) required by the Environmental Protection Agency (EPA) to establish national ambient air quality standards (NAAQS).

- **State Laws and Regulations –** The California Clean Air Act (CCAA), which was adopted in 1988, required the California Air Resources Board (CARB) to establish California ambient air **quality standards (CAAQS).**

- **Local Laws, Regulations, and Policies** – The *1991 Air Quality Attainment Plan* (AQAP), prepared and submitted by SMAQMD in compliance with the requirements set forth in the CCAA, specifically addressed the nonattainment status for ozone and to a lesser extent, CO and PM_{10}.

  - SMAQMD has also adopted various rules and regulations pertaining to the control of emissions from area and stationary sources. All projects are subject to SMAQMD rules and regulations in effect at the time of construction. Specific rules applicable to the construction of the proposed project may include, but are not limited to:

    - Rule 201 – General Permit Requirements.

    - Rule 402 – Nuisances.

    - Rule 403 – Fugitive Dust. Rule 442 – Architectural Coatings. .

PROJECT IMPACTS AND MITIGATION MEASURES

a) **Less than Significant.** As identified in the setting discussion, the Sacramento Metropolitan region, which includes the City of Elk Grove, is designated as a nonattainment area for the federal 8-hour ozone standard as well as a nonattainment area for the state 1-hour and 8-hour standards for ozone. The Sacramento Regional Ozone Attainment Plan (OAP) was developed by the air districts in the Sacramento Region to bring the region into attainment. The OAP is the regional component of the SIP, which is the State's plan for attaining the federal 8-hour ozone standard as required by the federal CAA. The SIP, which also includes the *Sacramento Metropolitan 8-Hour Ozone Attainment Plan*, has been prepared to identify a detailed comprehensive strategy for reducing emissions to the level needed for attainment and show how the region would make expeditious progress toward meeting this goal. The SIP assumes annual increases in air pollutant emissions resulting from regional growth (including construction-generated emissions) anticipated according to local land use plans (e.g., general plans, regional transportation plans). The SIP also assumes the incremental increase in emissions will be partially offset through the implementation of stationary, area, and indirect source control measures contained within the SIP.

In addition to not attaining the federal or state ozone standards, the region does not attain the federal or state particulate matter standards (PM_{10} and $PM_{2.5}$). Reduction of particulate matter by all feasible means is necessary to attain these particulate matter standards. Unlike for ozone, there is no approved regional plan for attaining the PM_{10} or $PM_{2.5}$ standards. PM directly emitted from a project is generally regarded as having regional and localized impacts, however, PM_{10} and $PM_{2.5}$ are of greatest concern during construction (e.g., site preparation phase) of a proposed project.

The Corporation Yard Facilities Master Plan and the Transit Yard Facilities Master Plan propose both the expansion of various services that will re-utilize and add to current facilities within the 13.5-acre City Corporation Yard/Jackson Property Site as well as the accommodation of transit services at one of two other potential sites within the City. As these actions do not consist of the addition of residential dwelling units, the proposed project would not be inconsistent with attainment plan population projections.

In addition, implementation of the proposed Transit Yard Facilities Master Plan would accommodate transit facilities needed to meet demand through the year 2030 in order to provide convenient, cost-effective and environmentally sound field operation, transit operation, and maintenance services to the citizens of Elk Grove as well as establish a long term transit operational location (property) and a long term field services operational location consistent with long term transit capital funding.

The accommodation of increasing transit facilities is anticipated to result in an overall reduction in on-road vehicle commute distances for City residents within the Elk Grove vicinity as the nature of the project is to provide more efficient local transit service and encourage transit use. For these reasons, long-term operation of the proposed project is anticipated to result in an overall beneficial air quality impact and would not be anticipated to conflict with existing or future air quality planning efforts. Therefore, this impact is considered to be **less than significant.**

b & c) Less than Significant with Mitigation Incorporated. Subsequent land use activities associated with implementation of the proposed project would introduce additional construction, mobile and stationary sources of emissions, which would adversely affect regional air quality. The NSVAB, which encompasses the City of Elk Grove, is designated as nonattainment for the federal 8-hour ozone standard, the state and 8-hour and 1-hour ozone standard, and the federal and state PM_{10} and $PM_{2.5}$ standards.

CONSTRUCTION EMISSIONS

Construction generated emissions are temporary and short-term but have the potential to represent a significant air quality impact. The construction and development of the proposed project would result in the temporary generation of emissions resulting from demolition of existing structures, site grading and excavation, paving, motor vehicle exhaust associated with construction equipment and worker trips, as well as the movement of construction equipment, especially on unpaved surfaces. Emissions of airborne particulate matter are largely dependent on the amount of ground disturbance associated with site preparation activities.

Ozone-Precursor Pollutants

The SMAQMD recommends that construction-generated emissions of ROG and NOx be quantified and presented as part of the analysis of project-generated emissions. However, because construction equipment emit relatively low levels of ROG and because ROG emissions from other construction processes (e.g., asphalt paving, architectural coatings) are typically regulated by the SMAQMD, the SMAQMD has not adopted a construction emissions threshold for ROG. The SMAQMD has, however, adopted a construction emissions threshold of 85 lbs/day for NOx. In addition, if daily emissions of NOx from heavy-duty mobile equipment do not exceed the 85 lbs/day threshold, then SMAQMD considers exhaust emissions of other pollutants to also be less than significant (SMAQMD, 2009).

The proposed project would include the expansion of various services that will re-utilize and add to current facilities within the 13.5-acre City Corporation Yard/Jackson Property Site. This proposed expansion includes an additional 15,372 square feet of police department field office use, 12,492 square feet of office use for Animal Services and Field Services, and an additional 48,500 square feet of City Public Works and Code Enforcement office space. In addition, the proposed project includes the construction of 20,000 square feet of administrative offices and 25,000 square feet of vehicle maintenance facilities at the location of the new Transit Yard.

Short-term construction emissions of ROG and NOx were estimated using the URBEMIS2007 (Version 9.2.4) computer program, as recommended by the SMAQMD. The URBEMIS2007 program is designed to model construction emissions for land use development projects and allows for the input of project-specific information. Maximum daily emissions anticipated to occur during the grading phase were calculated based on a project area of 13.5 acres at the City Corporation Yard/Jackson Property Site and 21 acres at the site of the new Transit Yard (the Iron Rock Way site is 20 acres while the Grant Line Road site is 21 acres). For the purposes of this air quality analysis, it is anticipated that one-quarter of the project site (totaling 8.05 acres) could be actively disturbed on any given day.

Estimated daily construction-generated emissions are summarized in **Table 3**, below. As depicted, unmitigated construction emissions associated with the onsite improvements would generate a maximum of approximately 56.40 lbs/day of NOx. Predicted daily emissions of NOx would not exceed the SMAQMD significance threshold of 85 lbs/day. As a result, short-term construction-generated emissions of ozone-precursor pollutants would be considered **less than significant.**

TABLE 3
SUMMARY OF SHORT-TERM CONSTRUCTION EMISSIONS

Source	ROG	NOx	PM_{10}	$PM_{2.5}$	CO
Construction Emission Estimates (lb/day)	128.64	56.40	31.99	9.34	43.75
SMAQMD Significance Thresholds (lb/day)	–	85	–	–	–

Notes: Assumes that maximum daily emissions associated with facility construction and paving could occur simultaneously on any given day. Emissions were calculated using the URBEMIS2007 (v9.2.4) computer program.

Fugitive Dust

In addition to emissions from onsite mobile equipment, onsite grading activities would also result in increased emissions of fugitive dust. Construction projects that require grading or other earthmoving activities generate large amounts of particulate matter. While construction related emissions produce only temporary impacts, these short-term impacts contribute to the emission inventory. Under certain conditions, the increased pollution load can exceed state and federal ambient air quality standards.

To assist in the evaluation of fugitive dust-related impacts, SMAQMD staff has developed screening criteria for construction projects. The SMAQMD guidelines state that if the maximum daily disturbed area (i.e., grading, excavation, cut and fill) would not exceed 15 acres and the project would implement all SMAQMD's *Basic Construction Emission Control Practices*, then the PM_{10} emission concentrations generated by construction projects shall be considered a less than significant impact to air quality. As previously mentioned, it is anticipated that one-quarter of the project site (totaling 8.05 acres) could be actively disturbed on any given day. Furthermore, the proposed project would be required to comply with SMAQMD Rule 403 for control of fugitive dust, as well as SMAQMD Rule 902 for control of asbestos if asbestos was identified in the structures to be demolished. Rule 403 requires implementation of reasonable precautions so as not to cause or allow emissions of fugitive dust from being airborne beyond the property line of the project site. Rule 902 requires compliance with the US EPA's National Emissions Standard for Hazardous Air Pollutants for Asbestos and limits emissions of asbestos to the atmosphere, including emissions occurring during demolition of existing structures. However, implementation of SMAQMD's *Basic Construction Emission Control Practices* is not proposed as part of the project resulting in **potentially significant impact** resulting from fugitive dust emissions.

The following mitigation is therefore required:

MM 3b-1: The following SMAQMD's *Basic Construction Emission Control Practices* shall be implemented:

- Water all exposed surfaces two times daily. Exposed surfaces include, but are not limited to soil piles, graded areas, unpaved parking areas, staging areas, and access roads.
- Cover or maintain at least two feet of free board space on haul trucks transporting soil, sand, or other loose material on the site. Any haul trucks that would be traveling along freeways or major roadways should be covered.
- Use wet power vacuum street sweepers to remove any visible trackout mud or dirt onto adjacent public roads at least once a day. Use of dry power sweeping is prohibited.
- Limit vehicle speeds on unpaved roads to 15 miles per hour (mph).
- All roadways, driveways, sidewalks, parking lots to be paved should be completed as soon as possible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used.
- Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to 5 minutes (as required by the state

airborne toxics control measure [Title 13, Section 2485 of the California Code of Regulations]). Provide clear signage that posts this requirement for workers at the entrances to the site.

- Maintain all construction equipment in proper working condition according to manufacturer's specifications. The equipment must be checked by a certified mechanic and determine to be running in proper condition before it is operated.

Timing/Implementation: During construction

Enforcement/Monitoring: City of Elk Grove Planning Department

Implementation of mitigation measure **MM 3b-1** would reduce construction-related air quality impacts to a **less than significant level.**

OPERATIONAL EMISSIONS

As previously mentioned, ozone is not emitted directly into the air but is formed through a complex series of chemical reactions between ROG and NO_x, while the principal sources of PM_{10} and $PM_{2.5}$ include fuel burned in cars and trucks, power plants, factories, fireplaces, agricultural activities, and wood stoves. Implementation of the proposed project would result in increased regional emissions of PM_{10}, $PM_{2.5}$ as well as ROG, NO_x, and CO, due to increased use of motor vehicles, natural gas, maintenance equipment, and various consumer products, thereby increasing potential operational air quality impacts.

Increases in operational air impacts with implementation of the proposed project would generally consist of two sources: stationary and mobile.

Long-term increases in area- and mobile-source emissions associated with the proposed project were estimated using the URBEMIS2007 computer program. The default settings for Sacramento County contained in the model were used for this analysis. Predicted operational emissions were calculated from the mean summer and winter conditions. Predicted long-term operational emissions are summarized in **Table 4**.

TABLE 4
LONG-TERM EMISSIONS

Emission Source	Total Emissions									
	Tons Per Year					Pounds Per Day				
	ROG	NO_x	PM_{10}	$PM_{2.5}$	CO	ROG	NO_x	PM_{10}	$PM_{2.5}$	CO
Proposed Project										
Area Source Emissions	0.20	0.16	0.00	0.00	0.82	1.07	0.85	0.015	0.015	4.53
Vehicle Emissions	0.74	7.29	1.28	0.31	5.85	3.86	41.83	7.07	1.72	31.29
Total Emissions	0.94	7.45	1.28	0.31	6.67	4.94	42.68	7.08	1.73	71.65

Notes: Refer to the Greenhouse Gas Emissions section for discussion of carbon dioxide emissions. Emissions were calculated using the URBEMIS2007 (v9.2.4) computer program, averaged winter and summer emissions.

As depicted, total operational emissions associated with the proposed project would generate a maximum of approximately 4.94 lbs/day of ROG and 42.68 lbs/day of NO_X. Predicted daily emissions of ROG and NO_X would not exceed the SMAQMD significance thresholds of 65 lbs/day. As a result, operational emissions of ozone-precursor pollutants would be considered **less than significant**.

d) **Less than Significant with Mitigation Incorporated.** Localized pollutant concentrations associated with development projects can often result from the onsite operation of stationary equipment, particularly diesel-powered equipment, which can occur during construction and operation of the project. Long-term increases in pollutant concentrations are typically associated with potential increases in localized concentrations of CO at nearby congested roadway intersections. Potential increases in localized concentrations of pollutants associated with short-term construction and long-term operation of the proposed project are discussed separately, as follows:

SHORT-TERM AIR QUALITY IMPACTS

Particulate exhaust emissions from diesel fueled engines (diesel-exhaust PM) were identified as Toxic Air Contaminants (TACs) by CARB in 1998. Implementation of the proposed project would result in the generation of diesel PM emissions during construction from the use of off-road diesel equipment for site grading and excavation, paving and other construction activities.

Health-related risks associated with diesel-exhaust emissions are primarily associated with long-term exposure and associated risk of contracting cancer. For residential land uses, the calculation of cancer risk associated with exposure of to TACs are typically calculated based on a 70-year period of exposure. The use of diesel-powered construction equipment, however, would be temporary and episodic and would occur over a relatively large area. Assuming that construction activities were to occur over an approximate one-year period, construction activities would constitute less than 0.01 percent of the total exposure period typically applied when calculating cancer risks for residential uses. For this reason, diesel-exhaust PM generated by project construction, in and of itself, would not be expected to create conditions where the probability of contracting cancer is greater than 10 in one million for nearby receptors. However, uncontrolled construction-generated emissions, particularly emissions of fugitive dust, could result in increased localized concentrations of emissions that could potentially affect nearby residential land uses. As a result, short-term exposure and nearby receptors to uncontrolled construction-generated emissions would be considered **potentially significant**.

The following mitigation is therefore required:

MM 3d-1 The following measures shall be implemented to reduce NOX and visible emissions from heavy-duty diesel equipment:

- The construction contractor shall provide a plan for approval by the City, in consultation with SMAQMD, demonstrating that the heavy-duty (>50 horsepower), off-road vehicles to be used in the construction project, including owned, leased, and subcontractor vehicles, will achieve a project-wide fleet-average 20-percent NO_X reduction and 45-percent particulate reduction compared to the most recent CARB fleet average at the time of construction. Acceptable options for reducing emissions include the use of late-model engines, low-emission diesel products, alternative fuels, particulate matter traps, engine retrofit technology, after-treatment products, and/or such other options as become available.

- The construction contractor shall submit to the City and SMAQMD a comprehensive inventory of all off-road construction equipment, equal to or greater than 50 hp, that will be used for an aggregate of 40 or more hours during any portion of the project. The inventory shall be updated and submitted monthly throughout the duration of the project, except that an inventory shall not be required for any 30-day period in which no construction operations occur. At least 48 hours before subject heavy-duty off-road equipment is used, the project representative shall provide the SMAQMD with the anticipated construction timeline including start date, and the name and phone number of the project manager and on-site foreman.

- The construction contractor shall ensure that emissions from off-road, diesel-powered equipment used on the project site do not exceed 40-percent opacity for more than 3 minutes in any 1 hour, as determined by an on-site inspector trained in visual emissions assessment. Any equipment found to exceed 40-percent opacity (or Ringlemann 2.0) shall be repaired immediately, and the SMAQMD shall be notified of non-compliant equipment within 48 hours of identification. A visual survey of all in operation equipment shall be made at least weekly, and a monthly summary of visual survey results shall be submitted throughout the duration of the construction project, except that the monthly summary shall not be required for any 30-day period in which no construction operations occur. The monthly summary shall include the quantity and type of vehicles surveyed, as well as the dates of each survey. The SMAQMD and/or other officials may conduct periodic site inspections to determine compliance.

Timing/Implementation: Prior to and during construction

Enforcement/Monitoring: City of Elk Grove Planning Department

Implementation of recommended mitigation measures **MM 3a-1** listed above, as well as **MM 3d-1** would reduce this impact to a **less than significant** level.

LONG-TERM AIR QUALITY IMPACTS

Toxic Air Contaminants

Implementation of the proposed project could potentially result in the long-term operation of onsite stationary sources of TACs due to the bus stop feature of the project and the potential for passenger buses to idle for extended periods of time at bus stop areas. This is considered **potentially significant** impact.

The following mitigation is therefore required:

MM 3d-2 The following measures shall be implemented:

During project operation, extended idling time of all public transit buses shall be limited to five minutes unless extreme hot or cold temperatures (over 100 degrees F or under 54 degrees F) require extended idling for cooling or heating functions of the buses to operate.

Timing/Implementation: Throughout project operation

Enforcement/Monitoring: City of Elk Grove Planning Department

In addition to saving fuel and reducing emissions, implementation of the above mitigation measure would reduce human exposure to toxic air contaminants to a **less than significant** level.

e) Less than Significant with Mitigation Incorporated. The occurrence and severity of odor impacts depends on numerous factors, including: the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of the receptors. While offensive odors rarely cause any physical harm, they still can be very unpleasant, leading to considerable distress among the public and often generating citizen complaints to local governments and regulatory agencies. Projects with the potential to frequently expose members of the public to objectionable odors would be deemed to have a significant impact.

Construction of the proposed project would involve the use of a variety of gasoline or diesel powered equipment that would emit exhaust fumes. Exhaust fumes, particularly diesel-exhaust, may be considered objectionable by some people. In addition pavement coatings and architectural coatings used during project construction would also emit temporary odors. However, construction-generated emissions would occur intermittently throughout the workday and would dissipate rapidly within increasing distance from the source. As a result, short-term construction activities would not expose a substantial number of people to frequent odorous emissions.

The proposed project would not result in the installation of any equipment that would be considered major odor-emission sources. Yet the project may result in a process that would be considered a major odor-emission source due to the bus stop feature of the project and the potential for passenger buses to idle for extended periods of time at bus stop areas. Extended idling could result in a build-up of fumes that are associated with odors. Therefore impacts could be **potentially significant**.

Implementation of mitigation measure **MM 3d-2** described above would reduce this impact to a less than significant level. As a result, potential exposure of sensitive receptors to odorous emissions would be considered **less than significant with mitigation incorporated.**

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
4. BIOLOGICAL RESOURCES. Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☒	☐	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan?	☐	☐	☐	☒

EXISTING SETTING

The following biological resource setting information was obtained largely from two recent biological surveys conducted on the project sites as part of the environmental review of other projects. The *Elk Grove Transfer Station Draft EIR* (EDAW, 2009) included site-specific review of the Iron Rock Way and Grant Line Road Sites and a general review of the surrounding area, which included the City Corporation Yard/Jackson Property Site. The *Police Vehicle Storage Facility Project Initial Study/Mitigated Negative Declaration* (City of Elk Grove, 2006b) surveyed the existing Corporation Yard site and the surrounding area, which included the Jackson Property, for listed species and their habitat, wetland resources, and riparian habitat in 2006. The biological resource information presented in the *Elk Grove Transfer Station Draft EIR* was based on a reconnaissance field survey conducted by an EDAW biologist on September 29, 2008, searches of electronic databases that contain records of sensitive biological resources, and a review of environmental documents from adjacent projects that discuss biological resources, including the *Revised Draft*

Environmental Impact Report for the Grant Line Road/SR 99 Interchange Reconstruction Project (City of Elk Grove, 2003) and the *Initial Study/Mitigated Negative Declaration for the Grant Line Road Widening Project* (City of Elk Grove, 2005). The biological resource information presented in the *Police Vehicle Storage Facility Project Initial Study/Mitigated Negative Declaration* was based on a reconnaissance field survey conducted by City of Elk grove biologists in February of 2006. At that time, the site was vacant and not yet developed with the currently existing Corporation Yard facilities. However, the findings of the 2006 reconnaissance field survey would still be valid in relation to the portion of the Corporation Yard site that was not developed as part of the original Corporation Yard facilities project and that currently remains vacant, as well as in relation to the contiguous, undeveloped Jackson Property.

Vegetation and Wildlife

Annual Grassland

All of the Iron Rock Way Site and the undeveloped portions of the City Corporation Yard/Jackson Property Site and Grant Line Road Site contain fallow land best characterized as annual grassland/ruderal grassland (City of Elk Grove, 2006b, p. 3-16)(EDAW, 2009, p. 4.9-1). Ruderal grasslands consist of grasslands growing where humans have disturbed natural vegetational cover. The vegetation is mowed or plowed annually to control the weed cover. The species composition and density of vegetation on the sites vary from a sparse cover of ruderal (weedy) forbs such as wild radish (Raphanus sativus), winter vetch (Vicia villosa), field bindweed (Convolvulus arvensis), and milk thistle (Silybum marianum) to dense cover of annual grasses, including Italian ryegrass (Lolium multiflorum), ripgut brome (Bromus diandrus), wild oat (Avena fatua), and foxtail barley (Hordeum murinum ssp. leporinum). At the time of the 2008 reconnaissance level field survey, vegetation on the undeveloped portions of the project sites had been mowed and/or disked. On the Iron Rock Way Site, one large valley oak (Quercus lobata) with a tree canopy diameter of approximately 60 feet occurs near northwestern corner of the site (EDAW, 2009, p. 4.9-1). No trees are located on the City Corporation Yard/Jackson Property Site or on the Grant Line Road Site (City of Elk Grove, 2006b, p. 3-16)(EDAW, 2009, p. 4.9-1).

Seasonal Wetland

Approximately one acre of seasonal wetlands occurs in the southern half of the Grant Line Road Site. No seasonal wetlands are located on the City Corporation Yard/Jackson Property Site or on the Iron Rock Way Site (City of Elk Grove, 2006b, p. 3-16)(EDAW, 2009, p. 4.9-1). Seasonal wetland habitat is typically associated with shallow drainages, swales, or depressions, which inundate long enough to support hydric soils and hydrophytic vegetation. Characteristic plant species in seasonal wetlands that were observed at the Grant Line Road Site during the September field survey included toad rush (Juncus bufonius), Mediterranean barley (Hordeum murinum ssp. gussoneanum), curly dock (Rumex crispus), rabbit-foot grass (Polypogon monspeliensis), slender popcorn flower (Plagiobothrys stipitatus), hyssop loosestrife (Lythrum hyssopifolia), water pygmy-weed (Crassula aquatica), and purslane speedwell (Veronica peregrina) (EDAW, 2009, p. 4.9-1).

The area of seasonal wetland habitat at the Grant Line Road Site was dry at the time of the reconnaissance field survey on September 29, 2008. Indicators of seasonal ponding of water were observed however, including cracks in the soil, the presence of seed shrimp (Phylum Ostracoda), and the presence of the hydrophytic plant species listed above (plant species that are adapted to, and are commonly found in, wetlands). Based on observations of plow lines through the features during the reconnaissance field survey, the area of seasonal wetland habitat appears to have been disk-plowed at some time within the last year. Given that the surrounding grassland also appears to be mowed and disk-plowed on a regular basis to keep vegetation height down, it is likely that the seasonal wetland is also plowed on an annual basis. Also, in an aerial photograph of this site taken in 2007, it appears that there was soil movement and grading in the area of the seasonal wetland in that year. A wetland delineation based on U.S. Army Corps of Engineers protocol for determining Clean Water Act Section 404 jurisdiction was not conducted (EDAW, 2009, p. 4.9-1 and 4.9-2).

Common Wildlife

The proposed project sites support wildlife typically associated with annual grassland and agricultural lands. Because of ongoing disturbances due to annual mowing and disking, and surrounding industrial activities, wildlife use of the project sites is limited. Small mammals that are expected to occur on the sites include voles (Microtus sp.), house mice (Mus musculus), and deer mice (Peromyscus maniculatus). California ground squirrels (Spermophilus beecheyi) burrows were observed on each of the project sites. Other larger mammals, such as coyote (Canis latrans), striped skunk (Mephitis mephitis), and raccoon (Procyon lotor) are common in the area and are expected to occur here. Birds observed during the September 2008 field survey include common birds such as the mourning dove (Zenaida macroura), house finch (Carpodacus mexicanus), California towhee (Pipilo fuscus), and western meadowlark (Sturnella neglecta). Raptors observed include red-tailed hawk (Buteo jamaicensis) and Cooper's hawk (Accipiter cooperii).

Sensitive Biological Resources

The California Natural Diversity Data Base (CNDDB) and California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants (CNPS 2008) were used as the primary sources to identify previously reported occurrences of special-status species and sensitive habitats in the project vicinity. The CNDDB is a statewide inventory, managed by the California Department of Fish and Game (DFG) that is continually updated with the location and condition of the state's rare and declining species and habitats. Although the CNDDB is the most current and reliable tool for tracking occurrences of special-status species, it contains only those records that have been reported to DFG. The Elk Grove 7.5 minute USGS quadrangle, on which the project sites are located, and the surrounding eight quadrangles were queried in the database searches.

Special-status species include plants and animals in the following categories:

- plant and wildlife species that are listed under the federal Endangered Species Act (ESA) and/or California Endangered Species Act (CESA) as rare, threatened, or endangered;
- plant and wildlife species considered candidates for listing or proposed for listing;
- wildlife species identified by DFG as fully protected and/or species of special concern; and
- plants considered by CNPS to be rare, threatened, or endangered.

Special-status species occurrences documented in the CNDDB within a 2-mile radius of the project sites are shown in **Figure 7**.

Special-status Plants

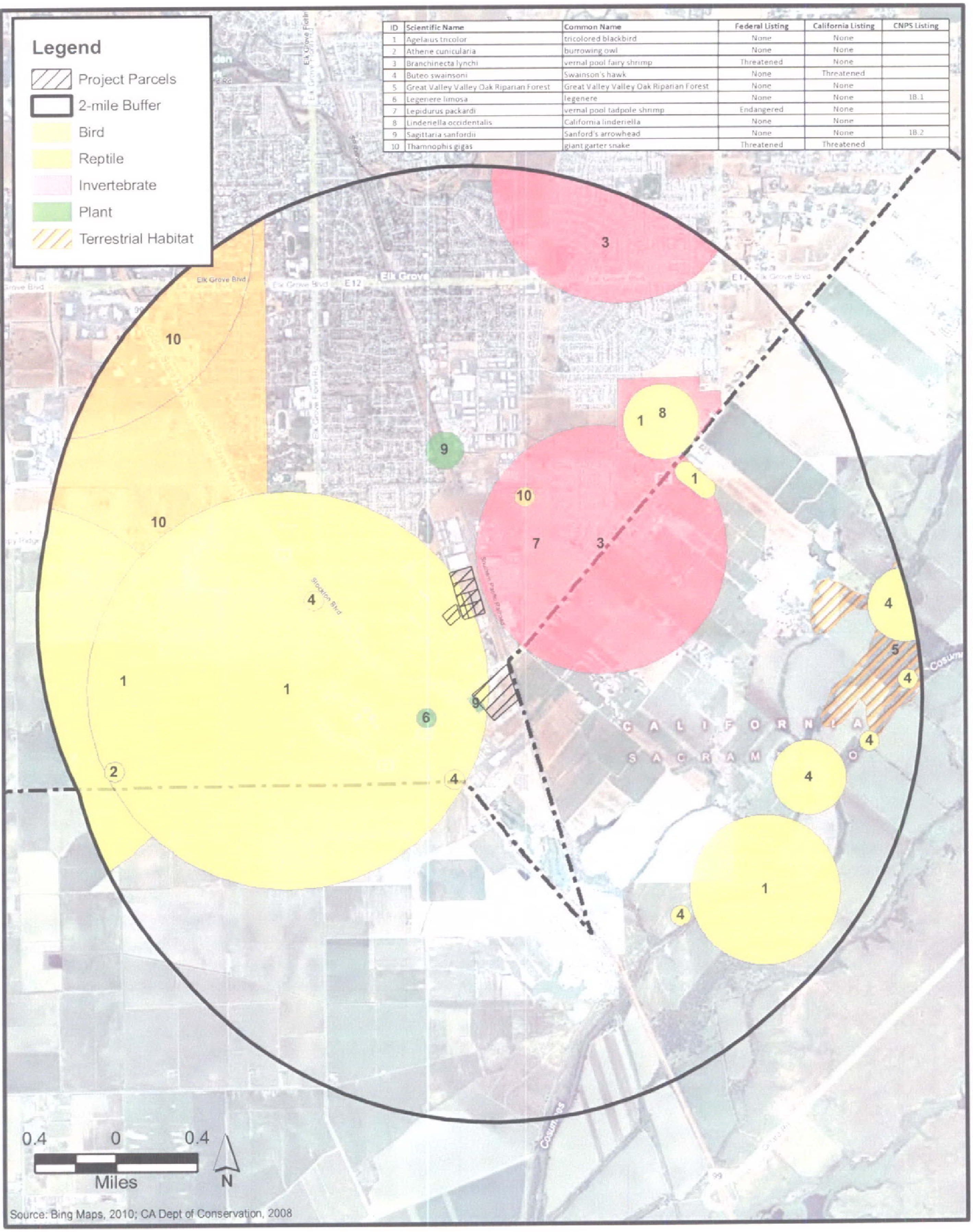
Searches of the CNDDB and CNPS online electronic inventory identified 15 special-status plant species that have been documented in the vicinity of the project sites. These 15 special-status plant species have specialized habitat requirements that are not found on the project sites. Alkali milk-vetch (Astragalus tener var. tener), San Joaquin spearscale (Atnplex joaquiniana), and palmate-bracted bird's-beak (Cordylanthus palmatus) are found in mesic alkaline playas that are not present on the project sites. Delta button-celery (Eryngium racemosum) and Greene's tuctoria (Tuctoria greenei) are found in vernally mesic clay flats and vernal pools that are not found on the project sites. Round-leaved filaree (Erodium macrophyllum) occurs on friable, undisturbed clay soils, which are not present on the sites. Slough thistle (Cirsium crassicaule), Delta tule pea (Lathyrus jepsonii var. jepsonii), Mason's lilaeopsis (Lilaeopsis masonii), Delta mudwort (Limosella subulata), Suisun Marsh aster (Symphyotrichum lentum), woolly rose-mallow (Hibiscus lasiocarpus) and Wright's trichocoronis (Trichocoronis wrightii var. wrightii) occur in freshwater and brackish marsh habitats that occur to the west of the project sites within the Sacramento-San Joaquin Delta. The CNDDB occurrence for recurved larkspur (Delphinium recurvatum) occurring just to the northeast of Grant Line Road Site is a historic record that has not been observed since 1937. This species occurs on alkaline soils in valley saltbush or valley chenopod scrub plant communities, and the habitat where this population once occurred is no longer present (EDAW, 2009, p. 4.9-6).

Although no suitable habitat is present within the grassland habitats on the project sites, Sanford's arrowhead (Sagittaria sanfordii) is known to occur in the storm water drainage channel just west of the pallet processing facility on the Grant Line Road Site. The population here is associated with the freshwater marsh vegetation occurring at the bottom the channel According to observations made in 2006, the population numbered between 1000 and 10,000 individuals (EDAW, 2009, p. 4.9-6).

Special-status Wildlife

Based on the results of the CNDDB search, a review of the USFWS list of threatened and endangered species that could be affected by the project, documented species ranges, and the reconnaissance-level survey conducted by EDAW in 2008, a list of special-status wildlife species with the potential to occur in the project area was compiled (**Table 5**). The project sites lack suitable habitat for a number of species identified in the CNDDB and/or on the USFWS list, including valley elderberry longhorn beetle (Desmocerus californicus dimorphus), northwestern pond turtle (Emys marmprata marmorata), purple martin (Progne subis), tricolored blackbird (Agelaius tricolor), bank swallow (Riparia riparia), California tiger salamander (Ambystoma californiense), and western spadefoot (Spea hammondii). Due to a lack of habitat, these species are not expected to occur on the project sites and are not discussed further in this section.

Five listed animal species could potentially occur or were observed on the project sites, and are protected pursuant to the ESA, the CESA, or both: these are the vernal pool fairy shrimp (Branchinecta lynchi), vernal pool tadpole shrimp (Lepidurus packardi), Swainson's hawk (Buteo swainsoni), giant garter snake (Thamnopsis gigas), and the burrowing owl (Athene cunicularia). In addition, three other bird species are protected pursuant to state laws protecting raptors: these are Loggerhead shrike, Northern harrier, and white-tailed kite. These species and their potential to occur on the sites are described in more detail below.



ID	Scientific Name	Common Name	Federal Listing	California Listing	CNPS Listing
1	Agelaius tricolor	tricolored blackbird	None	None	
2	Athene cunicularia	burrowing owl	None	None	
3	Branchinecta lynchi	vernal pool fairy shrimp	Threatened	None	
4	Buteo swainsoni	Swainson's hawk	None	Threatened	
5	Great Valley Valley Oak Riparian Forest	Great Valley Valley Oak Riparian Forest	None	None	
6	Legenere limosa	legenere	None	None	1B.1
7	Lepidurus packardi	vernal pool tadpole shrimp	Endangered	None	
8	Linderiella occidentalis	California linderiella	None	None	
9	Sagittaria sanfordii	Sanford's arrowhead	None	None	1B.2
10	Thamnophis gigas	giant garter snake	Threatened	Threatened	

City of Elk Grove
Development Services

Figure 7
Special-status Species Occurrences within 2-mile Radius

TABLE 5
SPECIAL-STATUS SPECIES WITH POTENTIAL TO OCCUR ON THE PROJECT SITES

Common Name	Scientific Name	Status	Habitat	Potential for Occurrence
Invertebrates				
Vernal pool fairy shrimp	*Branchinecta lynchi*	Federal: threatened	Vernal pools in valley and foothill grasslands	Unlikely to occur; the seasonal wetland is of low quality and considered only marginally suitable habitat.
Vernal pool endangered tadpole shrimp	*Lepidurus packardi*	Federal:	Vernal pools in valley and foothill grasslands	Unlikely to occur; the seasonal wetland is of low quality and considered only marginally suitable habitat.
Reptiles				
Giant garter snake	*Thamnophis gigas*	Federal: threatened	Ponds, stream, sloughs, and ditches	Could occur; potential aquatic habitat adjacent to the Grant Line Road Site.
Birds				
Western burrowing owl	*Athene cunicularia*	CA: species of special concern	Grasslands and agricultural fields with low-growing vegetation and the presence of small rodent burrows	Could occur; suitable foraging habitat present, suitable burrows observed at all sites.
Loggerhead shrike	*Lanius ludovidianus*	CA: species of special concern	Shrubs and small trees for nesting, grasslands for foraging	Could occur; could forage in annual grasslands on project sites; unlikely to nest at project sites.
Northern harrier	*Circus cyaneus*	CA: species of special concern	Grasslands and freshwater marsh	Could occur; suitable foraging habitat is present at all project sites.
Swainson's hawk	*Buteo swainsoni*	CA: threatened	Nest in riparian forest and scattered trees; forage in grasslands and agricultural fields	Could occur; suitable foraging and nesting habitat is present at all project sites.
White-tailed *kite*	*Elanus leucurus*	CA: fully protected	Forage in grasslands and agricultural fields; nest in isolated trees or small woodland patches	Could occur; suitable foraging and nesting habitat is present.

Notes: CA = California; CNPS = California Native Plant Society
Sources: EDAW, 2009. City of Elk Grove, 2006b.

Vernal Pool Tadpole Shrimp and Vernal Pool Fairy Shrimp

Vernal pool tadpole shrimp (Lepidurus packardi) is federally listed as endangered and vernal pool fairy shrimp (Branchinecta lynchi) is federally listed as threatened. Both vernal pool tadpole shrimp and vernal pool fairy shrimp have been documented within 2 miles of the project sites. Vernal pools and vernal swales that could support these species occur to the east and west of the project area. Seasonal wetland habitat on the Grant Line Road Site could provide habitat for these two species if they remain inundated for an adequate length of time. The habitat on the Grant Line Road Site, however, is considered low quality due to regular disturbance of the wetland by disk plowing and previous site grading. In addition, the area likely receives storm water runoff from the adjacent pallet processing facility, which further degrades the water quality in the area of seasonal wetland, and would diminish the likelihood of tadpole shrimp and fairy shrimp presence. The project sites are outside the proposed critical habitat boundary for the species in Sacramento County (EDAW, 2009, p. 4.9-6).

Giant Garter Snake

Giant garter snake is federally listed and state listed as threatened. Giant garter snakes were observed in a roadside ditch along Waterman Road approximately 1 mile north of the Grant Line Road Site in 2002. While no protocol level surveys have been conducted of this site, portions of the storm water drainage channel bordering the site with freshwater marsh vegetation could provide cover, basking, and foraging habitat for giant garter snake. The banks and the ruderal habitat on the Grant Line Road Site provide marginally suitable overwintering upland habitat for giant garter snake (EDAW, 2009, p. 4.9-8).

Swainson's Hawk

Swainson's hawk is state listed as threatened. This raptor catches prey in flight, including mice, gophers, ground squirrels, rabbits, amphibians, reptiles, other birds, and bats. Swainson's hawk roosts in large trees and occasionally on the ground (City of Elk Grove, 2006b, p. 3-17). Swainson's hawk nests have been recorded approximately one and a half miles to the south of the Grant Line Road Site in riparian trees on the edge of the Cosumnes River. Due to the likely presence of small rodents in the annual grassland on each of the project sites, suitable foraging habitat for Swainson's hawk is present (EDAW, 2009, p. 4.9-8).

Burrowing Owl

Burrowing owl is a DFG Species of Special Concern. Found commonly in fallow agricultural fields and low-growing grassland, this owl also frequents habitats such as airport fields, highway shoulders, golf courses, and vacant lots. As a subterranean nester, the burrowing owl is dependent on ground squirrels or other small mammals for ideal nest sites and tends to reuse the same burrows year after year. Man-made structures such as cement culverts, debris piles, or openings beneath pavement can also provide suitable nest areas. Burrowing owls can often be seen in the daytime perching near their burrow (City of Elk Grove, 2006b, p. 3-17).

No burrowing owls were observed during the 2008 reconnaissance level field survey of the project area. During the 2006 reconnaissance level field survey, burrowing owls were observed wintering within the project area; even so no active nests were observed (City of Elk Grove, 2006b, p. 3-17).

Although the annual grassland currently located on each of the project sites is of limited habitat quality due to mowing and plowing of the sites, numerous ground squirrel holes were observed around the perimeters of the sites on ground that had not been plowed. In addition, in 2008 the berm running through the middle of the Iron Rock Way Site appeared to have not been plowed and had numerous large ground squirrel burrows ranging in size from eight to twelve inches across. These burrows have the potential to provide suitable nesting habitat. The surrounding fields could provide suitable foraging habitat for burrowing owl, although it is of limited quality (EDAW, 2009, p. 4.9-8).

Loggerhead Shrike

The loggerhead shrike is a California Species of Special Concern that is present year-round in California. Loggerhead shrikes could use the annual grassland on the project sites for foraging. No suitable nesting habitat is present (EDAW, 2009, p. 4.9-9).

Other Special-status Raptors

White-tailed kite (Elanus leucurus) is fully protected under the California Fish and Game Code and northern harrier (Circus cyaneus) is a DFG Species of Special Concern. The large oak tree on the Iron Rock Way Site could be utilized as a nesting site for white-tailed kite or other raptors. Northern harriers typically nest in tall grass or marsh habitat and are not likely to nest in the project area, but could use the sites as foraging habitat (EDAW, 2009, p. 4.9-9).

Sensitive Habitats

Sensitive habitats include those identified as sensitive natural communities "rare and worthy of consideration" in the List of California Terrestrial Natural Communities recognized by the CNDDB, as well as those subject to U.S. Army Corps of Engineers (USACE) jurisdiction under Section 404 of the Clean Water Act, Section 1602 of the California Fish and Game Code, and the State's Porter-Cologne Water Quality Control Act protecting waters of the state. Sensitive habitats are of special concern because they have high potential to support special-status plant and animal species. Sensitive habitats can also provide other important ecological functions, such as enhancing flood and erosion control and maintaining water quality. The seasonal wetland habitat on the Grant Line Road Site could potentially be categorized as jurisdictional waters of the United States.

REGULATORY FRAMEWORK

The following federal, state, and local regulations, plans, programs, and guidelines are applicable to the proposed project:

- Federal Laws and Regulations
  - Federal Endangered Species Act
  - Clean Water Act
  - Migratory Bird Treaty Act
- State Laws and Regulations
  - California Endangered Species Act
  - Native Plant Protection Act
  - California Department of Fish and Game Species of Special Concern
- Local Laws and Regulations
  - Title 19, Chapter 19.12 of the Municipal Code (Tree Preservation and Protection)

- Swainson's Hawk Ordinance

PROJECT IMPACTS AND MITIGATION MEASURES

a) **Less than Significant with Mitigation Incorporated.** Based on known local occurrences and the presence of suitable habitat within the project area, 5 special-status animal species could potentially occur on the project sites, including the vernal pool fairy shrimp, vernal pool tadpole shrimp, Swainson's hawk, giant garter snake, and the burrowing owl. In addition, 3 other bird species are protected pursuant to state laws protecting raptors: Loggerhead shrike, Northern harrier, and white-tailed kite.

Vernal Pool Fairy Shrimp and Vernal Pool Tadpole Shrimp

Vernal pool fairy shrimp and vernal pool tadpole shrimp are most frequently found in small shallow pools. Viable habitat for these species is dependent upon the presence of water in the winter and early spring and the absence of water during the summer. The Grant Line Road Site includes approximately 1 acre of seasonal wetlands. However, while these two species are known to occur within a 2 mile radius of the project site, the seasonal wetland habitat present within the Grant Line Road Site has been isolated from the complex of surrounding habitat for many years. Furthermore, the seasonal wetland habitat on the site has been degraded and the water quality in the seasonal wetland appears to be of poor quality. The site also lies outside the proposed critical habitat boundary for the species in Sacramento County. Given these circumstances, federally listed vernal pool crustaceans are not expected to occur on the Grant Line Road Site. Neither the City Corporation Yard/Jackson Property Site nor the Iron Rock Way Site contains any wetland resources or habitat for this species. Therefore, implementation of the proposed project would be expected to have a **less than significant** impact on vernal pool crustaceans.

Swainson's Hawks and Other Special-Status Raptors

Implementation of the proposed project would accommodate removal of approximately 20 acres of annual grassland on the Iron Rock Way Site, approximately 14 acres of annual grassland on the Grant Line Road Site, and less 4.9 acres of annual grassland on the City Corporation Yard/Jackson Property Site that provide potential foraging habitat for Swainson's hawks and other raptors, including Northern harrier and white-tailed kite. Implementation of the project could also accommodate the removal of a single native oak tree on the Iron Rock Way Site that provides potential nesting habitat. Swainson's hawks are known to nest within 2 miles of the project sites and raptors, including Northern harrier and white-tailed kite, may nest in the vicinity of the project and utilize the annual grassland for foraging. This impact is therefore considered to be **potentially significant.**

The City of Elk Grove has adopted County Ordinance SCC No. 1093 which requires a payment of fees per acre of land developed within the Urban Services Boundary as mitigation for the loss of Swainson's hawk foraging habitat. The fees are earmarked for purchase of suitable habitat for this species by the County and were determined by DFG to be suitable mitigation for significant or cumulatively significant impacts to Swainson's hawk foraging habitat if the site is over one mile from active nests.

The following mitigations are therefore required:

MM 4a-1: The City shall implement one of the following options prior to ground-disturbing activities:

1) Preserve 1.0 acre of similar habitat for each acre lost. This land shall be protected through a fee title or conservation easement acceptable to the DFG and the City of Elk Grove as set forth In Chapter 16.130.040(a) of the City of Elk Grove Municipal Code as such may be amended from time to time and to the extent that said Chapter remains in effect, or

2) Submit payment of Swainson's hawk impact mitigation fee per acre of habitat impacted (payment shall be at a 1:1 ratio) to the City of Elk Grove's Swainson's hawk mitigation fund in the amount set forth in Chapter 16.130 of the City of Elk Grove Code as such may be amended from time to time and to the extent that said chapter remains in effect, or

3) Submit proof that mitigation credits for Swainson's hawk foraging habitat have been purchased at a DFG approved mitigation bank.

Timing/Implementation: Prior to any site disturbance.

Enforcement/Monitoring: City of Elk Grove Development Services.

MM 4a-2: In order to avoid impacts to nesting habitat for raptors, the City shall implement the following measures prior to construction and site grading activities on the Iron Rock Way Site:

1) Retain a qualified biologist to conduct a focused survey for active nests within the single oak tree on the Iron Rock Way Site. The survey shall occur no more than two weeks prior to ground disturbance.

2) If no active nests are found, tree removal may proceed. If active nests are found, DFG shall be notified, and the tree shall not be removed until the nest is no longer active, as determined by a DFG-approved biologist. No construction activities shall take place within a 500-foot (152-meter) radius of the active nest (or another distance determined appropriate during consultation with DFG).

Timing/Implementation: Prior to any site disturbance.

Enforcement/Monitoring: City of Elk Grove Development Services.

Implementation of the above mitigation measures would reduce impacts of the loss of foraging and nesting habitat for Swainson's hawk and other raptors to a **less than significant** level.

Giant Garter Snake

As previously discussed, the canal on the southwestern and southeastern boundary of the Grant Line Road Site and the adjacent upland areas within 200 feet of the canal, may provide basking and retreat site habitat for giant garter snake. Giant garter snakes were observed in a roadside ditch along Waterman Road approximately 1 mile north of the Grant Line Road Site in 2002. Therefore, if the Grant Line Road Site were ultimately chosen to house the relocated Transit Yard as envisioned by the Transit Yard Facilities Master Plan, impacts on giant garter snakes could include potential mortality, temporary disturbance, and permanent loss of upland habitat, and are therefore considered to be **potentially significant**

The following mitigations are therefore required:

MM 4a-3: Prior to any construction activities on the Grant Line Road Site, the City shall consult with the U.S. Fish and Wildlife Service and California Department of Fish and Game to determine the agencies' opinion on the suitability of the habitat on the project site to support giant garter snake, and the likelihood of injury for giant garter snakes that may be moving through the project site during construction. If the agencies determine that the project site does not support giant garter snake habitat, then no additional mitigation is required.

If U.S. Fish and Wildlife Service and California Department of Fish and Game determine that implementation of the proposed project could affect giant garter snake, the City shall undertake the following measures prior to project grading within 200 feet of Grant Line Channel.

- Construction personnel shall participate in a USFWS-approved worker environmental awareness program. Under this program, workers shall be informed about the potential presence of giant garter snake and habitat associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of the Endangered Species Act. Prior to construction activities, a qualified biologist approved by the USFWS shall instruct all construction personnel about: (1) the life history of the giant garter snake; (2) the importance of Grant Line Channel to the giant garter snake; and (3) the required avoidance/protection measures. Proof of this instruction shall be submitted to the City and the Sacramento U.S. Fish and Wildlife Service Office.

Timing/Implementation: Prior to any site disturbance.

Enforcement/Monitoring: City of Elk Grove Development Services.

MM 4a-4: The City shall mitigate to standard guidelines identified in the USFWS's *Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effects on the Giant Garter Snake within Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter and Yolo Counties, California* (1997). Loss of upland basking and retreat site habitat resulting from project grading and construction would be considered a "Level 3" impact.

Standard mitigation shall consist of:

a) replacement of affected giant garter snake habitat at a 3:1 ratio;

b) all replacement habitat must include both upland and aquatic habitat components. Upland and aquatic habitat components must be included in the replacement habitat at a ratio of 2:1 upland acres to aquatic acres;

c) if restoration of habitat is a component of the replacement habitat, one year of monitoring restored habitat with a photo documentation report due one year from implementation of the restoration with pre- and post-project area photos; and

d) Five years of monitoring replacement habitat with photo documentation report due each year. Loss of habitat resulting from the project implementation must be replaced at a location deemed appropriate by the USFWS; Evidence of compliance with this mitigation measure shall provided prior to grading activities that will remove giant garter snake habitat.

Timing/Implementation: Prior to any site disturbance.

Enforcement/Monitoring: City of Elk Grove Development Services.

Implementation of the above mitigation measures would reduce potential impacts on giant garter snake and its habitat to a **less than significant** level by ensuring that the City would consult with the U.S. Fish and Wildlife Service and California Department of Fish and Game regarding potential impacts to garter snake and its habitat and would provide necessary mitigation consistent with USFWS guidelines.

Burrowing Owls

No burrowing owls were observed on the project sites during the most recent site visit in 2008, but burrowing owls were observed wintering in the project area in 2006. Suitable habitat is present in the annual grasslands on each of the sites And burrowing owls could occupy existing ground squirrel burrows before construction begins. Burrowing owls and their nests are protected under Section 3503.5 of the California Fish and Game Code. If burrowing owls are present in construction areas, occupied burrows could be destroyed, and this impact could be **potentially significant.**

The following mitigation is therefore required:

MM 4a-5: One week prior to the start of ground disturbing activities within the project area, a qualified biologist shall survey the project site and surrounding areas (up to 160 feet outside the project area) for the presence of burrowing owls. A second pre-construction survey shall occur one-day prior to ground disturbing activities. If ground-disturbing activities are delayed or suspended for more than one week after the preconstruction survey, the site shall be resurveyed. If no burrowing owls are detected during the preconstruction surveys, no further action is necessary and construction may proceed.

If burrowing owls are detected during preconstruction surveys, occupied burrows shall not be disturbed during the nesting season (February 1 through August 31) unless a qualified biologist approved by the CDFG verifies through non-invasive methods that either: (1) the birds have not begun egglaying and incubation; or (2) that juveniles from the occupied burrows are foraging independently and are capable of independent survival.

If the qualified biologist determines that impacts on occupied burrows could occur, the City shall retain a qualified biologist to complete mitigation established by the CDFG to avoid and minimize impacts to burrowing owls at the project site. The biologist shall complete "passive relocation" of the owls utilizing one-way doors. Owls shall be excluded from burrows in the immediate impact zone and within a 50-meter (approx. 160 feet) buffer zone by installing one-way doors in burrow entrances. One-way doors should be left in place 48 hours to insure owl have left the burrow before excavation. Whenever possible, burrows should be excavated using hand tools and should be refilled to prevent reoccupation.

Timing/Implementation: Prior to any site disturbance.

Enforcement/Monitoring: City of Elk Grove Development Services.

Implementation of the above mitigation measure would reduce impacts on burrowing owl habitat and burrows to a **less than significant** level by ensuring that occupied burrows would be identified and protected prior to construction activities.

Loggerhead Shrikes

Loggerhead shrikes are expected to forage on the project sites and could nest in shrubs and small trees. However, the proposed project sites contain very few potential nest sites. No loggerhead shrikes or shrike nests were observed on the proposed project sites, and while a few loggerhead shrikes may forage and even nest on the sites, similar habitat is present nearby and is regionally abundant. Therefore, although removal of potential foraging and nesting habitat could result with project implementation, this impact is considered **less than significant**.

b) – c) Less than Significant with Mitigation Incorporated. Implementation of the proposed project would allow for the removal of approximately 1 acre of potential jurisdictional waters of the United States on the Grant Line Road Site. Areas of seasonal ponding were identified in the southern portion of the Grant Line Road Site during EDAW's 2008 reconnaissance field survey. These areas had characteristics of seasonal wetlands consistent with the parameters used by the USACE to determine the limits of jurisdiction of Section 404 of the Clean Water Act. A formal wetland delineation has not been conducted on the site to determine the limit of USACE jurisdiction. If these areas are determined to be outside the jurisdiction of the Clean Water Act, they may still be considered as "waters of the state", subject to regulation by the Regional Water Quality Control Board under the Porter Cologne Act, and this impact could be **potentially significant**

The following mitigations are therefore required:

MM 4c-1: To minimize, avoid and mitigate impacts to potential waters of the United States or waters of the state, the City shall conduct a formal wetland delineation to determine the extent of jurisdictional waters on the Grant Line Road Site. The wetland delineation report and map shall be submitted to the Sacramento district office of the USACE for verification.

MM 4c-2: For those waters of the United States that cannot be avoided during construction, authorization for fill of jurisdictional waters of the United States shall be secured from USACE via the Section 404 permitting process prior to project implementation.

MM 4c-3: The acreage of jurisdictional habitat removed shall be replaced or rehabilitated on a "no-net-loss" basis in accordance with USACE regulations and Policy CAQ-9 of the City of Elk Grove General Plan. Habitat restoration, rehabilitation, and/or replacement shall be at a location and by methods agreeable to USACE.

MM 4c-4: Section 401 water quality certification from the Central Valley RWQCB shall be obtained.

Timing/Implementation: Prior to any site disturbance on the Grant Line Road Site.

Enforcement/Monitoring: City of Elk Grove Development Services.

Implementation of the above mitigation measures would reduce impacts on sensitive habitats and jurisdictional waters of the United States to a **less than significant** level.

d) Less than Significant. Wildlife corridors refer to established migration routes commonly used by resident and migratory species for passage from one geographic location to another. Movement corridors may provide favorable locations for wildlife to travel between different habitat areas, such as foraging sites, breeding sites, cover areas, and preferred summer and winter range locations. They may also function as dispersal corridors allowing animals to move between various locations within their range. As discussed above, the project sites do contain annual grassland habitat that could provide potential foraging habitat for Swainson's hawks and other raptors. Therefore, the potential exists for wildlife to pass through the site and future construction consistent with the proposed Master Plans could impede the movement of wildlife through the project sites. However, the area surrounding the project sites is highly urbanized and developed with industrial uses. The project area does not contain any wildlife corridors. Therefore, future development consistent with the proposed Master Plans would not block a wildlife corridor and wildlife would not be impeded from traversing the areas surrounding the site. Additionally, the biological surveys did not identify any native wildlife nurseries or water features that would support the movement of fish on the project site. Therefore, this impact is considered to be **less than significant**.

e) Less than Significant with Mitigation Incorporated. Currently, the only ordinances protecting biological resources in the city (other than General Plan policies) are Title 19, Chapter 19.12 of the Municipal Code (Tree Preservation and Protection) and the City of Elk Grove Swainson's Hawk Ordinance.

Under Title 19, Chapter 19.12 of the Municipal Code (Tree Preservation and Protection), native oak trees measuring at least 6 inches dbh are protected and mitigation must be implemented for development projects that propose to remove the protected trees (native single-trunked trees 6 inches dbh and larger, or multi-trunked native trees having an aggregate diameter of 10 inches dbh and larger significant trees 19 inches dbh and larger). There are no native oak trees on the Corporation Yard Site or the Grant Line Road Site. However, the field survey conducted by EDAW on September 29, 2008 identified one native oak tree with a diameter at breast height of 20 inches was identified on Iron Rock

Way Site. This oak tree is subject to the Municipal Code and Policy CAQ-8 of the City of Elk Grove General Plan. If the Grant Line Road Site was chosen and developed with the relocated Transit Yard, the tree would be removed. Removal of the oak tree would be considered a **significant** impact without mitigation.

The following mitigation is therefore required:

MM 4e-1: If feasible based on final facilities needs and site constraints, the City shall design project facilities to retain the oak tree on the Iron Rock Way Site. The oak tree shall be fenced 5 feet beyond the dripline to minimize disturbance to the tree and its root zone. The fence shall be maintained until all project activities are complete. No grading, trenching, or movement of heavy equipment shall occur within the fenced area.

If removal of the oak tree cannot be avoided, off-site mitigation or payment of an in-lieu fee shall be implemented in accordance with Title 19, Chapter 19.12 of the City of Elk Grove Municipal Code (Tree Preservation and Protection).

Timing/Implementation: During site-specific project design phase.

Enforcement/Monitoring: City of Elk Grove Development Services.

Implementation of the above mitigation measure would ensure the proposed project's consistency with the Title 19, Chapter 19.12 of the City's Municipal Code (Tree Preservation and Protection).

The City's Swainson's Hawk Ordinance requires development projects to mitigate impacts to Swainson's hawk foraging habitat. Mitigation measure MM 4a-1, as identified above, requires the City to compensate for the permanent loss of Swainson's hawk foraging habitat per the requirements of the City's Swainson's Hawk Ordinance. Therefore, the proposed project's potential to conflict with local ordinances protecting biological resources would be mitigated to a **less than significant** level.

f) **No Impact.** The City of Elk Grove does not have an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan. Therefore, **no impact** would occur.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
5. CULTURAL RESOURCES. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☒	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☒	☐	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐

EXISTING SETTING

The City of Elk Grove General Plan DEIR (2003b) identifies 93 prehistoric and historic Native American archaeological sites within the City of Elk Grove General Plan Planning Area (Planning Area), which includes the City limits and surrounding area in unincorporated Sacramento County. Many, if not most, of these archaeological sites are village mounds located along rivers, creeks, sloughs and around lakes. Some are known to contain human remains and many others have the potential to contain human remains. In addition, there are 24 historic sites within the City of Elk Grove General Plan Planning Area, many of which are remnants of farms and ranches. Included among the historic sites is the Murphy's Ranch (Murphy's Corral) site, State Historic Landmark 680 and California Inventory of Historical Resources 182; the site of Joseph Hampton Kerr's home, California Inventory of Historical Resources 178 and Point of Historical Interest 001; the site of the Old Elk Grove Hotel, Point of Historical Interest 004; and the site of the first free library branch in California, California Historical Landmark No. 817 (City of Elk Grove, 2003b. Old Town Elk Grove became nationally recognized as a historic district on March 1, 1988. It is listed as the Elk Grove Historic District on the National Register of Historic Places (NRHP). The only other site in the Planning Area listed in the NRHP is the Eastern Star Hall, located along the Sacramento River, approximately 1.5 miles north of the community of Hood (City of Elk Grove, 2003b).

LOCAL SETTING

Cultural resource investigations for the project area were conducted as part of the environmental analysis for the *Elk Grove Transfer Station Draft EIR* (EDAW, 2009) and included consultation with the Elk Grove Historical Society, pre-field research, field survey, and research documentation. All aspects of those cultural investigations were conducted in accordance with guidelines outlined in the Office of Historic Preservation's (OHP) Instructions for Recording Historical Resources (OHP, 1995) and the federal Secretary of the Interior's Standards and Guidelines for the Identification of Cultural Resources (48 CFR 44720-23).

The Elk Grove Historical Society did not identify any historically significant sites or properties in or near the project sites. Pre-field research, which consisted of a record search at the North Central Information Center (NCIC) of the California Historical Resources Information System, identified that a segment of the Southern Pacific San Joaquin Valley Mainline is located within the local area.

However, this resource was previously analyzed and found to be ineligible for listing in the NRHP. The NCIC record search also indicated that a total of six cultural resource studies have been conducted in the vicinity of the project sites and that those studies found no historic properties and no cultural resources in the area (EDAW, 2009, p. 4.10-3). Finally, a search at the University of California Museum of Paleontology (UCMP) collections database identified paleontological resources in southern Sacramento County and the City of Elk Grove. These paleontological resources primarily consist of vertebrates associated with the geological formation known as Riverbank Formation. Although no paleontological resources have been recorded in the project area, the City is generally sensitive for such resources (EDAW, 2009, p. 4.10-4).

REGULATORY FRAMEWORK

The following state and local regulations, plans, programs, and guidelines are applicable to the proposed project:

- **Federal Laws and Regulations** –the Antiquities Act of 1906, National Park Service Act of 1966, Historic Sites Act of 1935, Section 106 of the National Historic Preservation Act (NHPA) Reservoir Salvage Act of 1960, Department of Transportation Act of 1966 (Section 4(f)), National Environmental Policy Act of 1969, Archaeological and Historic Preservation Act of 1974, Tax Reform Act of 1976, American Indian Religious Freedom Act of 1978, Archaeological Resources Protection Act of 1979, Abandoned Shipwrecks Act of 1987, Native American Graves Protection & Repatriation Act of 1990, and Executive Orders 12898, 11593, 13006, 13007

- **State Laws and Regulations** – California Environmental Quality Act (14 CCR 15064.5, PRC 21083.2, and PRC 21084.1), Section 7050.5 of the Health and Safety Code, Section 5097.98 of the Public Resources Code (Chapter 1492, Statutes of 1982, Senate Bill 297), and SB 447 (Chapter 44, Statutes of 1987).

- **Local Laws, Regulations, and Policies**

  - City of Elk Grove Historic Preservation Ordinance

PROJECT IMPACTS AND MITIGATION MEASURES

a) **No Impact.** As discussed above, previous cultural resources studies conducted in the vicinity of the project site found no historic properties and no cultural resources in the area other than the Southern Pacific San Joaquin Valley Mainline, which was previously determined not eligible for inclusion in the NRHP. Archeological and historical investigations did not identify any cultural resources (e.g. prehistoric sites, historic sites, or buildings) located within the project area that meet the CEQA criteria as presented in §15064.5; therefore, the proposed project would be expected to have **no impact** on historical resources.

b) – d) **Less than Significant with Mitigation Incorporated.** Archaeological and historical investigations for the project area did not identify any archaeological resources, cultural resources, or human remains, significant or otherwise, within the proposed project sites or surrounding area. Regardless, there are known archaeological resources in the City of Elk Grove associated with Native American and Euroamerican use and occupation of the area and future construction activities envisioned by the proposed Master Plans could result in the unanticipated discovery of archaeological and other cultural resources in the project area, including human remains. Furthermore, as the City has the potential to contain paleontological resources, there is a possibility of the unanticipated discovery of paleontological resources during future ground-disturbing activities envisioned by the project. Therefore, the project could impact significant archaeological, paleontological, or other cultural resources, including human remains. This impact is considered **potentially significant**.

The following mitigations are therefore required:

MM 5b-1 If cultural resources (i.e., prehistoric sites, historic sites, and isolated artifacts) are discovered during grading or construction activities on the project site, work shall be halted immediately within 50 feet of the discovery, the City Planning Department shall be notified, and a professional archaeologist that meets the Secretary of the Interior's Professional Qualifications Standards in archaeology and/or history shall be retained to determine the significance of the discovery.

The City shall consider mitigation recommendations presented by a professional archaeologist that meets the Secretary of the Interior's Professional Qualifications Standards in archaeology and/or history for any unanticipated discoveries. The City and project applicant shall consult and agree upon implementation of a measure or measures that the City deems feasible and appropriate. Such measures may include avoidance, preservation in place, excavation, documentation, curation, data recovery, or other appropriate measures. The project proponent shall be required to implement any mitigation necessary for the protection of cultural resources.

Timing/Implementation: *As a condition of project approval and implemented during ground-disturbing activities.*

Enforcement/Monitoring: *City of Elk Grove Development Services, Planning.*

MM 5b-2 If any paleontological resources (fossils) are discovered during grading or construction activities on the project site, work shall be halted immediately within 50 feet of the discovery, and the City Planning Department shall be immediately notified. At that time, the City will coordinate any necessary investigation of the discovery with a qualified paleontologist.

The City shall consider the mitigation recommendations of the qualified paleontologist for any unanticipated discoveries of paleontological resources. The City and project applicant shall consult and agree upon implementation of a measure or measures that the City deems feasible and appropriate. Such measures may include avoidance, preservation in place, excavation, documentation, curation, data recovery, or other appropriate measures. The project proponent shall be required to implement any mitigation necessary for the protection of paleontological resources.

Timing/Implementation: *As a condition of project approval and implemented during ground-disturbing activities.*

Enforcement/Monitoring: *City of Elk Grove Development Services, Planning.*

MM 5b-3 If, during the course of implementing actions under the Corp Yard Facilities Master Plan and Transit Yard Facilities Master Plan Project, human remains are discovered, all work shall be halted immediately within 50 feet of the discovery, the City Planning Department shall be notified, and the County Coroner must be notified according to Section 5097.98 of the State PRC and Section 7050.5 of California's Health and Safety Code. If the remains are determined to be Native American, the coroner will notify the Native American Heritage Commission, and the procedures outlined in CEQA Section 15064.5(d) and (e) shall be followed.

Timing/Implementation: *As a condition of project approval and implemented during ground-disturbing activities.*

Enforcement/Monitoring: *City of Elk Grove Development Services, Planning.*

Mitigation measures **MM 5b-1** through **MM 5b-2** address the unanticipated discovery of archaeological, paleontological, or other cultural resources, including human remains. These measures require all construction and/or grading work to be halted upon discovery of such resources or human remains and ensure that discovered resources and/or remains would be protected through consultation with appropriate professionals that would provide further mitigation. Implementation of these mitigation measures would reduce impacts to undiscovered archaeological, paleontological, or other cultural resources, including human remains to a **less than significant** level.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
6. GREENHOUSE GAS EMISSIONS. Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☒	☐	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

EXISTING SETTING

To fully understand global climate change, it is important to recognize the naturally occurring "greenhouse effect" and to define the greenhouse gases that contribute to this phenomenon. The temperature on earth is regulated by a greenhouse effect, which is so named because the earth's atmosphere acts like a greenhouse, warming the planet in much the same way that an ordinary greenhouse warms the air inside its glass walls. Like glass, the gases in the atmosphere let in light yet prevent heat from escaping.

Greenhouse gases (GHG) are naturally occurring gases such as water vapor, carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) that absorb heat radiated from the earth's surface. Greenhouse gases are transparent to certain wavelengths of the sun's radiant energy, allowing this energy to penetrate deep into the atmosphere or all the way to the earth's surface. Clouds, ice caps, and particles in the air reflect about 30 percent of this radiation, but oceans and land masses absorb the rest (70 percent of the radiation received from the sun) before releasing it back toward space as infrared radiation. GHG and clouds effectively prevent some of the infrared radiation from escaping; they trap the heat near the earth's surface where it warms the lower atmosphere. If this natural barrier of atmospheric gases were not present, the heat would escape into space, and the earth's average global temperatures could be as much as 61 degrees Fahrenheit cooler (NASA, 2007).

In addition to natural sources, human activities are exerting a major and growing influence on climate by changing the composition of the atmosphere and by modifying the land surface. Particularly, the increased consumption of fossil fuels (natural gas, coal, gasoline, etc.) has substantially increased atmospheric levels of greenhouse gases. Measured global GHG emissions resulting from human activities, especially the consumption of fossil fuels, have grown since pre-industrial times, with an increase of 70 percent between 1970 and 2004 (IPCC, 2007). This increase in atmospheric levels of GHG unnaturally enhances the greenhouse effect by trapping more infrared radiation as it rebounds from the earth's surface and thus trapping more heat near the earth's surface. Prominent GHGs contributing to the greenhouse effect and climate change include carbon dioxide, methane, ozone, nitrous oxide, and chlorofluorocarbons (CFCs). Emissions of these gases are attributable to human activities associated with the industrial/manufacturing, utilities, transportation, residential, and agricultural sectors (CEC, 2006a).

GLOBAL IMPLICATIONS

Recognizing the problem of global climate change, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the Intergovernmental Panel on Climate Change (IPCC) in 1988. It is open to all members of the

United Nations and WMO. The role of the IPCC is to assess on a comprehensive, objective, open, and transparent basis the scientific, technical, and socioeconomic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts, and options for adaptation and mitigation. IPCC projects that the earth's average surface temperature should rise 1.8 to 6.3 degrees Fahrenheit before the year 2100 (IPCC, 2007).

The IPCC Fourth Assessment Report's Working Group I Summary for Policymakers (Report) synthesizes current scientific understanding of global climate change and projects future climate change using the most comprehensive set of well-established global climate models. The report incorporates findings of the current effects of global climate change. These findings include:

- The intensity of tropical cyclones (hurricanes) in the North Atlantic has increased over the past 30 years, which correlates with increases in tropical sea surface temperatures.
- Droughts have become longer and more intense and have affected larger areas since the 1970s, especially in the tropics and subtropics.
- Since 1900 the Northern Hemisphere has lost 7 percent of the maximum area covered by seasonally frozen ground.
- Mountain glaciers and snow cover have declined worldwide.
- Satellite data since 1978 show that the extent of Arctic sea ice during the summer has shrunk by more than 20 percent.
- Since 1961, the world's oceans have been absorbing more than 80 percent of the heat added to the climate, causing ocean water to expand and contributing to rising sea levels. Between 1993 and 2003, ocean expansion was the largest contributor to sea level rise.
- Melting glaciers and losses from the Greenland and Antarctic ice sheets have also contributed to recent sea level rise.

An enhanced greenhouse effect will generate new patterns of microclimate and will have significant impacts on the economy, environment, and transportation infrastructure and operations due to increased temperatures, intensity of storms, sea level rise, and changes in precipitation. Impacts may include flooding of tunnels, coastal highways, runways, and railways, buckling of highways and railroad tracks, submersion of dock facilities, and a shift in agriculture to areas that are now cooler. Such prospects will have strategic security as well as transportation implications.

Climate change affects public health and the environment. Increased smog and emissions, respiratory disease, reduction in California's water supply, extensive coastal damage, and changes in vegetation and crop patterns have been identified as effects of climate change. The impacts of climate change are broad-ranging and interact with other market failures and economic dynamics, giving rise to many complex policy problems. The findings are the latest in a string of reports warning that the rate of carbon dioxide accumulating in the atmosphere is increasing at an alarming pace.

STATE AND REGIONAL IMPLICATIONS

Climate change is a global problem, and GHGs are global pollutants, unlike criteria air pollutants and toxic air contaminants (TACs), which are pollutants of regional and local concern. Worldwide, California is the 12th to 16th largest emitter of CO_2 and is responsible for approximately 2 percent of the world's CO_2 emissions (CEC, 2006a, 2006b). In 2004, California produced 492 million gross metric tons of carbon dioxide-equivalent (CO_2e) (CEC, 2006a).

The California Climate Action Team found that California-specific models estimate an average warming increase of 2.7 to 10.5 degrees Fahrenheit throughout California before the year 2100 (CAT, 2009). With the lowest projected global increase of 1.8 degrees, the earth would be warmer than it has been for 10,000 years (Miller, 2000). As a result, increased ocean temperatures could result in increased moisture flux into the state; however, since this would likely increasingly come in the form of rain rather than snow in the high elevations, increased precipitation could lead to increased potential and severity of flood events, placing more pressure on California's flood control systems.

Increased precipitation and sea level rise could increase coastal flooding, saltwater intrusion (a particular concern in the low-lying Sacramento–San Joaquin Delta, where potable water delivery pumps could be threatened) and degradation of wetlands. Mass migration and loss of plant and animal species could also occur. Potential effects of global climate change that could adversely affect human health include more extreme heat waves and heat-related stress; an increase in climate-sensitive diseases; more frequent and intense natural disasters such as flooding, hurricanes and drought; and increased levels of air pollution. The scientific evidence supporting these assertions continues to build, with updated modeling scenarios being testing on an ongoing basis. The science of climate change is such that it is constantly evolving, with information presented as a component of public policy quickly becoming out of date. General impacts as a result of climate change, as currently known at the adoption of this document, are outlined below.

To date, the primary impact of global climate change has been a rise in the average global tropospheric temperature (the troposphere is the zone of the atmosphere characterized by water vapor, weather, winds, and decreasing temperature with increasing altitude) of 0.2°C per decade, determined from meteorological measurements worldwide between 1990 and 2005. Climate change modeling using 2000 emission rates shows that further warming could occur, which would cause additional changes in the global climate system during the 21st century. Impacts to the environment of California that could result from continued global warming include, but are not limited to:

- Increasing temperatures by as much as 8 to 10.4 degrees Fahrenheit (°F) under the higher emission scenarios, resulting in a 25 to 35 percent increase in the number of days ozone pollution standards are exceeded in most urban areas;

- Increased electricity demand, particularly in the hot summer months;

- Decline of the Sierra snowpack, which accounts for a significant amount of the stored surface water in California, by 70 percent to 90 percent over the next 100 years;

- Decline in spring stream flow by as much as 30 percent, causing severe water shortages;

- The loss of sea ice and mountain snow pack, resulting in higher sea levels and higher sea surface evaporation rates with a corresponding increase in tropospheric water vapor due to the atmosphere's ability to hold more water vapor at higher temperatures;

- Changes in weather, such as widespread changes in precipitation, ocean salinity and wind patterns, and increased incidence of extreme weather, including droughts, heavy precipitation, heat waves, extreme cold and the intensity of tropical cyclones;

- Impacts to agricultural production due to increased temperatures, reduced water supply and increased threats from pests and pathogens;
- High potential for erosion of California's coastlines and seawater intrusion into the Delta and levee systems; and
- Increased wildfire risk resulting from dry vegetation and extended droughts.

REGULATORY FRAMEWORK

The following state and local regulations, plans, programs, and guidelines are applicable to the proposed project:

- **State Laws and Regulations** – Executive Order S-3-05 (2005) established the following aggressive emissions reduction goals: by 2010, GHG emissions must be reduced to 2000 levels; by 2020, GHG emissions must be reduced to 1990 levels; and by 2050, GHG emissions must be reduced to 80 percent below 1990 levels.

  In 2006, Governor Arnold Schwarzenegger signed Assembly Bill (AB) 32, the Global Warming Solutions Act, into legislation. The Act requires that California cap its GHG emissions at 1990 levels by 2020. AB 1493, the Pavley Bill, directed CARB to adopt regulations to reduce emissions from new passenger vehicles.

  Recently, California enacted legislation (SB 375) to expand the efforts of AB 32 by controlling indirect GHG emissions caused by urban sprawl.

- **Local Laws, Regulations, and Policies** – SMAQMD offers the guidance contained in the SMAQMD Guide for Air Quality Assessment in Sacramento County (2009) for addressing the GHG emissions associated with individual development projects.

PROJECT IMPACTS AND MITIGATION MEASURES

a) **Less than Significant with Mitigation Incorporated.** Implementation of the proposed project would contribute to increases of GHG emissions that are associated with global climate change. Estimated GHG emissions attributable to the proposed project would be primarily associated with increases of carbon dioxide (CO_2) from mobile sources. Emissions of CO_2 typically constitute a majority of total mobile-source GHGs commonly associated with community development projects. To a lesser extent, other GHG pollutants, such as Methane (CH_4), largely generated by natural-gas combustion, would typically have a minor contribution to overall GHG emissions, or are not commonly associated with typical community development projects.

   Estimated emissions of CO_2 were calculated using the URBEMIS2007 computer program, based on default parameters (i.e., emission factors, vehicle fleet, and trip distribution data) contained in the model. Emissions were converted to CO_2 equivalents (i.e., CO_2e), expressed in metric tons, based on the global warming potential of each pollutant. Emissions were calculated for short-term construction and long-term operational conditions and are discussed in more detail, as follows:

SHORT-TERM CONSTRUCTION

During construction of the project, GHGs would be emitted from the operation of construction equipment and from worker and building supply vendor vehicles. Emissions during construction were estimated using the URBEMIS2007 model. The project construction emissions of CO_2 are shown in **Table 6**, below. Emissions of nitrous oxide and methane are negligible in comparison and were not estimated. As indicated, construction of the proposed project would generate total annual emissions of approximately 210.11 metric tons of CO2e. These construction-generated emissions are temporary and short-term and would not result in a significant impact.

TABLE 6
SHORT-TERM CONSTRUCTION-GENERATED GREENHOUSE GAS EMISSIONS

Construction	CO_2 Equivalent (Metric Tons/Year)
Proposed Project	210.11
Total	**210.11**

Notes: Emissions were calculated using the URBEMIS2007 (version 9.2.4) computer program. Project construction was assumed to commence from the end of 2010 through mid-2011 for the purpose of this analysis.

LONG-TERM OPERATION

Long-term increases in area- and mobile-source GHG emissions associated with the proposed project were estimated using the URBEMIS2007 computer program. The default settings for Sacramento County contained in the model were used for this analysis. Increases in energy consumption were estimated using the Energy Information Administration's *Residential Energy Consumption Survey* (2005). Predicted long-term operational emissions of GHG are summarized in **Table 7**.

TABLE 7
LONG-TERM OPERATIONAL GREENHOUSE GAS EMISSIONS

	CO_2 Equivalent (Metric Tons/Year)			
	Area Source	**Mobile Source**	**Indirect Emissions from Energy Consumption**	**Total**
Proposed Project	160	1737	910	**2,798**

Notes: Operational emissions were calculated using the URBEMIS2007 (v9.2.4) computer program and the Energy Information Administration's Residential Energy Consumption Survey (2005). Proposed project emissions include landscape maintenance activities, automobile source emissions and energy generation. CO2e = carbon dioxide equivalent; MT/yr = metric tons per year; refer to Appendix A for detailed assumptions and modeling output files.

Source: PMC 2010

The SMAQMD offers the guidance contained in the SMAQMD *Guide for Air Quality Assessment in Sacramento County* (2009) for addressing the GHG emissions associated with individual development projects. However, SMAQMD does not currently have an adopted threshold of significance for GHG emissions. SMAQMD recommends addressing the potential impacts of project-generated GHG emissions including a description of the existing environmental conditions or setting (see Existing Setting above), a discussion of the existing regulatory environment pertaining to GHGs (see Regulatory Framework above), a discussion of the GHG emission sources associated with the project's construction and operational activities (see **Tables 5** and **6**), and a discussion of feasible construction and operational mitigation necessary to reduce impacts. Long-term operational greenhouse gas emissions are considered to be **potentially significant**.

The following mitigations are therefore required:

The following mitigation measures shall be incorporated into the project's design, construction activities, and operation in order to reduce impacts to global warming and climate change. A number of these measures have been identified by CARB to offset or reduce global warming impacts in their June 19, 2008, technical advisory CEQA and Climate Change: Addressing Climate Change Through California Environmental Quality Act (CEQA) Review.

MM 6a-1: The following emissions reduction measures shall be implemented:

1. The following measures shall be implemented during construction:
   - Limit idling of construction equipment and delivery vehicles;
   - Limit the vehicle trips of construction deliveries by consolidating material loads;
   - Delivery of materials should take place during non-rush hours, in order to increase vehicle fuel efficiency;
   - Provide opportunity for construction workers to carpool, and
   - Gasoline and diesel-run equipment and machinery should be well maintained and in good working condition.
2. Following consultation with SMAQMD, and to the extent agreed upon by the project applicant and SMAQMD, construction vehicles shall use retrofit emission control devices, such as diesel oxidation catalysts and diesel particulate filters verified by the California Air Resources Board.
3. No wood-burning fireplaces, woodstoves, or similar wood-burning devices will be used in association with the project.
4. For low-impact areas and surfaces, the lowest-emitting architectural coatings feasible shall be used during construction. Zero-VOC coatings shall be used. For areas of high use that will require frequent cleaning, such as door frames or kitchen room walls, low-VOC coatings shall be used. Design review submittals shall include information concerning the coatings products proposed for use in the project.

Timing/Implementation: *Prior to issuance of certification of occupancy*

Monitoring/Enforcement: *City of Elk Grove Development Services Department and Sacramento Metropolitan Air Quality Management District*

MM 6a-2 The following energy efficiency and renewable energy measures shall be implemented:

1. Include energy-efficient window glazings, wall insulation, and efficient ventilation methods.

2. Energy efficient lighting (e.g., fluorescent lighting, which uses approximately 75% less energy than incandescent lighting to deliver the same amount of light) shall be used.

3. Promote passive solar building design and landscaping conducive to passive solar energy use (i.e., building orientation in a south to southwest direction, encouraging planting of deciduous trees on western sides of structures, landscaping with drought-resistant species, and including groundcovers rather than pavement to reduce heat reflection) where energy modeling indicates that these measures will reduce energy consumption.

4. Landscaping plans shall prohibit the use of liquidambar and eucalyptus trees that produce smog-forming compounds (high emission factors for isoprenes).

5. Establish building guidelines that require the use of low-absorptive coatings on all building surfaces and Energy Star roofing products on all roofs if commercially available at the time building permits are issued and compliant with the California Building Code.

6. Require reuse and recycling of construction and demolition waste.

7. Preserve and create open space and parks. Preserve existing heritage and street trees (or in the event that preservation or relocation cannot be achieved, replace with similar species and size).

Timing/Implementation:	*Prior to issuance of certification of occupancy*
Monitoring/Enforcement:	*City of Elk Grove Development Services*
	Department and Sacramento Metropolitan Air Quality Management District

According to an emissions reduction estimate prepared for the proposed project (**Appendix A**), the stipulation to limit idling of construction equipment alone would reduce the amount of CO_2e emitted by four metric tons compared to if this mitigation measure was not instituted. In addition, it is estimated that the energy efficiency and renewable energy measures stipulated under mitigation measure **MM 6a-2** would result in the reduction of 98 metric tons of CO_2e per year. Implementation of mitigation measures **MM 6a-1** and **MM 6a-2** will provide feasible construction and operational mitigation necessary to reduce impacts while maintaining the proposed project in conformance with SMAQMD recommendations. Therefore this impact is considered **less than significant with mitigation incorporated**.

b) Less than Significant. The California Governor's Office of Planning and Research (OPR) recommendations are broad in their scope and address a wide range of industries and GHG emission sources. Therefore, most of the recommendations are not applicable to the development and operation of any single residential project, but rather as general development policies. Thus, the proposed project's compliance with these measures was evaluated qualitatively with the understanding that exact compliance can only be determined once specific applicable regulations are adopted.

By its nature, the project is consistent with applicable plans, policies, and regulations adopted for the purpose of reducing greenhouse gas emissions. Implementation of the proposed project would provide increased and more efficient local access to public transit service, which is anticipated to result in an overall reduction in on-road vehicle commute distances for Elk Grove residents. Furthermore, the analysis was completed in accordance with the methodology recommended in the SMAQMD Guide for Air Quality Assessment in Sacramento County (2009), which is consistent with the above-stated goals of the State of California. Absent other guidance from local, regional, or state agencies, the SMAQMD Guide for Air Quality Assessment in Sacramento County is the best available tool in Sacramento County to determine a level of significance for CEQA. Therefore, with the implementation of mitigation measures **MM 6a-1** and **MM 6a-2**, along with minimal additional emissions as a result of the project, there would be consistency with state and regional recommendations for addressing climate, and therefore a **less than significant** impact.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
7. GEOLOGY AND SOILS. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning map, issued by the State Geologist for the area or based on other substantial evidence of a known fault?	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable, or that would became unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☒	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☒	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

EXISTING SETTING

Geology and Soils

The majority of Sacramento County, including the entire City of Elk Grove and the proposed project sites, lies in the Great Valley geomorphic province. A "geomorphic province" is defined as an area with similar geologic origin and erosional/depositional history. The Great Valley geomorphic province is an alluvial plain approximately 50 miles wide and 400 miles long located in central California (CA Geological Survey, 2002a). The Great Valley province is bounded on the north by the Klamath and Cascade mountain ranges, on the east by the Sierra Nevada Mountains, and on the west by the California Coast Mountain Range. The Great Valley is a trough in which sediments consisting of Cenozoic non-marine (continental) sedimentary rocks and alluvial deposits have been deposited almost continuously since the Jurassic period approximately 160 million years ago. Elk Grove is in the northern portion of the Great Valley geomorphic province, the Sacramento Valley, and is drained by the Sacramento River (CA Geological Survey, 2002a; CA Geological Survey, 2002b).

Surface elevations within the Great Valley generally range from several feet below mean sea level (msl) to more than 1,000 feet above msl. The ground surface elevation in the vicinity of Elk Grove ranges from approximately 10 to 150 feet above msl (City of Elk Grove, 2003b, p. 4.9-1).

Soils on the project sites and in the surrounding project area are primarily composed of San Joaquin silt loam and San Joaquin-Galt Complex (NRCS, 2010). The San Joaquin soil type is moderately well drained and moderately deep over a cemented hardpan. This base geologic condition does not lend to structural failures such as sinkholes. Since these soils are located at shallow depths, they are conducive to urban development. Properly designed foundations, buildings, and roads, can help to prevent potential damage caused by the high shrink-swell potential and low subsoil strength (City of Elk Grove, 2003b, p. 4.9-1).

The project sites are relatively flat and there are no distinctive geological features, such as rock outcroppings, on any of the proposed project sites.

Faults and Seismicity

Sacramento County, as well as the City of Elk Grove, is less affected by seismic events and geologic hazards than other portions of the state. Nevertheless, some property damage has occurred as a result of seismic events in the past. The damage experienced was largely the result of major seismic events occurring in adjacent areas, especially the San Francisco Bay Area and, to a lesser extent, the foothills of the Sierra Nevada Mountain Range. Therefore, Sacramento County, like most of California, is considered a seismically active region.

Faults

There are no known active faults in the City of Elk Grove and no active or potentially active faults underlie the City. The City is not located in an Alquist-Priolo Earthquake Fault Zone. The closest fault to the City is the Foothills Fault System, which is 21 miles away (City of Elk Grove, 2003b, p. 4.9-3).

Liquefaction

The potential for liquefaction, which is the loss of soil strength due to seismic forces, is dependant on soil types and density, the groundwater table, and the duration and intensity of ground shaking. Based on these factors, the potential for liquefaction beneath the City of Elk Grove, and thus the project sites, is considered low. The potential for ground lurching, differential settlement or lateral spreading occurring during or after seismic events is also considered to be low (City of Elk Grove, 2003b, p. 4.9-4).

Expansive Soils

Soils that contain a relatively high percentage of clay minerals have the potential to shrink and swell with changing moisture conditions. The San Joaquin soil group contains approximately 5 inches of claypan in the subsoil, and contains a surface layer of brown silt loam between 11 and 23 inches thick. Therefore, as mentioned above, the shrink-swell potential is high in this soil type due to the high percentage of claypan (City of Elk Grove, 2003b, p. 4.9-4).

Other Potential Geologic Hazards

There is a risk for subsidence, the gradual settling or sinking of the earth's surface with little or no horizontal motion, within the City of Elk Grove and therefore within the project area. There are five causes of subsidence that affect the City – compaction by heavy structures, erosion of peat soils, peat oxidation, fluid withdrawal, and compaction of unconsolidated soils by earthquake shaking. The pumping of water from subsurface water tables for residential, commercial, and agricultural uses causes the greatest amount of subsidence within the City (City of Elk Grove, 2003b, p. 4.9-4).

There is little potential in the City and within the project sites for landslides to occur, since there are no major slopes in the area. There are also no oceans, large bodies of water, or volcanoes in the City or immediate vicinity, so there is little or no possibility for seiches, tsunamis, or volcanic eruptions to occur (City of Elk Grove, 2003b, p. 4.9-4).

REGULATORY FRAMEWORK

The following state and local regulations, plans, programs, and guidelines are applicable to the proposed project:

- State Laws and Regulations
  - Alquist-Priolo Earthquake Fault Zoning Act
  - California Building Code
- Local Laws, Regulations, and Policies
  - City's Buildings and Construction Ordinance

PROJECT IMPACTS AND MITIGATION MEASURES

a) **i) Less than Significant.** There are no known faults crossing through the proposed project sites or in the vicinity of the project sites. The closest fault is over 20 miles away from the City, as described above. Furthermore, the project sites are not located within an Alquist-Priolo earthquake hazard zone. Therefore, impacts related to faults would be considered **less than significant.**

ii) Less Than Significant. As discussed under item **i)** above, the proposed project sites are not located in the vicinity of any active faults. In addition, the City of Elk Grove is not located within an Alquist-Priolo Earthquake Fault Zone and surface evidence of faulting has not been observed. However, due to the proximity to the San Andreas Fault Zone and other active faults such as those discussed above, the City of Elk Grove may experience non-catastrophic ground shaking during a seismic event. The City of Elk Grove has adopted the CBC and all buildings constructed in the City, including those under the proposed Master Plans, would be required to comply with the CBC, which includes special design requirements for building and foundation stress capabilities, masonry and concrete reinforcement, and building spacing to accommodate moderate earthquake shaking. In recent earthquakes, buildings built to modern codes have generally sustained relatively little damage (USGS, 2010). Therefore, the CBC design requirements reduce impacts associated with seismic groundshaking by preparing structures to accommodate moderate earthquake-related ground movement and compliance with these seismic design parameters would ensure that impacts resulting from seismic groundshaking at the project sites would be **less than significant**.

iii) Less Than Significant. As previously discussed, the potential for liquefaction is dependant on soil types and density, the groundwater table, and the duration and intensity of ground shaking. Based on these factors, the potential for liquefaction beneath the City of Elk Grove, and thus the project sites, is considered low and impacts would be **less than significant**.

iv) No Impact. The proposed project sites are topographically flat; therefore the likelihood of landslides is minimal. Furthermore, the City of Elk Grove General Plan Draft EIR (City of Elk Grove, 2003) confirms that there is little potential for landslides to occur anywhere in the City as there are no major slopes in the area and the maximum land surface slope within the city is 3 percent. Therefore, **no impact** associated with landslides is expected to occur.

b) Less Than Significant. The proposed project envisions expansion of the existing Corporation Yard facilities, as well as relocation and expansion of Transit Yard facilities. Construction associated with these activities would require grading and compaction of project site soils, which would result in minor changes to the topography of the sites and surface relief features. This is particularly true on the Iron Rock Way Site as it is currently vacant. Over-covering of the soils on the project site would occur to the extent necessary to construct the necessary facilities. Temporary increases in soil erosion from wind and water may be experienced during construction activities. The City's Land Grading and Erosion Control Code (Title 16, Chapter 16.44 of the Municipal Code) establishes procedures to minimize erosion and sedimentation during construction activities. Compliance with this Ordinance would reduce impacts associated with soil erosion during construction. After construction, the building foundations, parking areas, and other facilities constructed at the project sites would serve to stabilize the soils that they cover and would effectively reduce erosion of all types. Therefore, this impact is considered to be **less than significant**.

c) – d) Less than Significant. The proposed project provides for the future expansion of the existing Corporation Yard facilities, as well as relocation and expansion of Transit Yard facilities, which could place development on expansive and unstable soils. However, as required by the City of Elk Grove General Plan (2003), all future development constructed on the project sites subsequent to approval of the proposed Master Plans would be required to submit a geotechnical report that would include recommendations, design criteria, and specifications to reduce impacts related to expansive and unstable soils. In addition, all development proposed on the sites would be required to comply with all applicable building codes including the CBC and commonly accepted engineering practices, which require special design and construction methods for dealing with expansive and unstable soil behavior.

Compliance with recommendations included in the geotechnical reports and applicable building codes would ensure that soils at future development sites would be capable of supporting the structures resulting from approval of the proposed Master Plans and would therefore reduce impacts resulting from expansive and unstable soils to a **less than significant** level.

e) No Impact. The project does not propose the use or construction of septic tanks or alternative wastewater disposal systems; therefore, **no impact** would occur.

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

EXISTING SETTING

Hazardous Materials

The Hazardous Waste and Substances Sites (Cortese) List is a planning document used by the State, local agencies and developers to comply with the California Environmental Quality Act (CEQA) requirements in providing information about the location of hazardous materials release sites. Government Code section 65962.5 requires the California Environmental Protection Agency (Cal/EPA) to develop at least annually an updated Cortese List. The Department of Toxic Substance Control (DTSC) is responsible for a portion of the information contained in the Cortese List. Other State and local government agencies are required to provide additional hazardous material release information for the Cortese List. DTSC's EnviroStor database provides DTSC's component of Cortese List data (DTSC, 2010). In addition to the Envirostor database, the State Water Resource Control Board (SWRCB) Geotracker database provides information on regulated hazardous waste facilities in California, including underground storage tank (UST) cases and non-UST cleanup programs, including Spills-Leaks-Investigations-Cleanups (SLIC) sites, Department of Defense sites (DOD), and Land Disposal program. A search of the DTSC Envirostor database and the SWRCB Geotracker determined that there are no known hazardous waste generators or hazardous material spill sites within the proposed project sites. However, the project sites are located in an industrial area and there are several Leaking Underground Storage Tank (LUST) and SLIC sites within one mile of the project sites. These are detailed in **Table 8** below.

TABLE 8
LUST AND SLIC SITES WITHIN ONE MILE OF THE PROJECT SITES

Facility	Address	Type of Site	Contaminants of Concern	Potential Media Affected	Cleanup Status
Georgia Pacific Resins	10399 Stockton Boulevard	SLIC	Semi-volatile organic compounds	Not Specified	Completed – Case closed as of 1/1/95
Flying V SS	10473 Stockton Boulevard	LUFT	Gasoline	Aquifer Used for Drinking Water Supply	Completed – Case closed as of 4/15/98
Arco #5752	10466 Grant Line Road	LUFT	Gasoline	Soil	Completed – Case closed as of 1/8/07
Transcon Lines	10401 Grant Line Road	LUFT	Diesel	Soil	Open – Site assessment as of 4/17/1989
Emerald Lake Golf Center	10651 East Stockton Boulevard	SLIC	Diesel	Under Investigation	Completed – Case closed as of 10/22/08
World Asphalt	10144 Waterman Road	LUFT	Stoddard Solvent/Mineral Spriits/Distillates	Under Investigation	Completed – Case closed as of 9/9/99
Conoco Asphalt Terminal	10090 Waterman Road	LUFT	Diesel	Soil	Completed – Case closed as of 11/12/86

Source: DTSC, 2010. SWRCB, 2010.

Facilities Storing, Transporting, Using, or Manufacturing Hazardous Materials

The potential project sites are located in an industrial area and a variety of facilities that store, transport, use, or manufacture hazardous materials are located near these sites. The two largest facilities are Suburban Propane, which stores propane in large aboveground tanks, and Georgia-Pacific Resins, which manufactures industrial coatings from chemicals such as formalin and formaldehyde. Both facilities are located within the City limits of Elk Grove and are surrounded by industrial, office, commercial, residential, and agricultural land uses.

Suburban Propane Facility

The Suburban Propane facility is located at 10450 Grant Line Road, south of the City Corporation Yard/Jackson Property Site and the Iron Rock Way Site and north of the Grant

Line Road Site. Suburban Propane receives pressurized liquid propane at ambient temperatures from tanker trucks and railroad cars and loads ambient-temperature propane for transport offsite. The facility stores both ambient-temperature and refrigerated liquid propane. On average, approximately 120,000 gallons of propane are handled at the facility each day, 50% by tanker truck and 50% by railroad car (EDAW, 2009, p. 4.7-4). Major equipment at Suburban Propane includes four 60,000-gallon storage tanks (known as "bullet tanks") for pressurized, ambient-temperature propane; two 12-million-gallon refrigerated, low-pressure storage tanks; loading/unloading stations for tanker trucks and railroad cars; a propane refrigeration system; a flare; and safety systems such as a water spray system in the railroad car and truck loading area.

The bullet tanks are protected from overpressure (the greater-than-normal pressure that accompanies an explosion) by multiple pressure relief valves on the top of each tank. A water spray system protects each bullet tank from excessive heating in the event of fire exposure. The refrigerated storage tanks are equipped with pressure and liquid-level gauges, liquid overflow vents, pressure relief valves, vacuum breakers, and a vent line to the facility flare. The loading/unloading stations for tanker trucks and railroad cars are equipped with water deluge systems. In the event of a fire in these areas, the deluge systems should help prevent physical failure of tanker trucks and railroad cars as a result of excessive heat and internal pressure (EDAW, 2009, p. 4.7-4).

Georgia-Pacific Resins

The Georgia-Pacific Resins facility is located at 10399 East Stockton Boulevard, to the southwest of the City Corporation Yard/Jackson Property and Iron Rock Way Sites and northwest of the Grant Line Road Site. Georgia Pacific Resins produces coating resins such as industrial coatings; air-dry varnishes; and specialty coatings for drums, pails, and food cans. The manufacturing process involves quantities of formalin, formaldehyde, formic acid, and ammonium hydroxide. The largest quantity of formalin, a toxic gas that is a mixture of formaldehyde and water, at the facility is contained in Tank 105, an insulated AST constructed of welded steel with a capacity of 40,000 gallons. Formalin within the tank is heated to maintain its temperature at about 140°F. Tank 105 is surrounded by a concrete containment structure that is large enough to hold the entire contents of the tank, a "pool area" of approximately 11,120 square feet. The material stored at the Georgia-Pacific Resins facility that would pose the largest problem following a large accidental release is formaldehyde, a colorless gas that can be toxic at certain levels by inhalation, ingestion, or physical contact (EDAW, 2009, p. 4.7-4 and 4.7-5).

Risk Analysis for the Suburban Propane and Georgia-Pacific Resins Facilities

In 2003, Quest Consultants performed a Quantitative Risk Analysis (QRA) for both the Suburban Propane propane terminal and a formalin storage tank at the Georgia-Pacific Resins facility (Quest Consultants, 2003). The objective of the study was to compute the level of risk posed to members of the public in the vicinity of the two facilities, including the potential project sites, by potential releases of flammable liquids from the propane terminal and toxic liquids from the formalin storage tank (EDAW, 2009, p. 4.7-5).

For the QRA, Quest Consultants identified all possible accident scenarios for the Suburban Propane and Georgia-Pacific Resins facilities and analyzed the hazard types, incidence scenarios, worst-case effects and the extent of those effects, specific conditions associated with worst-case effects, and approximate probabilities associated with each scenario.

Off-site hazards to human health and property associated with incidents at the Suburban Propane and Georgia-Pacific facilities fall into the following five main categories:

- Vapor cloud explosion from a release at Suburban Propane that generates an overpressure;
- Thermal radiation (radiant heat), such as a pool fire;
- Flash fire;
- Shrapnel from a sudden, catastrophic failure of a pressure vessel; and
- Formaldehyde exposure from a formalin spill.

Environmental Site Assessments

This discussion of below is based in part on a review of the *Phase I Environmental Site Assessment, 10250 Iron Rock Way, Elk Grove, California* prepared for a portion of the City Corporation Yard/Jackson Property Site in 2004 by Kleinfelder and the *Phase II Site Assessment Report, Kalwani Property, 10401 Grant Line Road, Elk Grove, California* prepared for the Grant Line Road Site in 2007 by Taber. Both of theses ESAs can be found in **Appendix B**.

Corporation Yard and Grant Line Road Sites

A *Phase I Environmental Site Assessment* (ESA) was prepared in 2004 for the portion of the City Corporation Yard/Jackson Property Site that contains the existing Corporation Yard (Kleinfelder, 2004). The purpose of the ESA was to determine the environmental conditions (i.e., hazardous substances) associated with the subject property's past and current use. A recognized environmental condition is defined as "the presence or likely presence of hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater or surface water of the property."

The portion of the City Corporation Yard/Jackson Property Site that contains the existing Corporation Yard was not identified as a contaminated property and was not found to contain any evidence of a past release of hazardous materials (Kleinfelder, 2004, p. 38). The ESA did note that the possibility exists for persistent agricultural chemicals to be present in soils on the site considering the property's historical use as agricultural land. In determining the environmental conditions of the existing Corporation Yard portion of the City Corporation Yard/Jackson Property Site, the ESA also evaluated the environmental conditions of surrounding properties, which included a database search of contaminated properties within the vicinity. Neither the Jackson Property nor the Iron Rock Way Site was not identified as a contaminated property and, based on a review of historical aerial photographs contained in the ESA, no historical development was evident on the Jackson Property or the Iron Rock Way Site. The ESA found no indication that the Jackson Property or the Iron Rock Way Site ever included any uses that would contribute to contamination of the sites.

Grant Line Road Site

A Phase II ESA was prepared for the Grant Line Road Site in 2007 (Taber, 2007a) in order to identify the presence of hazardous materials or petroleum products on the proposed right-of-way acquisition (take area) for the Grant Line Road Widening Project and to identify the level of soil contamination at the remainder of the site (non-take area). The limits of the ESA included the entire 21-acre site.

As previously discussed, the 21-acre site includes seven acres that are currently being used by Super Pallet, a wood pallet recycling business. This area was previously used as a truck terminal facility that consisted of a truck terminal building, a maintenance shop, diesel fuel storage and dispenser system and several other small structures surrounded by asphalt paving. The diesel fuel storage and dispenser system consisted of a 225,000-gallon diesel aboveground storage tank (AST), two 20,000-gallon and two 10,000-gallon diesel underground storage tanks (UST) and associated piping, valve and pump sheds, and a dispenser island. The diesel product was conveyed from the AST by aboveground piping, which connected to valves and meters located in the valve shed and then was conveyed, via underground piping, to the four USTs. The fuel was then pumped into the trucks from the dispenser island and from several remote pumps in the immediate vicinity of the four USTs. During the period May through June 1997, all four of the USTs as well as the foundation for the former AST, were removed (EDAW, 2009, p. 4.7-1).

Results of the ESA indicated that concentrations of volatile and semi-volatile compounds in the soils within the take area along Grant Line Road and the maintenance shop area were below detection limits. Detected metals concentrations appeared to be within the ranges expected for background levels. Two soil borings drilled in the vicinity of the former 225,000-gallon above ground diesel tank did not identify any impacts to subsurface soils (EDAW, 2009, p. 4.7-2).

However, concentrations of constituents of concern within the soils at the UST area indicated contamination, most of which appeared to be associated with the southern ends of the former 20,000-gallon diesel USTs. In the central portion of the former diesel UST location, concentrations of up to 11,000 milligrams per kilogram (mg/kg) of Total Petroleum Hydrocarbons, as Diesel (TPH-D) were found in soils at a depth of 30 feet below grade. Although soil impacts were not identified below 40 feet below grade in the current 2007 ESA, previous investigations identified TPH-D contamination to a depth of 60 feet below grade. The ESA indicated that, based on the identified contaminant concentrations and soil types, there is a potential for the contaminants to degrade groundwater over time and that active remediation at the UST location would likely be required to reduce current risk levels to those acceptable for regulatory closure (EDAW, 2009, p. 4.7-2).

REGULATORY FRAMEWORK

The following state and local regulations, plans, programs, and guidelines are applicable to the proposed project:

- Federal Laws and Regulations
  - Clean Water Act
  - Clean Air Act
  - Resource Conservation and Recovery Act
  - Comprehensive Environmental Response, Compensation, and Liability Act
  - Residential Lead-Based Paint Hazard Reduction Act of 1992 (Title 10)

- State Laws and Regulations
  - Cal/EPA Unified Program
  - California Accidental Release Prevention (CalARP) Program
  - California Department of Toxic Substances Control
  - UST Program
  - Hazardous Materials Release Response Plans and Inventory (Business Plan) Program
  - California Fire and Building Code
  - Defensible Space Requirements

PROJECT IMPACTS AND MITIGATION MEASURES

a) – b) Less than Significant with Mitigation Incorporated.

Construction Hazards

Future construction activities resulting from implementation of the proposed project could result in the exposure of construction workers and the general public to hazardous materials, including petroleum hydrocarbons, pesticides, herbicides, and fertilizers; contaminated debris; elevated levels of chemicals that could be hazardous; or hazardous substances that could be inadvertently spilled or otherwise spread. The Grant Line Road Site is known to contain contaminated soils associated with prior land uses on the site. According the ESA report for this site, active remediation at the UST location would likely be required to reduce current risk levels to those acceptable for regulatory closure. This remediation would be necessary prior to project development. Even with remediation, there is the potential that site construction activities could expose currently unknown hazardous materials. This potential exists for each of the project sites as the 2004 ESA identified that persistent agricultural chemicals have the potential to be present. The Grant Line Road and City Corporation Yard/Jackson Property Sites also contain structures that would require removal and/or improvement. These structures could include asbestos-containing building materials and lead-containing materials (e.g., paint, sealants, pipe solder), which could become friable or mobile during demolition activities and come into contact with construction workers, thus resulting in a health hazard.

In addition, future development of facilities identified in the Master Plans would utilize hazardous materials in varying amounts during construction activities, including: fuels (gasoline and diesel); oils and lubricants; paints and paint thinners; glues; and cleaners (which could include solvents and corrosives in addition to soaps and detergents). Construction workers and the general public could be exposed to hazards and hazardous materials as a result of improper handling or use during construction activities (particularly by untrained personnel); transportation accidents; or fires, explosions, or other emergencies. Construction workers could also be exposed to hazards associated with accidental releases of hazardous materials, which could result in adverse health effects. Impacts are therefore considered to be **potentially significant**.

The use and handling of hazardous materials during construction activities would be required to occur in accordance with applicable federal, state, and local laws and codes as discussed above, including California Occupational Health and Safety Administration (CalOSHA) requirements, thereby minimizing the extent of any spills, releases, or other exposure. Contractors would also be required to comply with Cal/EPA's Unified Program; regulated activities would be managed by Sacramento County Environmental Management Department, the designated CUPA for Sacramento County, in accordance with the regulations included in the Unified Program (e.g., hazardous materials release response plans and inventories, California UFC hazardous material management plans and inventories). Such compliance would reduce the potential for accidental release of hazardous materials during construction of the proposed project. As a result, it would lessen the risk of exposure of construction workers and the public to accidental release of hazardous materials, as well as the demand for incident emergency response. In addition, the following mitigation measures would be incorporated to further reduce impacts associated with any spills, releases, or other exposure to hazardous materials.

The following mitigation measures are therefore required:

MM 8a-1: Construction monitors trained in the identification of hazardous materials will be present during the excavation and site development phase of the project. Monitors will observe all excavation, trenching, and grading for the potential presence of hazardous materials and petroleum products. If during site preparation and construction activities previous undiscovered or unknown evidence of hazardous materials contamination is observed or suspected through either obvious or implied measures (e.g., stained or odorous soil, unknown storage tanks, etc.), construction activities shall immediately cease in the area of the find.

City of Elk Grove staff shall be immediately consulted and the project contractor shall contract with a qualified consultant registered in DTSC's Registered Environmental Assessor Program to assess the situation. If necessary, risk assessments shall include a DTSC Preliminary Endangerment Assessment or no further action determination, or equivalent. Any required remediation shall include a DTSC Remedial Action Work Plan or equivalent. Based on consultation between the Registered Environmental Assessor and DTSC, remediation of the site shall be conducted consistent with all applicable regulations.

Timing/Implementation: *During project construction.*

Enforcement/Monitoring: City of Elk Grove Planning Department.

MM 8a-2: Prior to start of construction, the construction contractor shall designate staging areas where fueling and oil-changing activities will take place. The staging area(s) shall be reviewed and approved by City's Planning Department and the Storm Water pollution Prevention Plan (SWPPP) Manager prior to the start of construction. No fueling and oil-changing activities shall be permitted outside the designated staging areas. The staging areas, as much as practicable, shall be located on level terrain and away from sensitive land uses such as residences, day care facilities, and schools. Staging areas shall not be located near any stream, channel, or wetlands. The proposed staging areas shall be identified in the SWPPP.

Timing/Implementation: *Prior to start of construction and during project construction.*

Enforcement/Monitoring: *City of Elk Grove Planning Department.*

Compliance with federal, State, and local hazardous materials regulations and codes, as well as the above mitigation measures, would reduce to a **less than significant** level impacts associated with hazards for construction workers and the general public involving the release of hazardous materials into the environment or through the routine transport, use, or disposal of hazards materials during construction activities.

Operational Hazards

Implementation of the proposed project would allow for future development of industrial Corp Yard and Transit Yard facilities on the project sites. Operation of these facilities would require aboveground fuel tanks on the site in order to fuel vehicles. In addition, operation of the facilities would involve temporary storage of small quantities of gasoline, paint, oil, used oil, antifreeze, and various household hazardous waste items picked up at the roadside (illegal dumping).

As with construction, operation of the proposed project will be required to be consistent with federal, State, and local laws and regulations addressing hazardous materials. These regulations and codes must be implemented, as appropriate, and are monitored by the State and/or local jurisdictions, including Caltrans, the CHP, the Sacramento County Environmental Management Department, and the Cosumnes CSD Fire Department. The fuel tanks discussed above would require secondary containment and periodic examination as is required for all storage of hazardous and toxic materials, consistent with state and federal laws. In addition, the fuel tanks would have equipment intended to prevent accidental fuel spills during use (i.e., automatic shutoff valves etc.) as required for all aboveground fuel storage tanks located in Sacramento County.

The Sacramento County Environmental Management Department, the Cosumnes CSD Fire Department, and other agencies would be required to enforce compliance, including issuing permits and tracking and inspections of hazardous materials transportation and storage. Restrictions on smoking and welding in the building, and installation of fire suppression systems (sprinklers, alarms, etc.) would minimize the risk of fire. In addition, existing regulatory requirements would ensure that the proposed project does not pose a significant hazard to off-site receptors or the nearby general public. As a result, operation of the proposed project would not create a significant hazard to the general public or the environment involving the release of hazardous materials into the environment or through the routine transport, use, or disposal of hazards materials. Therefore, this impact is considered **less than significant**.

c) **No Impact.** Currently there are no existing or proposed daycare/preschools, elementary, middle, or high schools within 0.25 mile of the project area. Therefore, **no impact** is expected concerning hazardous emissions, materials, or wastes near schools.

d) **Less than Significant.** As noted under the Existing Setting sub-section above, the proposed project sites are not *included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5*. Seven nearby facilities were listed; however, these facilities are not likely to have adversely affected the proposed project sites based on information reviewed. Those facilities that were reported as having unauthorized releases of hazardous materials are not likely to adversely impact the project site as most have been remediated or are in the process of being remediated. Therefore, this impact would be considered **less than significant**.

e) – f) **Less than Significant.** There are no public airports in the City of Elk Grove. The only private airport in the vicinity of the project sites is the Elk Grove (Sunset Skyranch) Airport, which is located near the intersection of Grant Line and Bradshaw roads approximately 1.5 miles from the sites. However, on January 25, 2006, the Sacramento County Board of Supervisors decided not to renew the Use Permit for the airport. Although the airport is still currently operating, its continued operation is in question due to ongoing litigation. The airport's use is limited to relatively small planes and the project sites are not located within the airport's designated safety zones. Furthermore, the proposed Master Plans do not include any structures or equipment anticipated to penetrate the navigable airspace of the Sunset Skyranch Airport. Therefore, the proposed project would not result in an airport safety hazard for people working in the project area and this impact would be considered **less than significant**.

g) **Less than Significant.** Upon incorporation, the City adopted the Sacramento County Multi-Hazard Disaster Plan (SCMDP), which was established to address planned response to extraordinary emergency situations associated with natural disasters and technological incidents. The SCMDP focuses on operational concepts relative to large-scale disasters, which can pose major threats to life and property requiring unusual emergency responses. Additionally, the City adopted the Sacramento County Area Plan (SCAP), which is used as a guideline for hazardous material related accidents or occurrences. The purpose of the SCAP is *"To delineate responsibilities and actions by various agencies in Sacramento County required to meet the obligation to protect the health and welfare of the populace, natural resource (environment), and the public and private properties involving hazardous materials."* ." The proposed project would not impede or conflict with the objectives or policies contained in the SCMDP or the SCAP.

After implementation of the proposed project, emergency response vehicles would have fairly direct access to the sites from SR 99 and Grant Line Road. Furthermore, the City's Police Department and the Cosumnes CSD Fire Department would review the site design and circulation layout as part of the project review process to ensure adequate emergency access is provided. Therefore, the proposed project would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan and impacts would be considered **less than significant**.

h) **No Impact.** The project sites are located in a primarily urban setting, surrounded by industrial and commercial development, as well as some agricultural uses. While there is some vacant land in the area, the risk of loss, injury, or death due to wildland fires is considered low. In the event of a fire, the Elk Grove Community Services District Fire Department would provide fire and emergency services for the project area (please refer to section 3.13, Public Services). Therefore, **no impact** would occur.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
9. HYDROLOGY AND WATER QUALITY. Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☒	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☒	☐	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner, which would result in flooding on- or off-site?	☐	☒	☐	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☒	☐	☐
f) Otherwise substantially degrade water quality?	☐	☒	☐	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood hazard Boundary of Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within 100-year flood hazard area structures, which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

REGIONAL SETTING

Regional Surface Water Hydrology

The proposed project sites are located in the southern portion of the Sacramento River Hydrologic Region, which covers approximately 17.4 million acres (27,200 square miles) (DWR, 2006). The region includes all or large portions of Modoc, Siskiyou, Lassen, Shasta, Tehama, Glenn, Plumas, Butte, Colusa, Sutter, Yuba, Sierra, Nevada, Placer, Sacramento, El Dorado, Yolo, Solano, Lake, and Napa counties. Geographically, the region extends south from the Modoc Plateau and Cascade Range at the Oregon border, to the Sacramento-San Joaquin Delta. The Sacramento Valley, which forms the core of the region, is bounded to the east by the crest of the Sierra Nevada and southern Cascades and to the west by the crest of the Coast Range and Klamath Mountains. Another significant feature is the Sacramento River, which is the longest river system in the State of California with major tributaries the Pit, Feather, Yuba, Bear and American rivers. The City is also located in the Morrison Creek Stream group drainage basin, a 192-square mile watershed tributary to the Sacramento River Basin. The Morrison Creek Stream Group drainage basin consists of Elder, Elk Grove, Laguna (and tributaries), Morrison, Strawberry, and Whitehouse Creeks. All creeks in the vicinity of the City drain into the Morrison Creek Stream Group, then eventually into the Sacramento River. Runoff from precipitation and snowmelt from the Sierra Nevada mountains are the main sources of surface water for the City of Elk Grove.

Project Sites Surface Hydrology

The project sites are located within the Grant Line Channel stormwater basin, which generally drains the Grant Line Road industrial area between SR 99 and the Union Pacific rail line. The basin is divided into two areas, the northern area, which drains to the west into the Shed C Channel and the southern area, which rains into the Grant Line Channel. Stormwater runoff from the City Corporation Yard/Jackson Property Site and the Iron Rock Way Site drains into the Shed C Channel and storm water drainage from the Grant Line Road Site drains into the Grant Line Channel.

Stormwater from the City Corporation Yard/Jackson Property and the Iron Rock Way Sites, as well as drainage from the surrounding industrial properties, is collected within an existing street storm drainage system that includes drop inlets along Iron Rock Way and Elkmont Drive. Underground drainage pipes that parallel the street system drain southwest to E. Stockton Boulevard and continue in a culvert under SR 99. The stormwater flows west in the Shed C Channel on the southwest side of SR 99 to the Beach Stone Lakes area. From this area, it drains south into Snodgrass Slough and continues to the Mokelumne River, which flows into the San Joaquin River and the Suisun Bay before ultimately flowing into the San Francisco Bay and the Pacific Ocean (EDAW, 2009, p. 4.8-1).

Drainage from the Grant Line Road Site is collected in the Grant Line channel, which is an open drainage channel that extends southeast from the western corner of the Suburban Propane facility north of Grant Line Road. The Grant Line channel flows through a culvert under Grant Line Road and continues southeast and then northeast along the property boundary of the Grant Line Road Site. As the channel intersects with the Union Pacific rail line at the Grant Line Road's southeastern corner, it turns sharply to the south and continues to parallel the rail line to the southern tip of the Emerald Lakes Golf Course. A detention basin is located within the southern portion of the golf course that collects peak stormwater flows that are captured between SR 99 and the Union Pacific rail line. In addition, a pump station is located within this area that pumps stormwater into the Deer Creek drainage. At this point the channel flows east through a large box culvert under the rail line and continues southeast for approximately 1,500 feet before it connects with Deer Creek. Deer Creek continues for approximately 1,100 feet before it flows into the Cosumnes River. The Cosumnes River is tributary to the Mokelumne River, which flows into the San Joaquin River, the Suisun Bay, the San Francisco Bay and ultimately the Pacific Ocean (EDAW, 2009, p. 4.8-1).

Surface Water Quality

Based on the most current Watershed Sanitary Surveys for the American and Sacramento rivers, both rivers are excellent sources of supply for drinking water in the Sacramento Metropolitan Area. These source waters can be treated to meet all Title 22 drinking water standards using both conventional and direct filtration processes, as well as membranes. There are no persistent constituents in the raw waters that require additional treatment processes. However, there are seasonal treatment requirements at times for rice herbicides on the Sacramento River. This treatment requirement is addressed through chemical oxidation processes. High turbidities during storm events are a treatment challenge which can be managed by optimizing operations including adjusting chemical types and dosing schemes and by reducing plant flow (SCWA, 2004).

Groundwater Hydrology and Quality

The *SCWA Zone 40: Groundwater Management Plan* (GMP) discusses groundwater in Zone 40, which includes both the City of Elk Grove and areas of Sacramento County surrounding the proposed project sites. Zone 40, as well as water supply facilities and water supplies other than groundwater, are discussed in more detail under the Utilities and Service Systems sub-section. According to the GMP, formations that constitute the water-bearing deposits underlying Sacramento County include an upper, unconfined aquifer system consisting of the Victor, Fair Oaks, and Laguna Formations (now known as the Modesto Formation) and a lower, semi-confined aquifer system consisting primarily of the Mehrten Formation known for its fine black sands. These formations are typically composed of lenses of inter-bedded sand, silt, and clay, interlaced with coarse-grained stream channel deposits (SCWA, 2004). Groundwater in the Central Basin is generally classified as occurring in a shallow aquifer zone (Laguna or Modesto Formation) or in an underlying deeper aquifer zone (Mehrten Formation). Within Zone 40, the shallow aquifer extends approximately 200 to 300 feet below the ground surface and, in general, the water quality in this zone is considered to be good except for the occurrence of arsenic in some locations. The shallow aquifer is typically targeted for private domestic wells requiring no treatment unless high arsenic values are encountered. The deep aquifer is separated from the shallow aquifer by a discontinuous clay layer that serves as a semi-confining layer for the deep aquifer. The base of the potable water portion of the deep aquifer averages approximately 1,400 feet below the ground surface. Water in the deep aquifer typically has higher concentrations of total dissolved solids (TDS), iron, and manganese. Groundwater used in Zone 40 is supplied from both the shallow and deeper aquifer systems (SCWA, 2004).

Groundwater in Central Sacramento County moves from sources of recharge to areas of discharge. Recharge to the local aquifer system occurs along active river and stream channels where extensive sand and gravel deposits exist, particularly along the American, Cosumnes, and Sacramento River channels. Additional recharge occurs along the eastern boundary of Sacramento County at the transition point from the consolidated rocks of the Sierra Nevada to the alluvial deposited basin sediments. This typically occurs through fractured granitic rock that makes up the Sierra Nevada foothills. Other sources of recharge within the area include deep percolation from applied surface water, precipitation, and small streams. Changes in the groundwater surface elevation result from changes in groundwater recharge, discharge, or extraction. The majority of the City of Elk Grove has poor groundwater recharge capabilities (City of Elk Grove, 2003b). Additionally, the Sacramento County Ground Water Elevations Map dated fall of 2003 shows groundwater levels ranging from 50 feet below mean sea level to 50 feet above mean sea level in Elk Grove (Sacramento DWR, 2003). Within the project vicinity, groundwater depths are estimated to be approximately 85 feet below the ground surface. Groundwater depths are seasonally influenced by local pumping, rainfall, and irrigation patterns (EDAW, 2009, p. 4.8-3).

The Sacramento County Water Agency (SCWA) meets water demands through a conjunctive use program of groundwater, surface water, and recycled water supplies, including a maximum yield 69,900 acre-feet/year (af/y) of groundwater from the groundwater basin underlying Zone 40 (SCWA, 2005a). The hydrologic effects of implementing the SCWA's Water Supply Master Plan (WSMP), which identifies a set of water supply alternatives that provide a long-term balance between water demands and supplies in Zone 40, were analyzed using the Sacramento County Integrated Groundwater Surface Water Model (IGSM). The IGSM model runs performed to analyze the effects of the Zone 40 WSMP to the groundwater basin under existing conditions, as well as 2030 conditions for different combinations of surface water and groundwater use (SCWA, 2004). The modeling evaluated projected pumping within the groundwater basin by SCWA as well as all other water users, including those for agriculture. The results of the groundwater model indicated that in 2030 approximately 74,000 acre-feet annually of groundwater is expected to be pumped by SCWA and private urban and agricultural water users for use in the Zone 40 2030 Study Area. This volume, combined with other pumping in the Central Basin (including pumping for groundwater remediation), would be less than the sustainable-yield recommendation of 273,000 af/y for all modeled scenarios that assume some level of reuse of remediated groundwater. Stabilized groundwater elevations at the Central Basin's cone of depression under the modeled scenarios would range from approximately 50 feet below mean sea level (msl) to 84 feet below msl, which are all substantially higher than the projected level of 116 feet below msl to 130 feet below msl. Therefore, groundwater pumping associated with the Zone 40 WSMP would not cause sustainable yield recommendations to be exceeded. Therefore, groundwater levels at the Central Basin cone of depression are projected to be higher than those determined to be acceptable to the Water Forum, and this impact was considered less than significant in the EIR for the Zone 40 WSMP.

Flooding

Although the Federal Emergency Management Agency (FEMA) designations of flood zones for the potential project sites are Zone X (areas determined to be outside the 100-year and 500-year floodplains), flooding is a major concern within many areas of the City. This is primarily the case in the City's eastern portion where major drainage facilities have not been built and where storm water flows either in natural channels or small ditches whose capacity is frequently exceeded.

In the area of the City Corporation Yard/Jackson Property Site and the Iron Rock Way Site the City's Flood Control and Storm Drainage Master Plan, which is discussed under the Regulatory Framework sub-section below, includes enlarging the underground storm drainage pipes that direct water to the Shed C Channel and upsizing the channel west of SR 99. In the area of the Grant Line Road Site, the Master Plan includes upsizing the detention basin and modifying the pump station located at the southern tip of the Emerald Lakes Golf Course (EDAW, 2009, p. 4.8-2).

Stormwater Quality

The City of Elk Grove Development Services, Public Works Department has jurisdiction over aspects of stormwater management in the City of Elk Grove and the Sacramento County Department of Water Resources has jurisdiction over areas outside the City in the unincorporated areas. The Water Resources segment of the Elk Grove Public Works Department is responsible for drainage, flood control, stormwater quality, and long-term water and urban runoff planning within the City.

Upon its incorporation in July 2000, the City of Elk Grove adopted two County ordinances that provide legal authority for the Stormwater Quality Improvement Program – the Stormwater Management and Discharge Control Ordinance (No 22-2003) (updated June 10, 2005) and the

Land Grading and Erosion Control Code (Chapter 16.44 of the Elk Grove City Code). The Stormwater Management and Discharge Control Ordinance prohibits most non-stormwater discharges conditionally allowable (e.g., water from firefighting activities) pursuant to NPDES federal regulations. The ordinance provides legal authority to the City for inspections and enforcement related to control of illegal and industrial discharges to the city storm drainage system and local receiving waters. The Land Grading and Erosion Control Code requires projects in Elk Grove disturbing 350 cubic yards or more of soil or one or more acres of land to prepare an erosion and sediment control plan specifying best management practices (BPMs) for erosion and sediment control, and provides legal authority to Elk Grove for inspections and enforcement needed to ensure compliance with the ordinance.

The City of Elk Grove is a joint participant with Sacramento County's National Pollutant Discharge Elimination System (NPDES). The permit was renewed in December 2002 and allows for the City to discharge urban runoff from Municipal Separate Storm Sewer Systems (MS4s) in their municipal jurisdictions. The permit requires that the City impose water quality and watershed protection measures for all development projects. The NPDES also requires a permit for every new construction project that implements the following measures:

- Eliminate or reduce non-stormwater discharges to stormwater systems and other waters of the nation;
- Develop and implement a stormwater pollution prevention plan (SWPPP); and
- Perform inspections of stormwater control structures and pollution prevention measures.

LOCAL SETTING

REGULATORY FRAMEWORK

The following state and local regulations, plans, programs, and guidelines are applicable to the proposed project:

- Federal Laws and Regulations
  - Clean Water Act
    - Section 303(d) of the Clean Water Act
- State Laws and Regulations
  - Porter-Cologne Water Quality Control Act
  - National Pollutant Discharge Elimination System (NPDES) Permit Program
  - National Flood Insurance Program
- Local Laws and Regulations
  - Elk Grove Flood Control and Storm Drainage Master Plan
  - Stormwater Quality Design Manual

- City of Elk Grove Land Grading and Erosion Control Code
- Zone 40 Water Supply Master Plan
- Zone 41 Urban Water Management Plan
- SCWA Groundwater Management Plan
- City of Elk Grove Water Use and Conservation Ordinance

PROJECT IMPACTS AND MITIGATION MEASURES

a) & f) Less than Significant with Mitigation Incorporated.

Construction Water Quality Impacts

Although the proposed project includes only programmatic approval of the Corp Yard Facilities and Transit Yard Facilities Master Plans, these plans envision the future expansion of the existing Corporation Yard facilities and relocation of the Transit Yard. Future development of facilities identified in the Master Plans could involve site grading, excavation for utilities, trenching, backfilling, and the construction of proposed facilities that could disturb the existing vegetation cover and soil of the project sites. Although the project sites are generally flat, intense rainfall and associated stormwater runoff could result in short periods of sheet erosion within areas of exposed or stockpiled soils. If uncontrolled, these soil materials would flow off of the site and into local drainages. Further, the compaction of soils by heavy equipment may reduce the infiltration capacity of soils and increase the potential for runoff and downstream sedimentation. Therefore, future construction activities could result in substantial stormwater discharges of pollutants into local drainage channels from the project construction sites. Construction-related chemicals (fuels, paints, adhesives, etc.) could be washed into surface waters by stormwater runoff. The deposition of pollutants (gas, oil, etc.) onto the ground surface by construction vehicles could similarly result in the transport of pollutants to surface waters by stormwater runoff or in seepage of such pollutants into groundwater.

Because the project could contribute substantial additional sources of polluted runoff and could substantially degrade water quality during proposed construction activities, this impact is considered **potentially significant** and the following mitigation measures are required:

MM 9a-1: Prior to the issuance of grading permits, the City shall prepare a Stormwater Pollution and Prevention Plan (SWPPP) to be administered through all phases of grading and project construction. The SWPPP shall incorporate best management practices (BMPs) which describe the site, erosion and sediment controls, means of waste disposal, control of post-construction sediment and erosion control measures and maintenance responsibilities, water quality monitoring and reporting during storm events (which will be responsibility of the City), corrective actions for identified water quality problems and non-stormwater management controls. The SWPPP shall address spill prevention and include a countermeasure plan describing measures to ensure proper collection and disposal of all pollutants handled or produced on the site during construction, including sanitary wastes, cement, and petroleum products. The measures included in the SWPPP shall ensure compliance with applicable regional, state and federal water quality standards. These measures shall be consistent with the City's Drainage Manual and Land Grading and Erosion Control Code which may include (1) restricting grading to the dry season; (2) protecting all finished graded slopes from erosion using such techniques as erosion control matting and hydroseeding; (3) protecting downstream storm drainage facilities from sedimentation; (4) use of silt fencing and hay bales to retain sediment on the project site; (5) use of temporary water conveyance and water diversion structures to eliminate runoff; and (6) any other suitable measures. The City shall require all construction contractors to retain a copy of the approved SWPPP on each construction site.

Timing/Implementation: *Prior to issuance of grading permits.*

Enforcement/Monitoring: *City of Elk Grove, Development Services, Planning Department.*

MM 9a-2: The project shall implement specific best management practices (BMPs) to ensure that long-term water quality is protected. The BMPs shall be designed, constructed, and maintained to meet a performance standard established by the City and shall conform to the provisions of the City's NPDES permit. BMPs may include, but are not limited to: scheduling or limiting construction activities to certain times of year, prohibitions of practices, maintenance procedures, installation of silt fences, hydroseeding, hydraulic mulch, soil binders, straw mulch, fiber rolls, earthen dikes and drainage swales, velocity dissipation devices, sediment traps, inlet filters, tire washes and other management practices that could be used during construction of the proposed project (see California Stormwater Quality Association's *Stormwater Best Management Practices Handbook for Construction)*.

The project applicant shall retain a qualified specialist to monitor the effectiveness of the BMPs selected. Monitoring activities, along with funding for monitoring, shall be established and shall include, but not be limited to, initial setup, annual maintenance, and annual monitoring.

Timing/Implementation: *Prior to issuance of grading permit; BMPs shall be implemented and monitored throughout the life of the project.*

Enforcement/Monitoring: *City of Elk Grove, Development Services, Planning Department.*

With implementation of the above mitigation measures, erosion from site soils would be minimized and pollutants would be largely captured on the site. Also, the implementation of identified spill prevention and cleanup plans would limit the potential for hazardous material spills to adversely affect storm water quality. Therefore, the project's construction-related water quality impacts would be reduced to a **less than significant** level.

Operational Water Quality Impacts

As described above, the proposed Master Plans envision the future development of facilities on the project site, including expansion of the Corporation Yard facilities and relocation of the Transit Yard facilities. The development and/or expansion of industrial uses on the proposed project sites would alter the types, quantities, and timing of contaminant discharges in stormwater runoff relative to existing conditions. The amount of contaminants discharged in stormwater drainage from development areas varies based on a variety of factors, including the intensity of urban uses such as vehicle traffic, types of activities occurring on-site (e.g., office, commercial, industrial), types of chemicals used on-site (e.g., pesticides, herbicides, cleaning agents, petroleum byproducts), the pollutants on street surfaces, and the amount of rainfall. The future industrial uses on the sites may result in the deposit of various materials on the new pavement and adjacent areas that constitute urban pollution. These materials include heavy metals, engine oil and other automobile wastes (e.g., antifreeze, transmission fluid, rubber, etc.) that can be transported in surface water runoff during storm events. Due to the industrial character of future development associated with the proposed project, it has the potential to contribute additional sources of polluted runoff and to degrade water quality during site operations.

Future development under the proposed project would be subject to the requirements of the NPDES Stormwater Permit No. CA0082597, which requires that the City impose water quality and watershed protection measures for all development projects and prohibits discharges from causing violations of applicable water quality standards or from resulting in conditions that create a nuisance or water quality impairment in receiving waters. A key component of the NPDES permit is the implementation of the Stormwater Quality Improvement Plan (SQIP) for the City, which includes a new development element requiring stormwater quality treatment and/or best management practices (BMPs) in project design for both construction and operation for new development. As described in the mitigation measures above, future development under the proposed project would be required to prepare a SWPPP and implement BMPs to ensure that long-term water quality is protected.

The implementation of BMPs, consistent with the requirements of the site's NPDES permit and the SWPPP, would ensure that the quality of discharged water from the project sites would not be substantially degraded. With implementation of the City's NPDES permit and the above mitigation measures, the project's operational water quality impacts would be reduced to a **less than significant** level.

b) Less than Significant. The project sites are located within the boundaries of Sacramento County Water Agency (SCWA) service areas Zone 41 and Zone 40. These service areas plan to utilize a combination of groundwater, surface water, and recycled water to meet customer demands. While the proposed project includes only approval of the Corp Yard Facilities and Transit Yard Facilities Master Plans and no facilities are currently being proposed for construction, for purposes of environmental review it is assumed that the facilities identified in the Master Plans will be constructed at some point in the future. Construction and operation of these facilities would require water supplies from the SCWA and would therefore increase groundwater consumption.

In December 2005, the Sacramento County Water Agency adopted the *Zone 41 Urban Water Management Plan* (UWMP). The UWMP was prepared based on land uses contained in the City of Elk Grove's 2003 General Plan. The UWMP also incorporates the

SCWA Zone 40 Water Supply Master Plan (WSMP) which was also prepared using land uses contained in the Elk Grove 2003 General Plan. The purpose of these documents is to ensure that a sustainable water supply exists to meet the demand planned in the various land use plans within their service areas. As the proposed project includes development consistent with the City's General Plan, future industrial development on the project sites has been accounted for in the Zone 41 UWMP and the Zone 40 WSMP. Modeling conducted for the WSMP identified that groundwater pumping associated with the Zone 40 WSMP, which included assumed industrial development on the proposed project sites, would not cause the sustainable yield recommendations for the groundwater basin underlying Zone 40 to be exceeded. Therefore, the proposed project will not substantially deplete groundwater supplies because the proposed land uses on the project sites were included in the WSMP, which was found not to exceed the sustainable yield of the groundwater basin.

In addition, all future facilities would use water at a rate consistent with low flow plumbing fixtures and safety equipment, all vehicle wash facilities would recycle the water used to minimize water demand, and all landscaping would be required to utilize landscaping that avoids excessive water demands and that is less vulnerable to periods of severe drought consistent with the Elk Grove Water Use and Conservation Ordinance. Therefore, impacts associated with the groundwater basin would be **less than significant**.

c) – e) Less than Significant with Mitigation Incorporated. Future development under the proposed Master Plans would result in increased impervious surfaces on the project sites and would therefore substantially alter the existing drainage pattern of the sites and increase surface runoff. Increased surface runoff could increase the potential for localized flooding and/or erosion both on- and offsite if allowed to exit the project area unchecked. In addition, runoff water could exceed the capacity of stormwater drainage systems and provide an additional source of polluted runoff.

As discussed under **a)** and **f)** above, the proposed project would be subject to the requirements of the NPDES Stormwater Permit No. CA0082597. Mitigation measure **MM 9a-1** requires that the City prepare a SWPPP consistent with the NPDES Permit. The SWPPP must contain BMPs including construction and post-construction erosion and sediment controls. In addition, the project (and the BMPs included in the SWPPP) would be required to comply with the City's Grading and Erosion Control Code (Chapter 44 of Title 16 of the City of Elk Grove Municipal Code). This ordinance establishes administrative procedures, standards for review, and implementation and enforcement procedures for controlling erosion, sedimentation, other pollutant runoff, and the disruption of existing drainage and related environmental damage. The ordinance requires that prior to grading activities, a detailed set of plans be developed that include measures to minimize erosion, sediment, and dust created by improvement activities. Compliance with the provisions of the NPDES Permit, BMPs, and the City's Land Grading and Erosion Control Code would reduce the impacts of increased runoff resulting from altering the drainage pattern of the proposed project sites.

Drainage from the existing City Corporation Yard/Jackson Property Site and the Iron Rock Way Site is collected in drop inlets along Iron Rock Way and Elkmont Drive and directed into underground drainage pipes that parallel the street system. In the area of the existing City Corporation Yard/Jackson Property Site and the Iron Rock Way Site, the Elk Grove Flood Control and Storm Drainage Master Plan identifies the need to enlarge the underground storm drainage pipes and to upsize the Shed C Channel in order to ensure the drainage system has adequate storm water conveyance capacity for existing and proposed developments in this area. Storm water drainage from the Grant Line Road Site is collected in the Grant Line channel. In the area of the Grant Line Road Site, the Flood Control and Storm Drainage Master Plan includes upsizing the detention basin and modifying the pump station located at the southern tip of the Emerald Lakes Golf Course in order to ensure that the drainage system has adequate storm water conveyance capacity for existing and proposed developments in this area and that localized flooding on the Emerald Lake Golf Course does not occur.

The Flood Control and Storm Drainage Master Plan would improve and expand on existing storm water drainage facilities in the areas of the project sites. These improvements would eliminate or reduce flooding potential and would accommodate the increased flows associated with project development on the sites. However, if facilities identified in the proposed Master Plans were developed prior to implementation of the Master Plan improvements, there is the potential that the increased storm water discharges from the sites could exceed storm drain facilities and increase the potential for localized flooding. This is a **potentially significant** impact.

The following mitigation is therefore required:

MM 9e-1: If the drainage system improvements identified in the Elk Grove Flood Control and Storm Drainage Master Plan are not implemented prior to the initiation of project construction, then storm water detention facilities shall be constructed on the project sites to capture any increase in storm water runoff associated with site development.

Timing/Implementation: *Prior to initiation of project construction.*

Enforcement/Monitoring: *City of Elk Grove, Development Services, Planning Department.*

The above mitigation measure, along with compliance with the City's NPDES permit and the SWPPP and BMPs, would ensure that stormwater runoff from the project sites would not contribute to localized flooding/erosion and would not exceed capacity of the storm drain system. Therefore, impacts would be considered **less than significant with mitigation incorporated.**

f) – h) **No Impact.** The proposed project sites are located outside of the FEMA 100-year flood hazard area. Therefore, implementation of the proposed project would not place housing or other structures within the 100-year flood hazard area and would not impede or redirect flood flows. **No impact** would occur.

i) **No Impact.** The only dam in the vicinity of the project sites is the Folsom Dam. The proposed project sites are located outside the Folsom Dam Failure Flood Area. Therefore, implementation of the project would not expose people or structures to a significant risk of loss, injury, or death involving flooding as a result of a failure of a levee or dam. **No impact** would occur.

j) **No Impact.** The proposed project area is not located near any ocean coast or seiche hazard areas and would not involve the development of residential or other sensitive land uses in or near these areas. Therefore, the project would not expose people to potential impacts involving seiche or tsunami. No potential for mudflows is anticipated. Therefore, there is **no impact** associated with the proposed project.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
10. LAND USE AND PLANNING. Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

EXISTING SETTING

Existing Land Uses

The City Corporation Yard/Jackson Property Site is partially developed with a warehouse, offices and maintenance facilities for the City's Transit, Animal Services Department, Field Services, Public Works Department, and Police Department. The Iron Rock Way Site is currently vacant. The developed portion of the Grant Line Road Site is presently utilized as a pallet processing facility (identified as Super Pallet) and a Federal Express truck storage site (EDAW, 2009, p. 4.1-1).

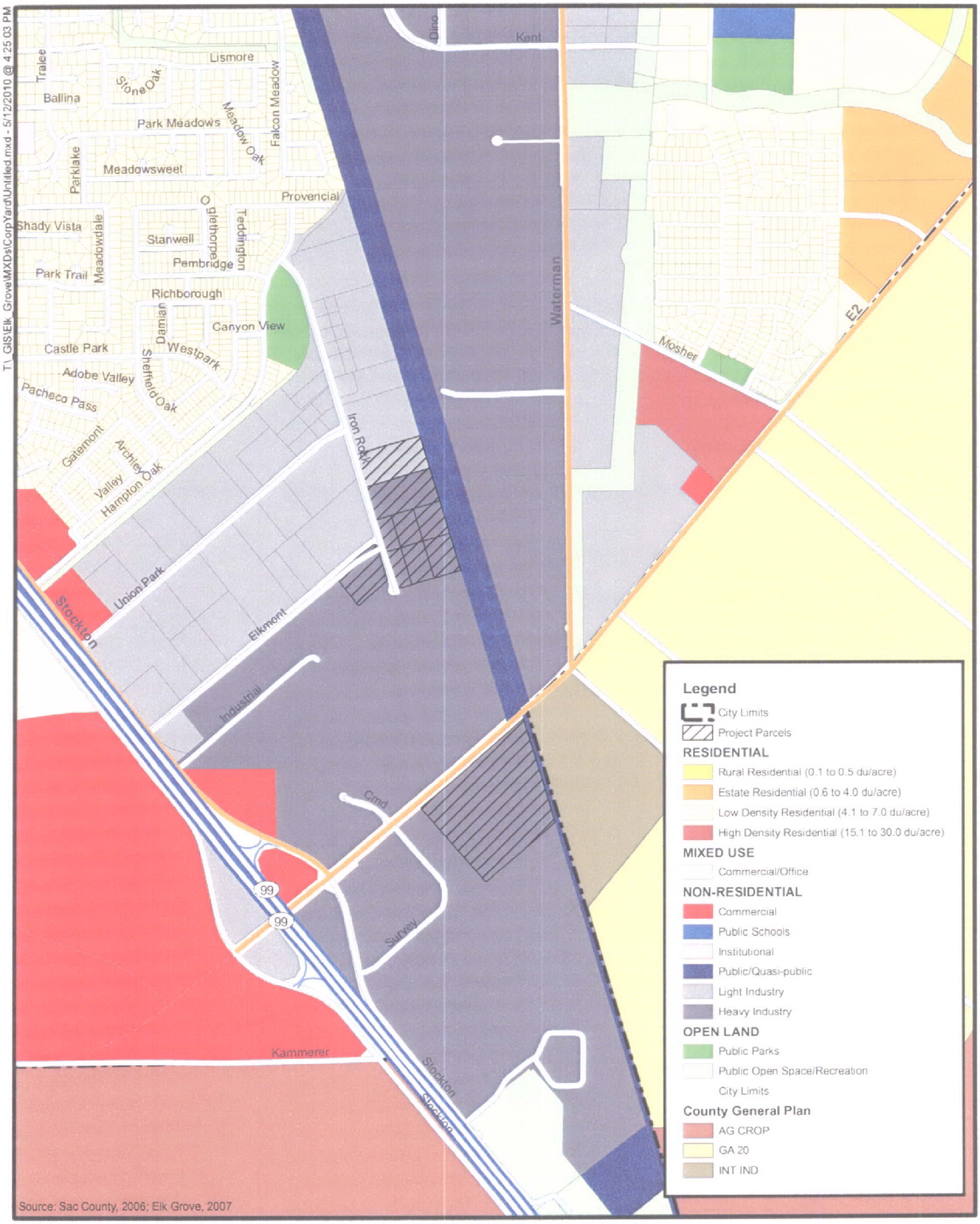
The areas surrounding the project sites contain predominantly industrial and commercial operations with some agricultural land located to the east and residential neighborhoods located farther to the north and east. Industrial and commercial uses, including a large Suburban Propane facility and a business park, separate the Corporation Yard and Iron Rock Way Sites from the Grant Line Road Site (EDAW, 2009, p. 4.1-1).

General Plan Land Use Designations

On-site Land Use Designations

The City of Elk Grove General Plan Land Use Element designates land uses within the City. The City of Elk Grove General Plan Land Use Policy Map designates eight of the nine parcels of the Iron Rock Way Site as Heavy Industry. The northern-most parcel is designated as Light Industry. The City Corporation Yard/Jackson Property Site is designated as Light Industry. The Grant Line Road Site is designated as Heavy Industry. The City's land use designations for the project sites and surrounding area are shown in **Figure 8** below.

The Land Use Element of the General Plan identifies Heavy Industry land uses as those generally characterized by industrial or manufacturing activities, which may occur inside or outside of an enclosed building. The Land Use Element identifies Light Industry land uses as generally characterized by industrial or manufacturing activities, which occur entirely within an enclosed building.



ELK GROVE

City of Elk Grove
Development Services

Figure 8
City and County General Plan Land Use Designations

Surrounding Land Use Designations

The proposed project sites are located in the southern portion of the City of Elk Grove, near unincorporated Sacramento County. The City's General Plan Land Use Map designates properties to the east and south of the City Corporation Yard/Jackson Property Site and Iron Rock Way Site as Heavy Industry. Areas to the north are designated Light Industry and areas to the west include a mix of Light and Heavy Industry land use designations. Land further north of this area is designated for Light Industry, Public Parks, and Low Density Residential (4.1 to 7.0 dwelling units per acre) land uses.

The City's General Plan Land Use Map designates land uses to the north, west, and south of the Grant Line Road Site as Heavy Industry. Land uses designations further south of the Grant Line Site include Public Open Space/Recreation, and Public/Quasi Public. The Sacramento County General Plan Land Use Map designates the area immediately east of the Grant Line Road Site as Intensive Industrial.

REGULATORY FRAMEWORK

The following state and local regulations, plans, programs, and guidelines are applicable to the proposed project:

- Local Laws, Regulations, and Policies –
  - City of Elk Grove General Plan
  - Sacramento County General Plan

PROJECT IMPACTS AND MITIGATION MEASURES

a) **No Impact.** The proposed project is located in an established and developed industrial area. Therefore, the proposed project would not physically divide an established community and **no impact** would occur.

b) **Less than Significant.** The proposed project includes programmatic approval of the Corporation Yard Facilities and Transit Yard Facilities Master Plans. These plans envision the future expansion of the existing Corporation Yard facilities and relocation of the Transit Yard, which would both develop new industrial uses and expand existing industrial uses in an established industrial area. Future development under the proposed Master Plans would be consistent with the existing General Plan land use designations on the project sites. Therefore, the proposed project does not conflict with any applicable City land use plans that have been adopted for the purpose of avoiding or mitigating environmental effects and this impact would be **less than significant.**

c) **No Impact.** The City of Elk Grove does not have an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state habitat conservation plan. Therefore, **no impact** would occur.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
11. MINERAL RESOURCE. Would the project:				
a) Result in the loss of availability of a known mineral resource that would be a value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

EXISTING SETTING

Mineral resources in Sacramento County include sand, gravel, clay, gold, silver, peat, topsoil, lignite, natural gas and petroleum. Potential sources of quality aggregate exist within Sacramento County. These potential sources lie within areas that are classified by the Surface Mining and Reclamation Act of 1975 (SMARA) Special Report 156 as MRZ-3, a classification that includes areas "containing aggregate deposits, the significance of which cannot be evaluated from available data," and include igneous rocks of volcanic origin and metamorphic rocks (Sacramento County, 2007; City of Elk Grove, 2003a). Using data contained in the SMARA Special Report 156, the City of Elk Grove was classified for its mineral resource potential and is covered by the MRZ-3 classification. However, no known significant mineral resource have been identified in the City of Elk Grove.

REGULATORY FRAMEWORK

The following state regulations, plans, programs, and guidelines are applicable to the proposed project:

- State Laws and Regulations
  - State Mining and Reclamation Act

PROJECT IMPACTS AND MITIGATION MEASURES

a) & b) As no known significant mineral resource have been identified in the City of Elk Grove, implementation of the proposed project is not expected to result in the loss of availability of a known mineral resource, or a resource delineated on a local general plan, specific plan or other land use plan. **No impact** would occur.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
12. NOISE. Would the project:				
a) The exposure of persons to, or the generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☒	☐	☐
b) The exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐	☐
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒	☐
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒	☐

EXISTING SETTING

Corporation Yard/Iron Rock Way Sites

The City Corporation Yard/Jackson Property Site and Iron Rock Way Site are located within an industrial area. Several churches are located within commercial/industrial buildings near the sites, including the Harvest Church, located at East Stockton Boulevard near SR 99; the Soaring Oaks Presbyterian Church, located at the northwest corner of Iron Rock Way and Union Park Way; and Faith Baptist Church, located near the intersection of Hampton Oak Drive and Iron Rock Way. Located approximately 300 feet to the northwest of the Iron Rock Way Site, the Soaring Oaks Presbyterian Church is the closest church to the sites. The closest park to the sites is the Jennie McConnell Park, located approximately 1,000 feet to the north. The Hampton Villages residential subdivision is located approximately 1,000 feet northwest of the sites. A single family residence is also located approximately 1,050 feet northeast of the sites on an industrially-zoned parcel. The Union Pacific rail line is located directly east of the Iron Rock Way Site with heavy industrial uses, including a large CEMEX cement batch plant, located to the east between the rail line and Waterman Road. The Iron Rock Business Park is located directly to the south and the Suburban Propane facility is located further to the south between the Business Park and Grant Line Road.

The ambient noise environment in the vicinity of the City Corporation Yard/Jackson Property Site and Iron Rock Way Site is dominated by the surrounding industrial uses, primarily the CEMEX cement batch plant. The sites also experience high intermittent noise levels from train traffic on the adjacent Union Pacific rail line. The sites are also affected to a lesser degree by traffic noise generated from SR 99 to the southwest (EDAW, 2009, p. 4.4-6).

Grant Line Road Site

The Grant Line Road Site is located directly south of a large Suburban Propane facility. Commercial and industrial uses are located along the site's southwestern boundary including an AM/PM Arco gas station at the eastern corner of Grant Line Road and Survey Road. Central Concrete Supply, a cement batch facility, is located directly southeast of the Grant Line Road Site and the Union Pacific rail line is located along its eastern boundary. Agricultural lands are located east of the rail line with a farm residence located approximately 1,500 feet directly east of the site. The closest residential subdivisions to the Grant Line Road Site are the Newton Ranch and Sonoma Creek subdivisions located approximately 0.7 mile (approximately 3,700 feet) to the northeast. The Emerald Lakes Golf Course is located further to the south near the confluence of SR 99 and the Union Pacific rail line.

The ambient noise environment in the vicinity of the Grant Line Road Site is dominated by traffic noise from Grant Line Road and to a lesser degree by SR 99. The ambient noise environment for the site is also affected by the surrounding industrial uses, primarily the Central Concrete Supply cement batch facility. Similar to the Corporation Yard and Iron Rock Way Sites, this site experiences high intermittent noise levels from train traffic on the adjacent Union Pacific rail line. The agricultural operations on the property to the east also affect the site's ambient noise environment (EDAW, 2009, pp. 4.4-6 and 4.4-8).

Noise Level Measurements

As part of the environmental review conducted for the *Elk Grove Transfer Station Draft EIR* (EDAW, 2009), noise level measurements were conducted on the Iron Rock Way Site and the Grant Line Road Site in the afternoon on Thursday, August 14, 2008 and in the morning on Friday, August 15, 2008. Measurements were conducted during the morning and afternoon during weekdays in order to identify the typical ambient noise levels when industrial operations are active on the surrounding properties. A Larson Davis Laboratories (LDL) precision integrating sound level meter was used for the noise level measurement survey. The meter was calibrated before and after use to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute (ANSI) for Type 1 sound level meters (ANSI 51.4) (EDAW, 2009, p. 4.4-8).

The noise level measurement survey results are summarized in **Tables 9** and **10**. For the purposes of this environmental analysis, it is assumed that the noise level measurements for the Grant Line Road Site can also be applied to the City Corporation Yard/Jackson Property Site. These two sites are immediately adjacent to each other and the difference in noise levels between the two sites would be negligible.

The ambient noise monitoring survey revealed that ambient noise levels in the immediate project vicinity can be quite high, as would be expected within an active industrial area adjacent to a rail line.

TABLE 9
SUMMARY OF NOISE MEASUREMENT DATA FOR IRON ROCK WAY SITE AND CITY CORPORATION YARD/JACKSON PROPERTY SITE

Noise Measurement Location #	Location	Date and Time	Leo[1]	Lmax	L10	L50	L90	Noise Sources During Noise Measurements
1	Southeast corner of Iron Rock Way Site	8-14-08/12:58 p.m.	65.5	80.3	71.0	59.4	56.6	Construction at Survey Road/ Grant Line Road Dust collector at wood processor. Two trains, P[t] with approximately 119 cars and 6 engines, 2[nd] with approximately 80 cars and 3 engines
2	West boundary of Iron Rock Way Site at Iron Rock Way	8-14-08/1:24 p.m.	59.5	71.6	55.6	49.7	46.9	Dust collector to east Traffic on Iron Rock Way
3	Northeast portion of Iron Rock Way Site	8-14-08/1:55 p.m.	50.7	61.3	54.1	47.7	44.3	Dust collector to southeast Loading dock activity at warehouse
1	Same as above	8-15-08/10:39 a.m.	57.9	63.5	60.2	57.4	55.2	Typical industrial operations and vehicle noise on local roads
2	Same as above	8-15-08/10:51 a.m.	55.0	69.7	58.7	48.8	47.2	Typical industrial operations and vehicle noise on local roads
3	Same as above	8-15-08/10:21 a.m.	47.8	65.9	48.5	46.1	44.6	Typical industrial operations and vehicle noise on local roads

[1] The Leg is the foundation of the composite noise descriptor Lee , which identifies the day-night noise level averaged over a 24-hour period with a 10 dBA "penalty" for noise events that occur during the noise-sensitive hours between 10:00 p.m. and 7:00 a.m.

Notes: Weather conditions during noise measurements, temperature 85 degrees F, humidity 20%, wind speed 0-2 mph.

Source: EDAW, 2009.

TABLE 10
SUMMARY OF NOISE MEASUREMENT DATA FOR GRANT LINE ROAD SITE

Noise Measurement Location #	Location	Date and Time	Leg'	Lmax	L10	L50	L90	Noise Sources During Noise Measurements
1	Northeast Portion of Grant Line Road Site - 40 meters from Grant Line Road and 32 meters from rail line	8-14-08/3:18 p.m.	75.5	99.9	75.1	62.9	57.4	Construction at Survey Road/ Grant Line Road Dust collector/towers at Northwest. Train with approximately 100 cars and 3 engines
2	Southeast Portion of Grant Line Road Site -26 meters from rail line	8-14-08/3:39 p.m.	48.8	57.0	50.0	48.3	46.7	Typical industrial operations and vehicle noise on local roads
3	Southwest Portion of Grant Line Road Site - 87 meters	8-14-08/4:42 p.m.	51.7	72.1	53.4	49.6	47.3	Concrete plant not operating

Noise Measurement Location #	Location	Date and Time	Leg'	Lmax	L10	L50	L90	Noise Sources During Noise Measurements
	from cement plant							Traffic on Survey Road Activity on-site at the pallet facility
4	North Central boundary-40 meters from Grant Line Road, east of pallet facility	8-14-08/4:11 p.m.	50.5	64.5	52.5	49.3	46.7	Traffic on Grant Line Road
1	Same as above	8-15-08/8:24 a.m.	61.3	70.1	64.9	60.0	52.7	Typical industrial operations and vehicle noise on local roads
2	Same as above	8-15-08/8:46 a.m.	59.5	76.3	61.8	53.2	49.8	Typical industrial operations and vehicle noise on local roads
3	Same as above	8-15-08/9:40 a.m.	63.6	73.3	66.5	62.3	58.4	Concrete plant operations Construction/demo to west
4	Same as above	8-15-08/9:12 a.m.	62.9	74.5	66.7	60.6	55.1	Traffic on Grant Line Road Construction at Survey Road/ Grant Line Road

[1] The Leg is the foundation of the composite noise descriptor Lee, which identifies the day-night noise level averaged over a 24-hour period with a 10 dBA "penalty" for noise events that occur during the noise-sensitive hours between 10:00 p.m. and 7:00 a.m.
Notes: Weather conditions during noise measurements, temperature 85 degrees F, humidity 20%, wind speed 0-2 mph.
Source: EDAW, 2009.

REGULATORY FRAMEWORK

The following state and local regulations, plans, programs, and guidelines are applicable to the proposed project:

- State Laws and Regulations
  - Title 24 of the California Building Code
  - State of California General Plan Guidelines
- Local Laws and Regulations
  - Noise Element of the City of Elk Grove General Plan

PROJECT IMPACTS AND MITIGATION MEASURES

a) & c) – d) Less Than Significant with Mitigation Incorporated. Noise generated by future facilities consistent with the proposed Master Plans would occur during short-term construction and long-term operation.

Short-term Increases in Ambient Noise Levels

Construction noise typically occurs intermittently and varies depending upon the nature or phase (e.g., demolition/land clearing, grading and excavation, erection) of construction. Noise generated by construction equipment, including earth movers, material handlers, and portable generators, can reach high levels. Although noise ranges were found to be similar for all construction phases, the grading phase tends to involve the most equipment resulting in slightly higher average-hourly noise levels. Typical noise levels for individual pieces of construction equipment are summarized in **Table 11**. As depicted, individual equipment noise levels typically range from approximately 75 to 91 dBA at 50 feet, without noise control. With noise control, individual equipment noise levels typically range from approximately 75 to 80 dBA at 50 feet. Typical operating cycles may involve two minutes of full power, followed by three or four minutes at lower settings. Depending on the activities performed and equipment usage requirements, combined average-hourly noise levels at construction sites typically range from approximately 65 to 89 dBA L_{eq} at 50 feet (EPA, 1971).

TABLE 11
TYPICAL CONSTRUCTION EQUIPMENT NOISE LEVELS

Type of Equipment	Noise Level in dBA at 50 feet	
	Without Feasible Noise Control	With Feasible Noise Control [1]
Dozer or Tractor	80	75
Excavator	88	80
Compactor	82	75
Front-end Loader	79	75
Backhoe	85	75
Grader	85	75
Crane	83	75
Generator	78	75
Truck	91	75

1. Feasible noise control includes the use of intake mufflers, exhaust mufflers, and engine shrouds.

Sources: U.S. Environmental Protection Agency 1971; Federal Transit Administration 2006.

The nearest land designated for noise sensitive uses to the City Corporation Yard/Jackson Property and Iron Rock Way Sites are the residential uses within the Hampton Villages subdivision and the Jennie McConnell Park, both located approximately 1,000 feet to the north-northwest. The churches located near the City Corporation Yard/Jackson Property and Iron Rock Way Sites are not located on lands designated for noise sensitive uses (i.e., the churches are located on Industrially-zoned land). Assuming a standard noise attenuation rate of 6 dBA per doubling of distance from the source to the receptor, exterior noise levels at the nearest existing residence during construction could be as high as 66 dBA without feasible noise control in place. This assumes no noise attenuation from intervening buildings. Buildings attenuate noise when they are located between the noise generator and the noise receptor. Because a number of industrial buildings are located between the project sites and the residences to the northwest of the City Corporation

Yard/Jackson Property and Iron Rock Way Sites, the construction noise levels experienced at the nearest residences would be reduced below 66 dBA.

The nearest noise sensitive land use to the Grant Line Way Site is a farm residence located approximately 1,500 feet to the east. The exterior noise levels at this existing residence during project construction are estimated to be as high as 61 dBA without feasible noise control in place (EDAW, 2009). Because no buildings are located between the site and the existing residence to the east, and the land is generally flat with the exception of the 2- to 3-foot Union Pacific rail line berm, no noise attenuation would be anticipated.

The City's General Plan Noise Element does not identify a short-term, construction-noise-level threshold. The distinction between short-term construction noise impacts and long-term operational noise impacts is a typical in both CEQA documents and local noise ordinances, which generally recognize the reality that short-term noise from construction is inevitable and cannot be mitigated beyond a certain level. Thus, local agencies frequently tolerate short-term noise at levels that they would not accept for permanent noise sources. A more severe approach would be impractical and might preclude the kind of construction activities that are inevitable from time to time in urban environments. Most residents of urban areas recognize this reality and expect to hear construction activities on occasion.

When noise levels generated by construction operations are being evaluated, activities occurring during the more noise-sensitive nighttime hours (i.e., 10:00 p.m. to 7:00 a.m.) are the primary concern. Because exterior ambient noise levels typically decrease during the nighttime hours as community activities (e.g., commercial activities, vehicle traffic) decrease, construction activities performed during these more noise-sensitive periods of the day can result in increased annoyance and potential sleep disruption for occupants of nearby residential dwellings. The proposed project does not include restrictions on the hours during which construction activities would occur. As a result, construction activities occurring during the more noise-sensitive nighttime hours could result in increased levels of annoyance and potential sleep disruption for occupants of nearby noise-sensitive land uses. This is a **potentially significant** impact. For this reason,the following mitigations are therefore required:

MM 10a-1: Noise-generating construction operations on the Grant Line Road Site shall be limited to the hours between 7 a.m. and 7 p.m.

Timing/Implementation: *During project construction.*

Enforcement/Monitoring: *City of Elk Grove Planning Department.*

MM 10a-2: Construction equipment and equipment staging areas on the Grant Line Road Site shall be located at the furthest distance possible from nearby noise-sensitive residential properties.

Timing/Implementation: *During project construction*

Enforcement/Monitoring: *City of Elk Grove Planning Department*

MM 10a-3: Construction equipment on the Grant Line Road Site shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations.

The onsite construction Contractor shall ensure that equipment engine shrouds are closed during equipment operation.

Timing/Implementation: *During project construction*

Enforcement/Monitoring: *City of Elk Grove Planning Department*

MM 10a-4: When not in use, motorized construction equipment on the Grant Line Road Site shall not be left idling.

Timing/Implementation: *During project construction*

Enforcement/Monitoring: *City of Elk Grove Planning Department*

Implementation of the above mitigation measures would prohibit noise-generating activities from occurring during the more noise-sensitive periods of the day and would reduce short-term noise impacts to the residential land use near the Grant Line Road Site. Therefore, this impact would be considered **less than significant with mitigation incorporated.**

Permanent Increases in Ambient Noise Levels

Future development of the proposed project sites for expanded Corporation Yard facilities and the relocated Transit Yard consistent with the proposed Master Plans would increase motor vehicle traffic noise and facility operation noise on and in the vicinity of the project sites. As discussed previously, the nearest land designated for noise sensitive uses to the City Corporation Yard/Jackson Property and Iron Rock Way Sites are the Hampton Villages subdivision and the Jennie McConnell Park, both located to the north-northwest, and a farm residence located to the east. This farm residence is located on an agriculturally-designated property and is not considered by the Elk Grove General Plan Noise Element as a noise sensitive use. Otherwise, the nearest lands designated for noise sensitive uses to the Grant Line Road Site are the residential uses within the Newton Ranch and Sonoma Creek subdivisions located approximately 0.7 mile (approximately 3,700 feet) to the northeast. Based on the operational characteristics of the facilities identified in the Master Plans and the distance of noise sensitive land uses from the project sites, the proposed project would not exceed the City's noise threshold of 55 dBA at these uses.

Furthermore, several churches are located near the City Corporation Yard/Jackson Property and Iron Rock Way Sites. The Soaring Oaks Presbyterian Church is the closest church to the sites, located approximately 300 feet to the northwest at the northwest corner of Iron Rock Way and Union Park Way. The other churches, including the Harvest Church, located at East Stockton Boulevard near SR 99, and Faith Baptist Church, located near the intersection of Hampton Oak Drive and Iron Rock Way, are sufficiently distant from the sites that they would not experience high noise levels associated with the proposed project. The churches located near the City Corporation Yard/Jackson Property and Iron Rock Way Sites are not located on lands designated for noise sensitive uses because they are located on lands zoned for Industrial uses. Therefore, they would typically not be subject to noise standards established for noise sensitive land uses.

Therefore, the proposed project's permanent operational noise impacts would not be expected to expose persons to noise levels in excess of standards established in the Elk Grove General Plan. The permanent increase in noise at the site would be consistent with the industrial noise environment of the area. Therefore, impacts would be considered **less than significant**.

b) Less than Significant. Future construction activities under the proposed Master Plans have the potential to result in varying degrees of temporary groundborne vibration, depending on the specific construction equipment used and operations involved. Vibration generated by construction equipment spreads through the ground and diminishes in magnitude with increases in distance. **Table 12** displays vibration levels for typical construction equipment.

TABLE 12
TYPICAL CONSTRUCTION-EQUIPMENT VIBRATION LEVELS

Equipment	PPV at 25 feet (in/sec)[1]	Approximate Lv at 25 feet[2]
Large Bulldozer	0.089	87
Caisson Drilling	0.089	87
Trucks	0.076	86
Jackhammer	0.035	79
Small Bulldozer	0.003	58

[1]*Where PPV is the peak particle velocity*

[2] *Where 1_, is the velocity level in decibels (VdB) referenced to 1 i.t inch/second and based on the root mean square (RMS) velocity amplitude.*

Source: Federal Transit Administration 2006.

As discussed above, on-site construction equipment could include dozers and trucks. According to Federal Transit Administration (FTA), vibration levels associated with the use of a large bulldozer is 0.089 inches per second (in/sec) peak particle velocity (PPV) and 87 vibration decibels [VdB referenced to 1 microinch per second (gin/sec) and based on the RMS velocity amplitude] at 25 feet, as shown in **Table 11**. Using FTA's recommended procedure for applying a propagation adjustment to these reference levels, predicted worst-case vibration levels of approximately 0.03 in/sec PPV and 81 VdB at approximately 50 feet from a project site's boundary could occur from use of a large bulldozer. These vibration levels would not exceed Caltrans' recommended standard of 0.2 in/sec PPV (Caltrans, 2002) with respect to the prevention of structural damage for normal buildings. Vibration levels at further distances would be substantially diminished. The nearest residences are 1,000 feet from the City Corporation Yard/Jackson Property and Iron Rock Way Sites and 1,500 feet from the Grant Line Road Site. Based on these substantial setbacks from the project sites, project construction would not be expected to expose offsite sensitive receptors to vibration levels that would be considered excessive. As a result, this impact is considered **less than significant**.

e) – f) Less than Significant. The project area is located within approximately 1.5 miles of the Elk Grove (Sunset Skyranch) Airport, which is located near the intersection of Grant Line and Bradshaw roads. On January 25, 2006, the Sacramento County Board of Supervisors decided not to renew the Use Permit for the airport. Although the airport is still currently operating, its continued operation is in question due to ongoing litigation. The airport's use is limited to relatively small planes and the project sites are not located within the airport's designated safety zones. Due to the distance of the proposed sites from the airport, its permit status, and its use by relatively small planes, the airport operations would not be expected to expose people residing or working in the project area to excessive noise levels and **less than significant** impact is anticipated to occur.

	Potentially Significant Impact	Less Than Significant with the Incorporated Mitigation	Less Than Significant Impact	No Impact
13. POPULATION AND HOUSING. Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

EXISTING SETTING

The City of Elk Grove's population in the year 2000 was 72,665 persons, compared to Sacramento's population of 1,223,499 (U.S. Census Bureau, 2000). Prior to the City's incorporation in 2000, the population of Elk Grove increased at an average rate of 7 percent annually, or a 70.5 percent increase since 1990 (Elk Grove, 2003a). Sacramento County experienced a much slower rate of growth during that time period, with population increasing only 17.5 percent from 1,041,219 in 1990 to 1,223,499 in 2000 (U.S. Census Bureau 2000, 1990). Elk Grove experienced rapid population growth after its incorporation in 2000.

Table 13 portrays both past and projected population growth in Elk Grove through the year 2035. Population growth in Elk Grove is anticipated to account for nearly 20 percent of the County's total growth between the years 2005 and 2010 and 23.4 percent of the County's total growth between the years 2010 and 2020. SACOG projects that the population of Sacramento County will increase to approximately 1,762,523 by the year 2027 (SACOG, 2006).

TABLE 13
CITY OF ELK GROVE POPULATION TRENDS

Year	Population	Change	Average Annual % Change
1990[1]	42,626	N/A	N/A
2000[1]	72,665	30,039	70.5
2005[2]	121,470	48,805	13.4
2007[2]	136,318	14,848	6.1
2015*[3]	164,403	28,085	2.5
2020*[3]	181,273	16,870	2.04
2035*[4]	183,070	33,640	1.5

Source:

[1] *U.S. Census Bureau. 1990. 1990 Census.*

[2] *State of California, Department of Finance. May 2007. E-5 Population and Housing Estimates for Cities, Counties and the State, 2001-2007, with 2000 Benchmark. Sacramento, California.*

[3] *SACOG Projections. March 15, 2001. www.sacog.org/demographics/projections/cities/sac.pdf. Note:* *The annexation of Laguna West in 2001 added an additional 14,973 persons to the City's population. Those persons have been added to the above Elk Grove totals (www.elkgrovecity.org, 2007).

[4] *SACOG Travel Model Run January 2007. SACOG DRAFT 2035 Projections for Households and Population by Housing Type and Employment by Sector. http://www.sacog.org/demographics/projections/files/2035 projections 010507.xls.*

* *SACOG Projections for 2035 based on Laguna and Elk Grove Regional Analysis Districts (RADs). A RAD is an area defined by SACOG. RADs may have the same name as community planning areas or city names, but the boundaries are not the same.*

In May 2007, the California Department of Finance released housing unit estimates for 2001 through 2007, which are shown in **Table 14** for the City of Elk Grove. As shown by the data, the total number of housing units increased an average of 11.17 percent each year and the majority of housing units built were single-family detached units and multi-family units with 5 or more units per structure.

TABLE 14
CITY OF ELK GROVE HOUSING UNITS ESTIMATES 2001-2007

Year	Total Housing Units	Single-Family		Multi-Family		
		Detached	Attached	2-4 Units	5+ Units	Mobile Homes
2001	25,057	22,196	919	525	1,144	273
2002	26,645	23,784	919	525	1,144	273
2003	28,323	25,462	919	525	1,144	273
2004	36,812	33,903	919	525	1,192	273
2005	40,932	37,687	919	525	1,528	273
2006	44,518	40,958	919	525	1,843	273
2007	46,495	42,281	1,327	525	2,089	273

Source: California Department of Finance, E-5 Population and Housing Estimates for Cities, Counties and the State, 2001-2007, with 2000 Benchmark. Sacramento, California, May 2007.

REGULATORY FRAMEWORK

There are no state and local regulations, plans, programs, and guidelines associated with population or housing that are applicable to the proposed project.

PROJECT IMPACTS AND MITIGATION MEASURES

a) **No Impact.** The proposed project includes programmatic approval of the Corp Yard Facilities and Transit Yard Facilities Master Plans. The intent of these Master Plans is to provide strategic planning documents designed to identify facilities and other assets available to provide required services to the City of Elk Grove. New homes or businesses are not proposed as part of the project, and the facilities in the Master Plans are expected to serve existing residents in the City, as well as future resident planned for in the City's General Plan. Furthermore, the proposed project site is in a developed area and, other than site-specific extensions to main lines, would receive water and sewer service from existing infrastructure. No additional roads would be constructed as a result of the project. Therefore, the proposed project would not result in indirect population growth through the extension of infrastructure or roadways. For these reasons, it is not anticipated that the proposed project would directly or indirectly induce substantial population growth into the area. **No impact** would occur associated with population growth.

b) – c) No Impact. The proposed project sites are located in an industrial area and do not contain any residences. Therefore, implementation of the proposed project would not displace substantial numbers of housing or people, and would not necessitate the construction of replacement housing elsewhere. **No impact** would occur.

Issues	Potentially Significant Impact	Less Than Significant with the Incorporated Mitigation	Less Than Significant Impact	No Impact
14. PUBLIC SERVICES. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
a) Fire protection?	☐	☐	☒	☐
b) Police protection?	☐	☐	☐	☒
c) Schools?	☐	☐	☐	☒
d) Parks?	☐	☐	☐	☒
e) Other public facilities?	☐	☐	☐	☒

EXISTING SETTING

Fire Protection

In November of 2006, a merger between the Elk Grove Community Services District and the Galt Fire Protection District resulted in the creation of the Cosumnes Community Services District (CCSD). This change expanded the delivery of community services district fire protection and emergency medical services to the cities of Elk Grove, Galt, and unincorporated south Sacramento County areas—approximately 157 square miles. The CCSD provides emergency services such as fire suppression, emergency medical services, technical rescue, arson, and explosion investigations. CCSD currently has eight fully staffed stations, of which six are located in Elk Grove (EDAW, 2009, p. 4.5-4):

- Fire Station 45 is located at 229 5th Street in central Galt.
- Fire Station 46 is located at 1050 Walnut Avenue in northeast Galt.
- Fire Station 71 is located at 8760 Elk Grove Boulevard. This station maintains a minimum of five personnel, 24 hours a day; one four person engine, one two person medic, and one battalion chief.
- Fire Station 72, located at 10035 Atkins Drive in the East Franklin Specific Plan area. Currently, staff at this station includes five personnel, 24 hours a day. Primary equipment at this station includes one three person engine and one two person medic.
- Fire Station 73 is located at 9607 Bond Road. This station provides fire, emergency medical and ambulance transport services. This station also maintains a minimum of five personnel, 24 hours a day. Primary equipment at this station includes one three person engine and one two person medic.
- Fire Station 74 is located at 6501 Laguna Park Drive. This station provides fire, rescue, emergency medical, and ambulance transport services. Minimum staffing at this station includes six personnel, 24 hours a day. Primary equipment at this station includes one four-person truck, one three-person engine and one two person medic.

- Fire Station 75 is located at 2300 Maritime Drive, approximately 9.5 miles northwest of the project site. This station provides fire and emergency medical services. Minimum staff at this station includes one three person engine.
- Fire Station 76 is located at 8545 Sheldon Road. This station provides fire and emergency medical service. Staff at this station includes three personnel, 24 hours a day. Primary equipment located at this station includes one three person engine.

The nearest fire station to the project area is Fire Station 71 approximately 3 miles to the northwest. The CCSD Fire Department is planning to construct Fire Station 70 to maintain service levels within the district. This station is currently planned to be located on Bruceville Road south of Kammerer Road. Fire Station 70 would be located approximately 3 miles to the west of the potential project sites (EDAW, 2009, p. 4.5-4).

The CCSD is staffed with more than 150 sworn personnel and eight engine companies, one ladder truck company, six ambulances, and a command vehicle each day on a 24-hour basis. Additionally, there are eight grass engines and other specialty apparatus, including one heavy foam unit, a heavy rescue engine, a technical rescue trailer, a mass decontamination trailer, a mass casualty incident trailer, and a swift water rescue boat, also staffed using these personnel as seasons and emergency circumstances dictate. The CCSD provides Advanced Life Support (ALS) and Basic Life Support (BLS) and ambulance transport services in the CCSD service boundaries, as well as the nearby communities of Wilton, Herald, and Courtland. All medical units are staffed with one paramedic and an emergency medical technician (EMT). The CCSD Fire Department operates three full-time medic units from Fire Stations 73, 74, and 75 in central Elk Grove, Laguna, and east Elk Grove, respectively. An additional medic unit is stationed at Fire Station 72 in Franklin and staffed by the station's engine company when needed. In addition to ambulance units, the EMS Division introduced a medic bike team in 1998 that is deployed at large-scale community events to provide rapid medical responses in heavily congested areas.

Police Protection

The City of Elk Grove Police Department (EGPD) was formed in conjunction with the City's incorporation in July 2000. The City created its own police department on October 28, 2006, which operates as a full service law enforcement agency contracted through the County Sheriff's Department. The service boundaries of the EGPD are contiguous with the City limits. The EGPD provides all law enforcement services including responding to all crime-related events, handling all traffic-related issues, and providing community services to the citizens of Elk Grove. All traffic accidents occurring on freeways that pass through Elk Grove (SR 99 and I 5) are handled by the California Highway Patrol (CHP) (EDAW, 2009, p. 4.5-5).

The EGPD currently operates out of three facilities. The main building is the 12,500-square-foot facility located in the City Hall complex at 8380 Laguna Palms Way, approximately 4.2 miles northwest of the project site. This facility accommodates the administrative functions of the Department including administration; detectives; and K-9 divisions. Another 31,000-square-foot facility is located at 8400 Laguna Palms Way, approximately 4.2 miles from the project sites. This facility houses records, property and evidence, communications, professional standards, traffic, information technology, and fleet. A total of 112 employees are staffed in this facility. In addition, an approximately 8,069-square-foot facility is located at the Corporation Yard Site. The facility serves as a staging area for the EGPD's fleet and provides shower and equipment storage for sworn personnel. This facility includes 103 parking spaces for patrol vehicles, with no regular on-site staff assigned to this building.

The EGPD provides the full range of public safety services for the City. Patrol personnel handle calls for service from residents, businesses and visitors. The EGPD has a total staff of 191 including 125 sworn police officers, and 66 non-sworn management, administrative and technical positions. The Elk Grove Communications Center answers an average of 186,000 emergency and non-emergency calls annually. There are no adopted standards relative to sworn police officers per population amounts; however, the current average response time city-wide is 14 minutes. The department strives to maintain a 1 per 1,000 ratio of officers to residents and the current staffing ratio is 0.92 to 1,000 (EDAW, 2009, p. 4.5-6).

Schools

The City of Elk Grove is located within the service area of the Elk Grove Unified School District (EGUSD). The EGUSD covers 320 square miles and is the fifth largest school district in California and the largest in Northern California (EGUSD, 2010). The EGUSD boundaries encompass the entire City of Elk Grove, portions of the cities of Sacramento and Rancho Cordova, and most of southern Sacramento County. Currently, the district provides education to over 62,000 students and operates 64 schools: 40 elementary schools, 9 middle schools, 9 high schools, 4 alternative education schools, 1 adult school, and 1 charter school (EGUSD, 2010).

Parks

The CCSD provides parks services to the Elk Grove community. The department plans and designs new parks; owns, operates, and maintains parks and community centers; manages rentals of community centers, picnic sites, and sports fields; and offers recreation programs. Currently, the CCSD manages 80 parks, 18 miles of off-street trails, two community centers, four recreation centers, and two aquatics complexes (CCSD, 2010).

REGULATORY FRAMEWORK

The following state and local regulations, plans, programs, and guidelines are applicable to the proposed project:

- State Laws and Regulations
  - Uniform Fire Code
  - California Health and Safety Code
- Local Laws, Regulations, and Policies
  - Fire Codes and Guidelines

PROJECT IMPACTS AND MITIGATION MEASURES

a) **Less than Significant.** Both the proposed Master Plans and future facilities envisioned by the Master Plans are consistent with the land use and zoning designations at the project sites. Construction and operation of the facilities identified in the Master Plans would not increase the demand for fire protection services or emergency medical services above the level anticipated for the project sites within the Elk Grove General Plan. In addition, all future facilities would be required to comply with State regulatory requirements as specified in the California Code of Regulations (CCR), as well as the CCSD Fire Department requirements.

Each of the project sites has a fire hydrant located on-site. The nearest fire station to the project sites is Fire Station 71, located approximately 3 miles to the northwest. In addition, the CCSD Fire Department is planning to construct Fire Station 70 on Bruceville Road south of Kammerer Road in order to maintain service levels in the local area. Because the proposed project would be located within developed industrial areas with fire hydrants on the site, would be located near existing and planned fire stations, and would be consistent with planned land uses in the area, the project's fire protection and emergency medical service impacts would be considered **less than significant**.

b) **No Impact**. Implementation of the proposed project would not generate new residences in the project area that would increase the demand for police protection services. The expanded Corporation Yard and relocated Transit Yard operations would be located within an existing industrial area that is currently patrolled by the Elk Grove Police Department and those operations are not anticipated to generate significant demands on law enforcement because they would not be considered a magnet for criminal activity. Furthermore, as described above, future facilities envisioned by the Master Plans are consistent with the land use and zoning designations at the project sites and construction and operation of the facilities identified in the Master Plans would not increase the demand for police protection services above the level anticipated for the project sites within the Elk Grove General Plan Therefore, the project would have **no impact** on law enforcement services.

c) – e) **No Impact**. The proposed project would not include any components which would result in an increased demand for schools, parks, or other public services, such as the construction of housing. As such, there would be no need for additional facilities to maintain acceptable service ratios for schools and/or parks. **No impact** would occur.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
15. RECREATION. Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities, such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Include recreational facilities or require the Construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?	☐	☐	☐	☒

EXISTING SETTING

The CCSD provides recreation services to the Elk Grove community. The department offers recreation programs for all ages including special events, preschools, summer camps, teen programs, special interest classes, before- and after-school recreation, non-traditional sports, therapeutic recreation, youth and adult sports, and aquatic programming (CCSD, 2010).

PROJECT IMPACTS AND MITIGATION MEASURES

a – b) No Impact. As described above, the CCSD provides park and recreation services to the City of Elk Grove. However, the proposed project would not include any components which would result in an increased demand for parks or recreation services or facilities. As such, there would be no need for additional facilities to maintain acceptable service ratios for parks and recreation services. **No impact** would occur.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
16. TRANSPORTATION/TRAFFIC. Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☒	☐
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	☒

EXISTING SETTING

The following transportation setting information was obtained largely from *Transportation Impact Study for the Proposed Elk Grove Transit Facilities* (May 2010) conducted by Fehr & Peers. This traffic study is included in **Appendix C.**

Roadway System

The following describes the freeway facilities and local roadways that serve the project sites (Fehr & Peers, 2010):

State Route 99 (SR 99) is a north-south freeway with interchanges at Elk Grove Boulevard and Grant Line Road. It consists of two lanes in each direction from south of Grant Line Road to just south of Elk Grove Boulevard, where a High Occupancy Vehicle (HOV) lane is added in each direction.

Waterman Road is a north-south two-lane roadway that extends from Grant Line Road to north of Calvine Road.

East Stockton Boulevard is a north-south roadway that extends from south of Grant Line Road to Mack Road. East Stockton Boulevard has two lanes within the project area. East Stockton Boulevard becomes Survey Road south of Grant Line Road.

Grant Line Road is a major east-west roadway that extends from SR 99 to White Rock Road in unincorporated Sacramento County. Through the project area, Grant Line Road varies from two to six lanes.

Kammerer Road is an east-west roadway that extends from SR 99 to Bruceville Road. Kammerer Road has six lanes through the project area. Kammerer Road becomes Grant Line Road east of the SR 99 interchange.

Traffic Operations

Traffic operations were analyzed by Fehr & Peers in September of 2009. The following 6 intersections, 4 roadway segments, and 6 freeway ramp junctions were selected for analysis based on their proximity to the project sites, their expected usage by project traffic, and the project's expected travel characteristics.

Intersections

1. Grant Line Road / SR 99 Southbound Ramps
2. Grant Line Road / SR 99 Northbound Ramps
3. Grant Line Road / East Stockton Boulevard / Survey Road
4. Grant Line Road / Waterman Road
5. Kammerer Road / Promenade Parkway (cumulative conditions only)
6. Kammerer Road / Lent Ranch Parkway (cumulative conditions only)

Roadway Segments

1. Grant Line Road – SR 99 to Waterman Road
2. Kammerer Road – SR 99 to Lotz Parkway
3. Waterman Road – Elk Grove Boulevard to Grant Line Road
4. Elk Grove Florin Road – Elk Grove Boulevard to East Stockton Boulevard

Ramp Junctions

1. SR 99 Northbound Grant Line Road Off-Ramp
2. SR 99 Northbound Grant Line Road Loop On-Ramp
3. SR 99 Northbound Grant Line Road Slip On-Ramp
4. SR 99 Southbound Grant Line Road Off-Ramp
5. SR 99 Southbound Grant Line Road Loop On-Ramp
6. SR 99 Southbound Grant Line Road Slip On-Ramp

Analysis Methodology

Level of service (LOS) is a qualitative measure describing the operating condition of intersections and roadways. LOS ranges from A through F, which represents driving conditions from best to worst, respectively. In general, LOS A represents free-flow conditions with no congestion, and LOS F represents severe congestion and delay under stop-and-go conditions.

Intersections

The study intersections were analyzed using procedures and methodologies contained in the Transportation Research Board's (TRB) *Highway Capacity Manual 2000*. **Table 15** displays the average control delay per vehicle for each LOS range for signalized and unsignalized intersections. The LOS for signalized and all-way stop-controlled intersections is based on the average delay of all vehicles passing through the intersection. The LOS for side-street stop-controlled intersections is based on the delay for the minor street movement with the greatest delay.

TABLE 15
LEVEL OF SERVICE DEFINITIONS FOR STUDY INTERSECTIONS

Level of Service	Average Control Delay (seconds/vehicle)	
	Signalized	Unsignalized
A	≤ 10.0	≤ 10.0
B	10.1 – 20.0	10.1 – 15.0
C	20.1 – 35.0	15.1 – 25.0
D	35.1 – 55.0	25.1 – 35.0
E	55.1 – 80.0	35.1 – 50.0
F	> 80.0	> 50.0

Source: Transportation Research Board. Highway Capacity Manual 2000.

Roadway Segments

Roadway segments were analyzed by comparing average daily traffic volumes to capacity thresholds presented in the City of Elk Grove's *Traffic Impact Analysis Guidelines* (July 2000). Consistent with assumptions in the City's General Plan background report, all study roadways were assumed to have moderate access control. **Table 16** shows daily volume thresholds for each LOS category for two-, four-, six-, and eight-lane roadways with moderate access control.

TABLE 16
LEVEL OF SERVICE DEFINITIONS FOR STUDY ROADWAYS

Number of Lanes[1]	Maximum Daily Volume				
	LOS A	LOS B	LOS C	LOS D	LOS E
2	10,800	12,600	14,400	16,200	18,000
4	21,600	25,200	28,800	32,400	36,000
6	32,400	37,800	43,200	48,600	54,000
8	43,200	50,400	57,600	64,800	72,000

Notes: [1] *Elk Grove General Plan Background Report shows all study roadways with moderate access control.*
Source: City of Elk Grove. Traffic Impact Analysis Guidelines. July 2000.

Freeway Facilities

Per Caltrans standards, the freeway on- and off-ramps were analyzed using procedures from the *Highway Capacity Manual, 2000*. This procedure determines the LOS based on the computed density, which is expressed in passenger cars per lane per mile.

Intersection Operations

The traffic counts for the study intersections were collected in September of 2009 during the AM (7 – 9 AM) and PM (4 – 6 PM) peak periods. The two study intersections located on Kammerer Road (Kammerer Road/Promenade Parkway and Kammerer Road/Lent Ranch Road) were not analyzed under existing conditions because the project is not anticipated to produce any traffic along this roadway.

Table 17 summarizes the results of the traffic counts. As shown, the traffic counts indicate that all of the study intersections operate at an acceptable LOS during the AM and PM peak hours.

TABLE 17
INTERSECTION LEVEL OF SERVICE – EXISTING CONDITIONS

Intersection	Traffic Control	AM Peak Hour		PM Peak Hour	
		Delay[1]	LOS[2]	Delay[1]	LOS[2]
1. Grant Line Road / SR 99 SB Ramps	Signal	9	A	10	A
2. Grant Line Road / SR 99 NB Ramps	Signal	14	B	13	B
3. Grant Line Road / East Stockton Boulevard	Signal	32	C	32	C
4. Grant Line Road / Waterman Road	Side-Street Stop	23	C	17	C

Notes: [1] *For signalized and all-way stop-controlled intersections, the overall average intersection control delay is reported in seconds per vehicle. For side-street stop-controlled intersections, the average control delay for the worst movement is reported in seconds per vehicle. Delay is reported as >80 when Synchro is unable to calculate the average control delay for stop-controlled intersections due to oversaturated conditions.*

[2] *Level of Service based on Highway Capacity Manual 2000 (TRB, 2000).*

Source: ***Fehr & Peers, 2010.***

Roadway Segment Operations

Traffic counts for the study roadway segments were counted mid-week over a 24-hour period in September of 2009. **Table 18** shows the average daily traffic (ADT) volume, V/C Ratio, and LOS on the study roadway segments. As shown, all of the study roadways operate at LOS A under existing conditions.

TABLE 18
ROADWAY SEGMENT LEVEL OF SERVICE – EXISTING CONDITIONS

Roadway Segment	Daily Capacity[1]	Existing Conditions		
		ADT	V/C Ratio	LOS[2]
Grant Line Road – SR 99 to Waterman Road	36,000	16,000	0.44	A
Kammerer Road – SR 99 to Lotz Parkway	54,000	3,700	0.07	A

Roadway Segment	Daily Capacity[1]	Existing Conditions		
		ADT	V/C Ratio	LOS[2]
Waterman Road – Elk Grove Blvd. to Grant Line Road	18,000	5,600	0.31	A
Elk Grove Florin Road – Elk Grove Blvd. to East Stockton Blvd.	18,000	5,500	0.31	A

Notes: [1] *The capacity of each roadway is based on the number of lanes and the facility type.*
[2] *Level of Service (LOS) based on Traffic Impact Analysis Guidelines (City of Elk Grove, 2000).*
Source: ***Fehr & Peers, 2010.***

Freeway Ramp Junction Operations

The freeway ramp junctions were analyzed using the intersection traffic counts collected at the ramp terminals in September of 2009. The volume on the SR 99 mainline was determined using the Caltrans Transportation Systems Network (TSN) database for 2007. **Table 19** displays the density and LOS which are the result of the HCM analysis.

TABLE 19
FREEWAY FACILITY LEVEL OF SERVICE – EXISTING CONDITIONS

Freeway Facility	Existing Conditions			
	AM Peak Hour		PM Peak Hour	
	Density[1]	LOS[2]	Density[1]	LOS[2]
SR 99 NB Grant Line Rd. Off-Ramp	14	B	13	B
SR 99 NB Grant Line Rd. Loop On-Ramp	11	A	10	A
SR 99 NB Grant Line Rd. Slip On-Ramp	13	B	14	B
SR 99 SB Grant Line Rd. Off-Ramp	11	B	13	B
SR 99 SB Grant Line Rd. Loop On-Ramp	12	B	14	B
SR 99 SB Grant Line Rd. Slip On-Ramp	13	B	15	B

Notes: [1] *Density reported in passenger cars per mile per lane.*
[2] *Level of Service based on Highway Capacity Manual 2000 (TRB, 2000).*
Source: *Fehr & Peers, 2010.*

As shown in **Table 19**, all of the ramp junctions at the Grant Line Road interchange operate at LOS B of better during both the AM and PM peak hours.

Bicycle and Pedestrian Facilities

Class II bike lanes (on-street with signing and striping) are provided on East Stockton Boulevard and Grant Line Boulevard, between East Stockton Boulevard and Promenade Parkway. Within the project area, crosswalks are generally provided at signalized intersections and sidewalks exist along the frontage of most developed properties (Fehr & Peers, 2010).

Transit Service

The City of Elk Grove operates fixed-route bus service (E-Tran) within the project area. Numerous routes with stops are available within the project area, including East Stockton Boulevard (Routes 60, 57, and 162), Elk Grove-Florin Road (Routes 59, 57, and 162), Elk Grove Boulevard (Routes 66, 59, 52, 162, and 156), and Grant Line/Waterman Road (Routes 58 and 160). E-Tran is currently running a reduced schedule due to temporary budget cuts (Fehr & Peers, 2010).

REGULATORY FRAMEWORK

The following local regulations, plans, programs, and guidelines are applicable to the proposed project:

- Local Laws, Regulations, and Policies
  - City of Elk Grove Transportation Improvement Plan

PROJECT IMPACTS AND MITIGATION MEASURES

a) – b) Less than Significant. Implementation of the proposed project would accommodate the future expansion of the Corporation Yard facilities on the City Corporation Yard/Jackson Property Site and relocation of the Transit Yard to either the Iron Rock Way Site or the Grant Line Road Site. Future development associated with the project would increase traffic over existing conditions in the project area. The City of Elk Grove Public Works Department has determined that increased traffic resulting from the expansion of the Corporation Yard after the relocation of the Transit facilities would not exceed either individually or cumulatively an LOS standard established by the City and the projected daily trips generated by the project would not trigger the preparation of a traffic study (Owens, 2010). This determination was made due to the fact that the Corporation Yard portion of the proposed project would include expansion of an existing industrial use that was envisioned by the City's General Plan for the City Corporation Yard/Jackson Property Site. Therefore, increased traffic resulting from expansion of the Corporation Yard would result in no further impacts beyond those analyzed by the City's 2003 General Plan Draft Environmental Impact Report (DEIR) (SCH#: 2002062082) and impacts would be **less than significant.**

However, while the Transit Yard portion of the proposed project falls under the category of an industrial use that is consistent with the City's General Plan, transit facilities are a unique use that may not have been considered by the City's General Plan DEIR. Therefore, a traffic study was prepared by Fehr and Peers in 2010 for the relocation and expansion of Transit facilities. The results of the traffic study are discussed below.

Existing Plus Project Conditions

This section presents the technical analysis of intersections, roadways, and freeway facilities under existing plus project conditions.

<u>Intersection Operations</u>

The study intersections were analyzed under existing plus project conditions using the procedures described under the Existing Setting sub-section above. The Grant Line Road/East Stockton Boulevard/Survey Road intersection was analyzed considering the transit facilities located at the Grant Line Road Site and again with the transit facilities located at the Iron Rock Way Site. The results of the analysis are shown in **Tables 20** and **21**. The analysis shows all of the study intersections continue to operate acceptably with the addition of project traffic. Therefore the addition of project traffic would not cause a significant impact at any of the study intersections under the existing plus project scenario and impacts would be **less than significant**. The intersection of Grant Line Road/East Stockton Blvd/Survey Road will operate at LOS C regardless of the project location.

TABLE 20
INTERSECTION CONTROL DELAY AND LEVEL OF SERVICE – EXISTING PLUS PROJECT CONDITIONS
GRANT LINE ROAD SITE

Intersection	Traffic Control	Existing Conditions				Existing Plus Project Without Expansion				Existing Plus Project With Expansion			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Grant Line Road / SR 99 SB Ramps	Signal	9	A	10	A	9	A	10	A	9	A	10	A
2. Grant Line Road / SR 99 NB Ramps	Signal	14	B	13	B	14	B	13	B	14	B	13	B
3. Grant Line Road / East Stockton Boulevard	Signal	32	C	32	C	33	C	33	C	33	C	33	C
4. Grant Line Road / Waterman Road	Side-Street Stop	23	C	17	C	23	C	17	C	23	C	17	C

Notes: *For signalized and all-way stop-controlled intersections, the overall average intersection control delay is reported in seconds per vehicle. For side-street stop-controlled intersections, the average control delay for the worst movement is reported in seconds per vehicle.*

Level of Service based on Highway Capacity Manual 2000 (TRB, 2000).

Source: *Fehr & Peers, 2010.*

TABLE 21
INTERSECTION CONTROL DELAY AND LEVEL OF SERVICE – EXISTING PLUS PROJECT CONDITIONS
IRON ROCK WAY SITE

Intersection	Traffic Control	Existing Conditions				Existing Plus Project Without Expansion				Existing Plus Project With Expansion			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Grant Line Road / SR 99 SB Ramps	Signal	9	A	10	A	9	A	10	A	9	A	10	A
2. Grant Line Road / SR 99 NB Ramps	Signal	14	B	13	B	14	B	13	B	14	B	13	B

Intersection	Traffic Control	Existing Conditions				Existing Plus Project Without Expansion				Existing Plus Project With Expansion			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
3. Grant Line Road / East Stockton Boulevard	Signal	32	C	32	C	32	C	32	C	33	C	33	C
4. Grant Line Road / Waterman Road	Side-Street Stop	23	C	17	C	23	C	17	C	23	C	17	C

Notes: *For signalized and all-way stop-controlled intersections, the overall average intersection control delay is reported in seconds per vehicle. For side-street stop-controlled intersections, the average control delay for the worst movement is reported in seconds per vehicle.*

Level of Service based on Highway Capacity Manual 2000 (TRB, 2000).

Source: *Fehr & Peers, 2010.*

Roadway Segment Operations

The roadway segments were analyzed under existing plus project conditions. As shown in **Table 22**, all of the study segments continue to operate at LOS A with the addition of project traffic. Since both prospective project sites are located near each other, the roadway volumes will remain the same regardless of the project location. Impacts to the study roadway segments under the existing plus project scenario would be **less than significant.**

TABLE 22
ROADWAY SEGMENT LEVEL OF SERVICE – EXISTING PLUS PROJECT CONDITIONS
BOTH SITES

Roadway Segment	Daily Capacity[1]	Existing Conditions			Existing Plus Project Conditions – Without Expansion			Existing Plus Project Conditions – With Expansion		
		ADT	V/C Ratio	LOS[2]	ADT	V/C Ratio	LOS[2]	ADT	V/C Ratio	LOS[2]
Grant Line Road – SR 99 to Waterman Road	36,000	16,000	0.44	A	16,000	0.44	A	16,200	0.45	A
Kammerer Road – SR 99 to Lotz Parkway	54,000	3,700	0.07	A	3,700	0.07	A	3,700	0.07	A
Waterman Road – Elk Grove Blvd. to Grant Line Road	18,000	5,600	0.31	A	5,600	0.31	A	5,700	0.32	A
Elk Grove Florin Road – Elk Grove Blvd. to East Stockton Blvd.	18,000	5,500	0.31	A	5,500	0.31	A	5,600	0.31	A

Notes: [1] *The capacity of each roadway is based on the number of lanes and the facility type.*

[2] *Level of Service (LOS) based on Traffic Impact Analysis Guidelines (City of Elk Grove, 2000).*

Source: *Fehr & Peers, 2010.*

Freeway Ramp Junctions Operations

The freeway ramp junctions were analyzed under existing plus project conditions using the analysis procedures specified in the *Highway Capacity Manual 2000* (TRB, 2000). As shown in **Table 23**, all of the freeway facilities continue to operate at an acceptable level of service after the project traffic is added, regardless of which site location is selected.

TABLE 23
FREEWAY FACILITY LEVEL OF SERVICE – EXISTING PLUS PROJECT CONDITIONS
ALL SITES

Intersection	Existing Conditions				Existing Plus Project Without Expansion				Existing Plus Project With Expansion			
	AM		PM		AM		PM		AM		PM	
	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
1. SR 99 NB Grant Line Rd. Off-Ramp	14	B	13	B	14	B	13	B	14	B	13	B
2. SR 99 NB Grant Line Rd. Loop On-Ramp	11	A	10	A	11	A	10	A	11	A	10	A
3. SR 99 NB Grant Line Rd. Slip On-Ramp	13	B	14	B	13	B	14	B	13	B	14	B
4. SR 99 SB Grant Line Rd. Off-Ramp	11	B	13	B	11	B	13	B	11	B	13	B
5. SR 99 SB Grant Line Rd. Loop On-Ramp	12	B	14	B	12	B	14	B	12	B	14	B
6. SR 99 SB Grant Line Rd. Slip On-Ramp	13	B	15	B	13	B	15	B	13	B	15	B

Notes: *Density reported in passenger cars per mile per lane.*

Level of Service based on Highway Capacity Manual (Transportation Research Board, 2000).

Source: *Fehr & Peers, 2010.*

Cumulative Conditions

Cumulative (at buildout of the City's General Plan) weekday and peak hour traffic volume forecasts for study roadways, intersections, and freeway facilities were developed using the City of Elk Grove version of the SACMET regional travel demand model. This version of the SACMET travel demand model contains the latest land uses for the full build-out of the Laguna Ridge Specific Plan, Sterling Meadows, Southeast Area Specific Plan, and Elk Grove Marketplace retail parcels. No development was assumed south of Kammerer Road.

This version of the SACMET model also assumes full build-out of the roadway network identified in the City of Elk Grove General Plan. The following are key roadway improvements within the study area:

- Grant Line Road/Kammerer Road constructed as six lanes from Calvine Road to Bradshaw Road, as eight lanes from Bradshaw Road to Lotz Parkway, and as six lanes to I-5, where it is assumed to connect with the present Hood Franklin Road interchange.
- Waterman Road widened to four lanes from Grant Line Road to Calvine Road.
- Bradshaw Road widened to six lanes from Grant Line Road to north of Calvine Road.

The analysis did not assume a loop on-ramp from East Stockton Boulevard (at the SR 99/Elk Grove Boulevard interchange) onto northbound SR 99 per City direction. It also did not assume a new interchange on SR 99 between Elk Grove Boulevard and Grant Line Road.

Cumulative Conditions Traffic Operations Analysis

Cumulative Without Project Conditions

This section presents the analysis of intersections, roadways and freeway ramp junctions under cumulative conditions without the proposed project.

Intersection Operations

The study intersections were analyzed under cumulative conditions, without the proposed project, using the procedures described under the Existing Setting sub-section above. The results of that analysis are displayed in **Table 24**. Prior to the addition of project traffic, three of the six study intersections would operate unacceptably during both the AM and PM peak hours.

TABLE 24
INTERSECTION CONTROL DELAY AND LEVEL OF SERVICE – CUMULATIVE CONDITIONS

Intersection	Traffic Control	AM Peak Hour		PM Peak Hour	
		Delay[1]	LOS[2]	Delay[1]	LOS[2]
1. Grant Line Road / SR 99 SB Ramps	Signal	23	C	26	C
2. Grant Line Road / SR 99 NB Ramps	Signal	40	D	39	D
3. Grant Line Road / East Stockton Boulevard/Survey Road	Signal	**>80**	**F**	**>80**	**F**
4. Grant Line Road / Waterman Road	Signal	**>80**	**F**	**76**	**E**
5. Kammerer Road / Promenade Parkway	Signal	**62**	**E**	**>80**	**F**
6. Kammerer Road / Lent Ranch Parkway	Signal	28	C	25	C

Notes: [1] *For signalized and all-way stop-controlled intersections, the overall average intersection control delay is reported in seconds per vehicle. For side-street stop-controlled intersections, the average control delay for the worst movement is reported in seconds per vehicle. Delay is reported as >80 when Synchro is unable to calculate the average control delay for intersections due to oversaturated conditions.*

[2] Level of Service based on Highway Capacity Manual 2000 (TRB, 2000).
Shading indicates that the intersection operates unacceptably based on the significance criteria.
Source: Fehr & Peers, 2010.

Roadway Segment Operations

Roadway segments were analyzed using the procedures described under the Existing Setting sub-section above. The analysis results are displayed in **Table 25**. They indicate that two of the study roadway segments would operate unacceptably under cumulative conditions prior to the addition of project traffic. Grant Line Road and Kammerer Road are assumed to be 8 lane facilities, while Waterman Road has four and Elk Grove-Florin Road is assumed to have two lanes under the cumulative scenario in the study area.

TABLE 25
ROADWAY SEGMENT LEVEL OF SERVICE – CUMULATIVE NO PROJECT CONDITIONS

Roadway Segment	Daily Capacity[1]	Cumulative No Project Conditions		
		ADT	V/C Ratio	LOS[2]
1. Grant Line Road – SR 99 to Waterman Road	**72,000**	**78,100**	**1.08**	**F**
2. Kammerer Road – SR 99 to Lotz Parkway	**72,000**	**90,500**	**1.26**	**F**
3. Waterman Road – Elk Grove Blvd. to Grant Line Road	36,000	29,300	0.81	D
4. Elk Grove-Florin Rd – Elk Grove Blvd. to East Stockton Blvd.	18,000	4,500	0.25	A

Notes: [1] The capacity of each roadway is based on the number of lanes and the facility type.
[2] Level of Service (LOS) based on Traffic Impact Analysis Guidelines, City of Elk Grove, July 2000.
Shading indicates that the roadway operates unacceptably based on the significance criteria.
Source: Fehr & Peers, 2010.

Freeway Ramp Junction Operations

The density and LOS for the freeway ramp junctions were calculated using the methodology described under the Existing Setting sub-section above. The analysis results are displayed in **Table 26**. They indicate that all of the study facilities will operate acceptably in the LOS B to D range under cumulative no project conditions.

TABLE 26
FREEWAY FACILITY LEVEL OF SERVICE – CUMULATIVE NO PROJECT CONDITIONS

Freeway Facility	Cumulative No Project Conditions			
	AM Peak Hour		PM Peak Hour	
	Density[1]	LOS[2]	Density[1]	LOS[2]
1. SR 99 NB Grant Line Rd. Off-Ramp	24	C	23	C
2. SR 99 NB Grant Line Rd. Loop On-Ramp	17	B	17	B
3. SR 99 NB Grant Line Rd. Slip On-Ramp	21	C	18	B
4. SR 99 SB Grant Line Rd. Off-Ramp	17	B	17	B
5. SR 99 SB Grant Line Rd. Loop On-Ramp	18	B	22	C
6. SR 99 SB Grant Line Rd. Slip On-Ramp	22	C	30	D

Notes: [1] *Density reported in passenger cars per mile per lane.*
[2] *Level of Service based on Highway Capacity Manual 2000 (TRB, 2000).*
Source: *Fehr & Peers, 2010.*

Cumulative Plus Project Conditions

This section presents the analysis of intersections, roadways, and freeway facilities under cumulative plus project conditions.

Intersection Operations

The study intersections were analyzed under cumulative plus project conditions using the procedures described under the Existing Setting sub-section above. The results of the analysis are shown in **Tables 27** and **28**. Although the project does increase the average delay at intersections that already operate at LOS E or F, all increases are less than the significance threshold of 5 seconds; therefore these are considered to be **less than significant** impacts. The project will not cause a significant impact at any of the study intersections under cumulative plus project conditions.

TABLE 27
INTERSECTION CONTROL DELAY AND LEVEL OF SERVICE – CUMULATIVE PLUS PROJECT CONDITIONS
GRANT LINE ROAD SITE

Intersection	Traffic Control	Cumulative No Project Conditions				Cumulative Plus Project Without Expansion				Cumulative Plus Project With Expansion			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Grant Line Road / SR 99 SB Ramps	Signal	23	C	26	C	23	C	26	C	24	C	26	C
2. Grant Line Road / SR 99 NB Ramps	Signal	40	D	39	D	41	D	39	D	41	D	40	D
3. Grant Line Road / East Stockton Boulevard	Signal	**>80**	**F**	**>80**	**F**	**>80**	**F**	**>80**	**F**	**>80**	**F**	**>80**	**F**
4. Grant Line Road / Waterman Road	Signal	**>80**	**F**	**76**	**E**	**>80**	**F**	**76**	**E**	**>80**	**F**	**76**	**E**
5. Kammerer Road / Promenade Parkway	Signal	**62**	**E**	**>80**	**F**	**62**	**E**	**>80**	**F**	**62**	**E**	**>80**	**F**
6.Kammerer Road / Lent Ranch Parkway	Signal	28	C	25	C	28	C	25	C	28	C	25	C

Notes: *For signalized and all-way stop-controlled intersections, the overall average intersection control delay is reported in seconds per vehicle. For side-street stop-controlled intersections, the average control delay for the worst movement is reported in* *seconds per vehicle. Delay is reported as >80 when Synchro is unable to calculate the average control delay for intersections due to oversaturated conditions.*

Level of Service based on Highway Capacity Manual 2000 (TRB, 2000).

Shading indicates that the intersection operates unacceptably based on the significance criteria.

Source: Fehr & Peers, 2010.

TABLE 28
INTERSECTION CONTROL DELAY AND LEVEL OF SERVICE – CUMULATIVE PLUS PROJECT CONDITIONS
IRON ROCK WAY SITE

Intersection	Traffic Control	Cumulative No Project Conditions				Cumulative Plus Project Without Expansion				Cumulative Plus Project With Expansion			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Grant Line Road / SR 99 SB Ramps	Signal	23	C	26	C	23	C	26	C	23	C	26	C
2. Grant Line Road / SR 99 NB Ramps	Signal	40	D	39	D	41	D	39	D	41	D	40	D
3. Grant Line Road / East Stockton Boulevard	Signal	**>80**	**F**	**>80**	**F**	**>80**	**F**	**>80**	**F**	**>80**	**F**	**>80**	**F**
4. Grant Line Road / Waterman Road	Signal	**>80**	**F**	**76**	**E**	**>80**	**F**	**76**	**E**	**>80**	**F**	**76**	**E**
5. Kammerer Road / Promenade Parkway	Signal	**62**	**E**	**>80**	**F**	**62**	**E**	**>80**	**F**	**62**	**E**	**>80**	**F**
6.Kammerer Road / Lent Ranch Parkway	Signal	28	C	25	C	28	C	25	C	28	C	25	C

Notes: For signalized and all-way stop-controlled intersections, the overall average intersection control delay is reported in seconds per vehicle. For side-street stop-controlled intersections, the average control delay for the worst movement is reported in seconds per vehicle. Delay is reported as >80 when Synchro is unable to calculate the average control delay for intersections due to oversaturated conditions.

Level of Service based on Highway Capacity Manual 2000 (TRB, 2000).

Shading indicates that the intersection operates unacceptably based on the significance criteria.

Source: Fehr & Peers, 2010.

Roadway Segment Operations

Roadway segments were analyzed under cumulative plus project conditions using the procedures described under the Existing Setting sub-section above. The analysis results are displayed in Table 29. They indicate that two of the study roadway segments would continue to operate unacceptably under cumulative plus conditions.

While project traffic increases ADT volumes on all the study segments, in no case would the addition of project traffic increase ADT volumes enough to result in additional segments operating unacceptably or to increase the volume-to-capacity ratio of already-deficient segments by 0.05. Therefore, impacts would be **less than significant.**

TABLE 29
ROADWAY SEGMENT LEVEL OF SERVICE – CUMULATIVE PLUS PROJECT CONDITIONS
BOTH SITES

Roadway Segment	Daily Capacity[1]	Existing Conditions			Cumulative Plus Project Conditions – Without Expansion			Cumulative Plus Project Conditions – With Expansion		
		ADT	V/C Ratio	LOS[2]	ADT	V/C Ratio	LOS[2]	ADT	V/C Ratio	LOS[2]
Grant Line Road – SR 99 to Waterman Road	72,000	78,100	1.08	F	78,200	1.09	F	78,500	1.09	F
Kammerer Road – SR 99 to Lotz Parkway	72,000	90,500	1.26	F	90,500	1.26	F	90,700	1.26	F
Waterman Road – Elk Grove Blvd. to Grant Line Road	36,000	29,300	0.81	D	29,300	0.81	D	29,300	0.81	D
Elk Grove Florin Road – Elk Grove Blvd. to East Stockton Blvd.	18,000	4,500	0.25	A	4,500	0.25	A	4,600	0.25	A

Notes: [1] *The capacity of each roadway is based on the number of lanes and the facility type.*

[2] *Level of Service (LOS) based on Traffic Impact Analysis Guidelines (City of Elk Grove, 2000).*

Source:* *Fehr & Peers, 2010.

Freeway Ramp Junction Operations

The density and level of service for the freeway ramp junctions were calculated using the methodology procedures from the *Highway Capacity Manual 2000* (TRB, 2000). As shown in **Table 30**, the analysis indicates that all of the study facilities will continue to operate at an acceptable LOS under cumulative plus project conditions. Therefore, the project will cause **less than significant** impacts to the study freeway facilities.

TABLE 30
FREEWAY FACILITY LEVEL OF SERVICE – CUMULATIVE PLUS PROJECT CONDITIONS
BOTH SITES

Intersection	Cumulative No Project				Cumulative Plus Project Without Expansion				Cumulative Plus Project With Expansion			
	AM		PM		AM		PM		AM		PM	
	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
1. SR 99 NB Grant Line Rd. Off-Ramp	24	C	23	C	24	C	23	C	24	C	23	C
2. SR 99 NB Grant Line Rd. Loop On-Ramp	17	B	17	B	17	B	17	B	17	B	17	B
3. SR 99 NB Grant Line Rd. Slip On-Ramp	21	C	18	B	21	C	18	B	21	C	18	B
4. SR 99 SB Grant Line Rd. Off-Ramp	17	B	17	B	17	B	17	B	17	B	17	B
5. SR 99 SB Grant Line Rd. Loop On-Ramp	18	B	22	C	18	B	22	C	18	B	22	C
6. SR 99 SB Grant Line Rd. Slip On-Ramp	22	C	30	D	22	C	30	D	22	C	30	D

Notes: Density reported in passenger cars per mile per lane.
Level of Service based on Highway Capacity Manual 2000 (TRB, 2000).
Source: Fehr & Peers, 2010.

c) **No Impact.** As previously discussed, there are no public airports in the City of Elk Grove and the only private airport in the vicinity of the project sites is the Elk Grove (Sunset Skyranch) Airport located approximately 1.5 miles from the sites. The airport's use is limited to relatively small planes and the project sites are not located within the airport's designated safety zones. Furthermore, the proposed Master Plans do not include any structures or equipment anticipated to penetrate the navigable airspace of the Sunset Skyranch Airport. Therefore, the proposed project would not result in a change in air traffic patterns that would result in substantial safety risks and **no impact** would occur.

d) **No Impact.** Future development resulting from implementation of the proposed project would place industrial uses in a developed industrial area. No design features such as sharp curves, dangerous intersections, turning radius, banking, or line of sight are present within the existing project area. The proposed project would not include any of the above non-standard design features. Therefore, **no impacts** are anticipated.

e) **No Impact.** The proposed Master Plans envision the future development of facilities on the project site, including expansion of the Corporation Yard facilities and relocation of the Transit Yard facilities. Future development and/or expansion of industrial uses on the proposed project sites would be required to be designed in accordance with City road and improvement standards. Therefore the project would provide adequate emergency access and **no impact** would occur.

f) **No Impact.** Future development resulting from implementation of the proposed project would place industrial uses in a developed industrial area and would not disrupt or interfere with existing or planned bicycle or pedestrian facilities as it would not inhibit bicyclists or pedestrians from using the facilities in the project's vicinity. In addition, implementation of the project would allow the City to increase transit operations. Therefore, **no impact** would occur.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
17. UTILITIES AND SERVICE SYSTEMS. Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☒	☐
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
c) Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
d) Have sufficient water supplies available to serve the project from existing entitlements and resources or are new or expanded entitlements needed?	☐	☐	☒	☐
e) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	☐

EXISTING SETTING

Water Supply

The project sites are located within the boundaries of Sacramento County Water Agency (SCWA) service areas Zone 41 and Zone 40. SCWA Zone 41 is a retail water supplier that provides drinking water to its various service areas located in both the unincorporated and incorporated (i.e., the cities of Elk Grove and Rancho Cordova) portions of the County. Service areas include a portion of Walnut Grove, Hood, Arden Park Vista, Northgate, Southwest Tract, Zone 50, and Zone 40. Zone 41 is responsible for the operations and maintenance of all the water supply facilities within these service areas. Revenues from utility charges, connection permit fees, construction water permits, and fund water supply capital facilities replacement design and construction and water supply facilities operations, maintenance, and administration. Zone 41 retails and wholesales water to its defined service areas and to agencies where agreements are in place to purchase water from SCWA. Zone 41 includes all of Zone 40, which was formed by SCWA in 1986 to manage groundwater resources within the influence area of the Elk Grove cone of depression by providing for the acquisition, construction, maintenance, and operation of facilities for the production, treatment, transmission, distribution, conservation, and sale of groundwater and surface water within the zone. Zone 40 generates revenue for its capital program through development fees and from special development capital fees collected bi-monthly from Zone 41 retail water service customers within Zone 40 and wholesale water service customers in the Elk Grove Water Service area. In April 1999, SCWA expanded Zone 40 boundaries and scope to include large areas in the southern part of Sacramento County and to include the use of recycled water in conjunction with groundwater and surface water. Upon completion of construction of Zone 40 water facilities, the facilities are granted over to Zone 41 for long-term operations and maintenance and eventually replacement as facilities become older (SCWA, 2005b).

As mentioned above, SCWA seeks to meet future water demands through a conjunctive use program of groundwater, surface water, and recycled water supplies (SCWA, 2005a). Water sources available to SCWA include a maximum yield 69,900 acre-feet/year (af/yr) of groundwater, entitlements of 54,900 af/yr of surface water, and 4,400 af/yr of recycled water. SCWA anticipates its long-term water availability to be approximately 113,937 year, including 40,900 af/yr of groundwater, 68,637 af/yr of surface water, and 4,400 af/yr of recycled wastewater (SCWA, 2005a). SCWA has secured (and is in the process of securing additional) surface water entitlements that would allow SCWA to meet its projected 2030 water demands. SCWA intends to continue to extract groundwater to meet its customer demands within the limits of the negotiated sustainable yield of the Central Basin, as discussed under the Hydrology and Water Quality sub-section of this document. According to the SCWA's Zone 40: Water Supply Master Plan (2003), the SCWA's groundwater supplies are considered reliable, as are those surface water supplies for which SCWA has existing contracts (15,000 af/y from the Central Valley Project and 30,000 af/y from SMUD), and there is reasonable likelihood that these water supplies will continue to be available (SCWA, 2005a).

As of late 2004, Zone 41 facilities included a transmission and distribution system, 65 groundwater production facilities, and 6 million gallons per day (mgd) (expandable to 11 mgd) of nondedicated surface water capacity from the Sacrament River Water Treatment Plant (SRWTP) (SCWA, 2005b). The SCWA WSMP, along with its companion document, the *Zone 40 Water System Infrastructure Plan* (WSIP) (2006) identify both current and proposed water treatment plants, storage facilities, and distribution pipelines needed to serve the Zone 40 area through the year 2030 (SCWA, 2005a)(SCWA, 2006).

Wastewater Collection and Treatment

Sacramento Regional County Sanitation District

Wastewater treatment for the project area is provided by the Sacramento Regional County Sanitation District (SRCSD). SRCSD owns and operates the regional wastewater conveyance system and the Sacramento Regional Wastewater Treatment Plant (SRWTP), located at 8521 Laguna Station Road, approximately seven miles from the project area. SRCSD's contributing agencies – the Sacramento Area Sewer District (SASD) and the cities of Folsom, West Sacramento, and Sacramento – each collect wastewater, while SRCSD is responsible for major conveyance, wastewater treatment, and wastewater disposal. On an average day, 165 million gallons of wastewater is transported through more than 100 miles of SRCSD's interceptor pipe to the SRWTP, which is permitted to treat 181 million gallons per day (mgd) average dry weather flow. At the SRWTP, the wastewater undergoes a secondary treatment process, after which it is safely disposed of into the Sacramento River.

The *Sacramento Regional Wastewater Treatment Plant 2020 Master Plan* (2020 MP) for the SRWTP provides a phased program of recommended wastewater treatment facilities and management programs to accommodate planned growth and to meet existing and anticipated regulatory requirements in the SRCSD service area through the year 2020. The SRWTP 2020 MP uses SACOG population projections multiplied by per capita flow and load values to determine future facilities needs (SRCSD, 2008, p. 14). The current SRWTP capacity of 185 mgd falls short of the projected 218 mgd average dry weather flow in 2020. Therefore, the SRWTP has been master planned to accommodate 350 mgd average dry weather flow (SRCSD, 2008, p. 15). In addition, the SRCSD has prepared a long-range master plan for the large-diameter interceptors that transport wastewater to the SRWTP. The *Regional Interceptor Master Plan 2000* includes interceptor upgrades/expansions to accommodate anticipated growth through 2035 (SRCSD, 2008, p. 5).

Sacramento Area Sewer District

The SASD, formerly known as County Sanitation District-1, provides wastewater collection services in the urbanized unincorporated area of Sacramento County, in the cities of Citrus Heights, Elk Grove, and Rancho Cordova, and in a portion of the cities of Sacramento and Folsom. SASD owns, operates and maintains a network of 4,200 miles of main line and lower lateral pipes within a 268 square-mile areas (SASD, 2010). The collection system pipelines are categorized and based on size, function and hydraulic capacity. Trunk sewers are pipes that function as conveyance facilities to transport the collected wastewater flows to the SRCSD interceptor system. The collection system within the project area includes trunks, which are designed to carry flows from 1 to 10 mgd, and laterals, which are designed to carry flows of less than 1 mgd. The existing Elk Grove trunk line extends southeast from the SRWTP influent diversion structure to Laguna Boulevard, then parallel to SR 99 along E. Stockton Boulevard extending close to the southern City boundary. For the Corporation Yard and Iron Rock Way Sites, lateral lines extend under the existing roadway network northeast from the E. Stockton Boulevard trunk line. For the Grant Line Road Site, a trunk line extends from the E. Stockton Boulevard trunk line northeast under Grant Line Road, passing directly in front of the site (EDAW, 2009, p. 4.5-1).

The *County Sanitation District-1 Sewerage Facilities Expansion Master Plan* estimates the future capital needs of the SASD trunk sewer system, both for capacity relief projects for the existing system and expansion projects to serve newly developed areas. The Master Plan also includes a conceptual plan for providing sewer service to undeveloped areas.

Solid Waste

Solid waste services in the City of Elk Grove are provided by Central Valley Waste Services. Commercial waste in the City of Elk Grove, which includes waste generated by multi-family residential developments, is an "open market", meaning that commercial and multi-family waste in the City is hauled by any permitted hauler selected by the development and is hauled to a variety of permitted landfills chosen by the hauler. Solid waste generated in Elk Grove is taken to a variety of landfills. **Table 31** shows landfills used by the City of Elk Grove and the permitted and remaining capacities of those landfills. As shown, the majority of the landfills serving Elk Grove waste haulers have over 70 percent remaining capacity (CalRecycle, 2010).

TABLE 31
DISPOSAL FACILITIES USED BY ELK GROVE AND THEIR CAPACITIES 2005

Facility	Total Estimated Permitted Capacity (in cubic yards)	Total Estimated Capacity Used		Remaining Estimated Capacity	
		Cubic Yards	Percentage	Cubic Yards	Percentage
Altamont Landfill & Resource Recovery (01-AA-0009)	62,000,000	16,280,000	26.3%	45,720,000	73.7%
Hay Road Landfill, Inc. (B + J Landfill) (48-AA-0002)	28,240,000	5,763,569	20.4%	22,476,431	79.6%
Bakersfield Metropolitan (Bena) SLF (15-AA-0273)	53,000,000	8,181,042	15.4%	44,818,958	84.6%
Foothill Sanitary Landfill (39-AA-0004)	102,000,000	4,100,000	4%	97,900,000	96%
Forward Landfill, Inc. (39-AA-0015)	51,040,000	11,008,942	21.6%	40,031,058	78.4%
Keller Canyon Landfill (07-AA-0032)	75,018,280	6,738,610	9%	68,279,670	91%
L and D Landfill Co. (34-AA-0020)	6,031,055	1,931,055	32%	4,100,000	68%
North County Landfill (39-AA-0022)	17,300,000	-300,000	-1.7%	17,600,000	101.7%
Potrero Hills Landfill (48-AA-0075)	13,300,000	21,500,000	61.9%	8,200,000	38.1%
Sacramento County Landfill (Kiefer) (34-AA-0001)	117,400,000	4,500,000	3.8%	112,900,000	96.2%

Source: CalRecycle, 2010.

REGULATORY FRAMEWORK

The following state and local regulations, plans, programs, and guidelines are applicable to the proposed project. In addition, master planning documents for both water and wastewater services are described in the appropriate sections above.

- State Laws and Regulations

   - California Integrated Waste Management Act

- Local Laws and Regulations

   - Central Valley Regional Water Quality Control Board

PROJECT IMPACTS AND MITIGATION MEASURES

a) – e) Less than Significant. Future development constructed as a result of implementation of the proposed project would be served by the Sacramento Regional County Sanitation District (SRCSD) (interceptor collection and treatment) and Sacramento Area Sewer District (SASD) (local collection). The studies discussed earlier in this section, including the SRCSD Regional Interceptor Master Plan 2000, the SRWTP 2020 Master Plan, and the CSD-1 Sewerage Facilities Expansion Master Plan, identify projected wastewater facilities, infrastructure, and service needs to adequately provide wastewater services to the SRCSD and SASD service areas. Wastewater facilities identified in the plans are also intended to meet regulatory requirements, including wastewater treatment requirements of the CVRWQCB. These facilities include the expansion of the SRWTP, as well as additional interceptor lines, effluent pumps, and solids facilities. Future development on the project sites under the proposed Master Plans would not significantly increase wastewater flows over those anticipated in the SRCSD Regional Interceptor Master Plan 2000, the SRWTP 2020 Master Plan, and the CSD-1 Sewerage Facilities Expansion Master Plan as the project would not increase population in the City and would be consistent with the City's General Plan. Furthermore, future development on the sites would be required to pay connection fees and construct necessary wastewater improvements to ensure adequate financing. Therefore, impacts associated with wastewater treatment requirements and capacity would be **less than significant.**

a) –c) Less than Significant. As described under a)-e) above and d) below, as well as in the Hydrology and Water Quality section above, the project sites are located in an established industrial area with established water, wastewater, and storm drainage infrastructure. Infrastructure to meet future demands, including the future demands of the project sites, have been identified in the various master planning documents for each agency, including the SRCSD Regional Interceptor Master Plan 2000, the SRWTP 2020 Master Plan, the CSD-1 Sewerage Facilities Expansion Master Plan, the SCWA's Zone 40 Water System Infrastructure Plan, and the City's Flood Control and Storm Drainage Master Plan. Future development on the project sites under the proposed Master Plans would be consistent with that projected by these plans. Therefore, the proposed project would not require or result in the construction of new water, wastewater treatment, or storm drain facilities beyond what has been planned for the area and impacts would be **less than significant.**

d) Less than Significant. The project sites are located in a developed industrial area with established water service, which is provided by the SCWA. While the proposed project includes only programmatic approval of the Corporation Yard Facilities Master Plan and the Transit Yard Facilities Master Plan and no facilities are currently being proposed for construction, for purposes of environmental review it is assumed that the facilities identified in the Master Plans will be constructed at some point in the future. Construction and operation of these facilities would place additional demands on SCWA water supplies. As described under the Hydrology and Water Quality sub-section, the SCWA *Zone 41 Urban Water Management Plan* (UWMP) and *Zone 40 Water Supply Master Plan* (WSMP) ensure that a sustainable water supply exists to meet the demand planned in the various land use plans within their service areas. These documents were prepared based on land uses contained in the City of Elk Grove's 2003 General Plan. As future facilities identified in the proposed project are consistent with the City's General Plan, future industrial development on the project sites has been accounted for in the Zone 41 UWMP and the Zone 40 WSMP. Therefore, implementation of the proposed project would not require additional water supply entitlements and/or resources beyond what has already been planned for the project area.

In addition, all future development on the site would use water at a rate consistent with low flow plumbing fixtures and safety equipment, all vehicle wash facilities would recycle the water used to minimize water demand, and all landscaping would be required to utilize landscaping that avoids excessive water demands and that is less vulnerable to periods of severe drought consistent with the Elk Grove Water Use and Conservation Ordinance. Therefore, impacts associated with the water supplies would be **less than significant**.

f) – g) **Less than Significant Impact**. Future development at the proposed project sites would receive solid waste service from the current private haulers permitted by the City. Multiple landfills serving Elk Grove waste haulers have over 70 percent remaining capacity. Furthermore, the City's General Plan DEIR found that landfills serving the City of Elk Grove have permitted capacity to serve future development consistent with the General Plan (City of Elk Grove, 2003b). Furthermore, the City of Elk Grove has met or exceeded the 50 percent diversion rate requirement of AB 939 since 2004 (CalRecycle, 2010). Future development at the project sites would be required to comply with applicable solid waste regulations. Therefore, as landfills would have adequate capacity and the project would be required to comply with any applicable solid waste regulations, solid waste impacts are considered **less than significant**.

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
18. MANDATORY FINDINGS OF SIGNIFICANCE. Would the project:				
a) Have the potential to 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 a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒	☐
b) Have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☐	☒	☐
c) Have environmental effects, which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

DISCUSSION

The following are Mandatory Findings of Significance in accordance with Section 15065 of the CEQA Guidelines.

a) **Less than Significant.** Future facilities under the proposed project would have the potential to impact several special-status plant and wildlife species and their habitat; however, with implementation of mitigation measures **MM 4a-1** through **MM 4a-5** impacts to special-status species and their habitat would be reduced to a less than significant level.

The potential for discovery of or disturbance of historical, archaeological, or paleontological resources, or human remains, is not anticipated. Should such discovery occur, implementation of mitigation measures **MM 5b-1** through **MM 5b-3** would ensure that City policy would be followed and appropriate measures implemented to ensure a less than significant impact to these resources.

Therefore, the proposed project would not be expected to significantly degrade the quality of the environment, substantially reduce the habitat or population of any plant or wildlife species, or eliminate important examples of California history or prehistory.

b) **Less than Significant.** CEQA Guidelines Section 15064(i) states that a Lead Agency shall consider whether the cumulative impact of a project is significant and whether the effects of the project are cumulatively considerable. The assessment of the significance of the cumulative effects of a project must, therefore, be conducted in connection with the effects of past projects, other current projects, and probable future projects.

The proposed project would include the adoption and approval of the Corporation Yard Facilities Master Plan and the Transit Yard Facilities Master Plan. The project would provide for future City facilities necessary to adequately provide City services. New homes or businesses are not proposed as part of the project, and the facilities identified in the Master Plans are expected to serve existing residents in the City, as well as future resident planned for by the City's General Plan and General Plan EIR (SCH# 2002062082). Furthermore, the proposed project sites are in a developed area and, other than site-specific extensions to main lines, would receive water and sewer service from existing infrastructure. No additional roads would be constructed as a result of the project. The proposed project not expected to result in direct or indirect population growth. Therefore, implementation of the project would not result in significant cumulative impacts beyond those described and disclosed in the Elk Grove General Plan EIR adopted by the City Council in 2003 (SCH# 2002062082) and all potential impacts would be reduced to a **less than significant** through the implementation of basic regulatory requirements, and/or conditions of approval incorporated into future project design.

c) **Less than Significant.** The proposed project consists of the adoption and approval of the Corporation Yard Facilities Master Plan and the Transit Yard Facilities Master Plan. The proposed project in and of itself would not create a significant hazard to the public or the environment.

Construction-related air quality, noise, water quality, and hazardous materials exposure impacts would occur temporarily as a result of project construction. However, implementation of basic regulatory requirements and mitigation measures identified in this IS/MND would ensure that impacts are less than significant. Therefore, the proposed project would not have any direct or indirect adverse impacts on humans. This impact would be **less than significant.**

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APPENDIX A
AIR QUALITY AND GHG MODELING

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Urbemis 2007 Version 9.2.4

Summary Report for Summer Emissions (Pounds/Day)

File Name: U:\Projects\Elk Grove\Elk Grove - Corp Yard IS_MND\Urbemis\Construction Emissions.urb924

Project Name: Corporation Yard - Construction Emissions

Project Location: Sacramento County AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

CONSTRUCTION EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
2010 TOTALS (lbs/day unmitigated)	6.14	42.07	25.21	0.00	28.22	2.68	30.90	5.90	2.47	8.36	4,006.25
2011 TOTALS (lbs/day unmitigated)	128.64	56.40	43.75	0.02	28.27	3.73	31.99	5.91	3.43	9.34	6,705.51

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Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: U:\Projects\Elk Grove\Elk Grove - Corp Yard IS_MND\Urbemis\Construction Emissions.urb924

Project Name: Corporation Yard - Construction Emissions

Project Location: Sacramento County AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
2010 TOTALS (lbs/day unmitigated)	6.14	42.07	25.21	0.00	28.22	2.68	30.90	5.90	2.47	8.36	4,006.25
2011 TOTALS (lbs/day unmitigated)	128.64	56.40	43.75	0.02	28.27	3.73	31.99	5.91	3.43	9.34	6,705.51

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2

3/23/2010 11:36:31 AM

Time Slice 11/30/2010-12/27/2010 Active Days: 20	3.03	25.04	13.54	0.00	28.20	1.25	29.46	5.89	1.15	7.04	2,358.97
Fine Grading 11/30/2010-01/11/2011	3.03	25.04	13.54	0.00	28.20	1.25	29.46	5.89	1.15	7.04	2,358.97
Fine Grading Dust	0.00	0.00	0.00	0.00	28.20	0.00	28.20	5.89	0.00	5.89	0.00
Fine Grading Off Road Diesel	3.00	24.99	12.46	0.00	0.00	1.25	1.25	0.00	1.15	1.15	2,247.32
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.03	0.05	1.08	0.00	0.00	0.00	0.01	0.00	0.00	0.00	111.65
Time Slice 12/28/2010-12/31/2010 Active Days: 4	6.14	42.07	25.21	0.00	28.22	2.68	30.90	5.90	2.47	8.36	4,006.25
Asphalt 12/28/2010-01/11/2011	3.10	17.04	11.67	0.00	0.02	1.43	1.44	0.01	1.31	1.32	1,647.29
Paving Off-Gas	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	2.64	15.97	9.18	0.00	0.00	1.39	1.39	0.00	1.27	1.27	1,272.04
Paving On Road Diesel	0.07	0.97	0.34	0.00	0.01	0.04	0.04	0.00	0.04	0.04	151.95
Paving Worker Trips	0.06	0.09	2.15	0.00	0.01	0.00	0.01	0.00	0.00	0.01	223.30
Fine Grading 11/30/2010-01/11/2011	3.03	25.04	13.54	0.00	28.20	1.25	29.46	5.89	1.15	7.04	2,358.97
Fine Grading Dust	0.00	0.00	0.00	0.00	28.20	0.00	28.20	5.89	0.00	5.89	0.00
Fine Grading Off Road Diesel	3.00	24.99	12.46	0.00	0.00	1.25	1.25	0.00	1.15	1.15	2,247.32
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.03	0.05	1.08	0.00	0.00	0.00	0.01	0.00	0.00	0.00	111.65

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Time Slice 1/3/2011-1/10/2011 Active Days: 6	5.78	39.59	24.30	0.00	28.22	2.54	30.76	5.90	2.34	8.23	4,006.48
Asphalt 12/28/2010-01/11/2011	2.93	16.11	11.36	0.00	0.02	1.37	1.38	0.01	1.26	1.26	1,647.43
Paving Off-Gas	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	2.48	15.15	9.07	0.00	0.00	1.33	1.33	0.00	1.22	1.22	1,272.04
Paving On Road Diesel	0.06	0.87	0.31	0.00	0.01	0.03	0.04	0.00	0.03	0.03	151.95
Paving Worker Trips	0.06	0.09	1.98	0.00	0.01	0.00	0.01	0.00	0.00	0.01	223.45
Fine Grading 11/30/2010-01/11/2011	2.86	23.48	12.95	0.00	28.20	1.17	29.38	5.89	1.08	6.97	2,359.04
Fine Grading Dust	0.00	0.00	0.00	0.00	28.20	0.00	28.20	5.89	0.00	5.89	0.00
Fine Grading Off Road Diesel	2.83	23.44	11.96	0.00	0.00	1.17	1.17	0.00	1.08	1.08	2,247.32
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.03	0.04	0.99	0.00	0.00	0.00	0.01	0.00	0.00	0.00	111.73

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Time Slice 1/11/2011-1/11/2011 Active Days: 1	9.46	<u>56.40</u>	<u>43.75</u>	<u>0.02</u>	<u>28.27</u>	<u>3.73</u>	<u>31.99</u>	<u>5.91</u>	<u>3.43</u>	<u>9.34</u>	<u>6,705.51</u>
Asphalt 12/28/2010-01/11/2011	2.93	16.11	11.36	0.00	0.02	1.37	1.38	0.01	1.26	1.26	1,647.43
Paving Off-Gas	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paving Off Road Diesel	2.48	15.15	9.07	0.00	0.00	1.33	1.33	0.00	1.22	1.22	1,272.04
Paving On Road Diesel	0.06	0.87	0.31	0.00	0.01	0.03	0.04	0.00	0.03	0.03	151.95
Paving Worker Trips	0.06	0.09	1.98	0.00	0.01	0.00	0.01	0.00	0.00	0.01	223.45
Building 01/11/2011-08/22/2011	3.67	16.81	19.45	0.01	0.05	1.19	1.23	0.02	1.09	1.11	2,699.03
Building Off Road Diesel	3.39	15.67	10.85	0.00	0.00	1.14	1.14	0.00	1.05	1.05	1,621.20
Building Vendor Trips	0.07	0.81	0.86	0.00	0.01	0.03	0.04	0.00	0.03	0.03	202.13
Building Worker Trips	0.22	0.33	7.75	0.01	0.04	0.02	0.06	0.01	0.01	0.03	875.71
Fine Grading 11/30/2010-01/11/2011	2.86	23.48	12.95	0.00	28.20	1.17	29.38	5.89	1.08	6.97	2,359.04
Fine Grading Dust	0.00	0.00	0.00	0.00	28.20	0.00	28.20	5.89	0.00	5.89	0.00
Fine Grading Off Road Diesel	2.83	23.44	11.96	0.00	0.00	1.17	1.17	0.00	1.08	1.08	2,247.32
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.03	0.04	0.99	0.00	0.00	0.00	0.01	0.00	0.00	0.00	111.73
Time Slice 1/12/2011-8/5/2011 Active Days: 148	3.67	16.81	19.45	0.01	0.05	1.19	1.23	0.02	1.09	1.11	2,699.03
Building 01/11/2011-08/22/2011	3.67	16.81	19.45	0.01	0.05	1.19	1.23	0.02	1.09	1.11	2,699.03
Building Off Road Diesel	3.39	15.67	10.85	0.00	0.00	1.14	1.14	0.00	1.05	1.05	1,621.20
Building Vendor Trips	0.07	0.81	0.86	0.00	0.01	0.03	0.04	0.00	0.03	0.03	202.13
Building Worker Trips	0.22	0.33	7.75	0.01	0.04	0.02	0.06	0.01	0.01	0.03	875.71

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Time Slice 8/8/2011-8/22/2011 Active Days: 11	**128.64**	16.88	20.89	0.01	0.05	1.19	1.24	0.02	1.09	1.11	2,861.93
Building 01/11/2011-08/22/2011	3.67	16.81	19.45	0.01	0.05	1.19	1.23	0.02	1.09	1.11	2,699.03
Building Off Road Diesel	3.39	15.67	10.85	0.00	0.00	1.14	1.14	0.00	1.05	1.05	1,621.20
Building Vendor Trips	0.07	0.81	0.86	0.00	0.01	0.03	0.04	0.00	0.03	0.03	202.13
Building Worker Trips	0.22	0.33	7.75	0.01	0.04	0.02	0.06	0.01	0.01	0.03	875.71
Coating 08/08/2011-09/05/2011	124.97	0.06	1.44	0.00	0.01	0.00	0.01	0.00	0.00	0.01	162.89
Architectural Coating	124.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.04	0.06	1.44	0.00	0.01	0.00	0.01	0.00	0.00	0.01	162.89
Time Slice 8/23/2011-9/5/2011 Active Days: 10	124.97	0.06	1.44	0.00	0.01	0.00	0.01	0.00	0.00	0.01	162.89
Coating 08/08/2011-09/05/2011	124.97	0.06	1.44	0.00	0.01	0.00	0.01	0.00	0.00	0.01	162.89
Architectural Coating	124.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.04	0.06	1.44	0.00	0.01	0.00	0.01	0.00	0.00	0.01	162.89

Phase Assumptions

Phase: Fine Grading 11/30/2010 - 1/11/2011 - Default Fine Site Grading Description

Total Acres Disturbed: 5.63

Maximum Daily Acreage Disturbed: 1.41

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

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Phase: Paving 12/28/2010 - 1/11/2011 - Default Paving Description

Acres to be Paved: 1.41

Off-Road Equipment:

4 Cement and Mortar Mixers (10 hp) operating at a 0.56 load factor for 6 hours per day

1 Pavers (100 hp) operating at a 0.62 load factor for 7 hours per day

1 Paving Equipment (104 hp) operating at a 0.53 load factor for 8 hours per day

1 Rollers (95 hp) operating at a 0.56 load factor for 7 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

Phase: Building Construction 1/11/2011 - 8/22/2011 - Default Building Construction Description

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 6 hours per day

2 Forklifts (145 hp) operating at a 0.3 load factor for 6 hours per day

1 Generator Sets (49 hp) operating at a 0.74 load factor for 8 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

3 Welders (45 hp) operating at a 0.45 load factor for 8 hours per day

Phase: Architectural Coating 8/8/2011 - 9/5/2011 - Default Architectural Coating Description

Rule: Residential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

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Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: U:\Projects\Elk Grove\Elk Grove - Corp Yard IS_MND\Urbemis\Operational Emissions.urb924

Project Name: Corporation Yard - Operational Emissions

Project Location: Sacramento County AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	1.38	0.90	8.40	0.00	0.03	0.03	974.50

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	4.39	36.12	33.51	0.10	7.07	1.72	10,671.07

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	5.77	37.02	41.91	0.10	7.10	1.75	11,645.57

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Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.06	0.80	0.67	0.00	0.00	0.00	960.46
Hearth							
Landscape	0.61	0.10	7.73	0.00	0.03	0.03	14.04
Consumer Products	0.00						
Architectural Coatings	0.71						
TOTALS (lbs/day, unmitigated)	1.38	0.90	8.40	0.00	0.03	0.03	974.50

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Police Department Field Office Expansion	0.47	3.56	3.30	0.01	0.70	0.17	1,051.28
Neighborhood Services Expansion	0.38	2.87	2.66	0.01	0.56	0.14	848.14
Public Works and Code Compliance Office Expansion	1.48	11.23	10.42	0.03	2.20	0.53	3,317.31
New Transit Center Public Counter and Admin Office	0.75	6.28	5.82	0.02	1.23	0.30	1,854.17
New Transit Center Vehicle Maintanence Shop	1.31	12.18	11.31	0.03	2.38	0.58	3,600.17
TOTALS (lbs/day, unmitigated)	4.39	36.12	33.51	0.10	7.07	1.72	10,671.07

Operational Settings:

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Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2011 Temperature (F): 95 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Police Department Field Office Expansion		3.32	1000 sq ft	15.37	51.03	376.08
Neighborhood Services Expansion		3.32	1000 sq ft	12.40	41.17	303.41
Public Works and Code Compliance Office Expansion		3.32	1000 sq ft	48.50	161.02	1,186.72
New Transit Center Public Counter and Admin Office		4.50	1000 sq ft	20.00	90.00	663.30
New Transit Center Vehicle Maintanence Shop		6.99	1000 sq ft	25.00	174.75	1,287.91
					517.97	3,817.42

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	38.6	1.1	98.7	0.2
Light Truck < 3750 lbs	5.0	2.0	92.0	6.0
Light Truck 3751-5750 lbs	11.5	0.9	98.7	0.4
Med Truck 5751-8500 lbs	5.1	1.0	99.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.1	0.0	76.2	23.8
Lite-Heavy Truck 10,001-14,000 lbs	0.4	0.0	55.6	44.4
Med-Heavy Truck 14,001-33,000 lbs	0.7	0.0	18.8	81.2
Heavy-Heavy Truck 33,001-60,000 lbs	0.2	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Urban Bus	36.3	0.0	0.0	100.0
Motorcycle	1.0	62.9	37.1	0.0
School Bus	0.0	0.0	0.0	100.0
Motor Home	0.0	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	10.8	7.3	7.3
Rural Trip Length (miles)	15.0	10.0	10.0	15.0	10.0	10.0
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Police Department Field Office Expansion				2.0	1.0	97.0
Neighborhood Services Expansion				2.0	1.0	97.0
Public Works and Code Compliance Office Expansion				2.0	1.0	97.0
New Transit Center Public Counter and Admin Office				2.0	1.0	97.0
New Transit Center Vehicle Maintanence Shop				2.0	1.0	97.0

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Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: U:\Projects\Elk Grove\Elk Grove - Corp Yard IS_MND\Urbemis\Operational Emissions.urb924

Project Name: Corporation Yard - Operational Emissions

Project Location: Sacramento County AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.77	0.80	0.67	0.00	0.00	0.00	960.46

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	3.34	47.54	29.07	0.10	7.07	1.72	10,153.58

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	4.11	48.34	29.74	0.10	7.07	1.72	11,114.04

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Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.06	0.80	0.67	0.00	0.00	0.00	960.46
Hearth							
Landscaping - No Winter Emissions							
Consumer Products	0.00						
Architectural Coatings	0.71						
TOTALS (lbs/day, unmitigated)	0.77	0.80	0.67	0.00	0.00	0.00	960.46

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Police Department Field Office Expansion	0.33	4.68	2.86	0.01	0.70	0.17	1,000.30
Neighborhood Services Expansion	0.27	3.78	2.31	0.01	0.56	0.14	807.01
Public Works and Code Compliance Office Expansion	1.04	14.78	9.04	0.03	2.20	0.53	3,156.44
New Transit Center Public Counter and Admin Office	0.58	8.26	5.05	0.02	1.23	0.30	1,764.25
New Transit Center Vehicle Maintanence Shop	1.12	16.04	9.81	0.03	2.38	0.58	3,425.58
TOTALS (lbs/day, unmitigated)	3.34	47.54	29.07	0.10	7.07	1.72	10,153.58

Operational Settings:

3/23/2010 11:37:27 AM

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2011 Temperature (F): 50 Season: Winter

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Police Department Field Office Expansion		3.32	1000 sq ft	15.37	51.03	376.08
Neighborhood Services Expansion		3.32	1000 sq ft	12.40	41.17	303.41
Public Works and Code Compliance Office Expansion		3.32	1000 sq ft	48.50	161.02	1,186.72
New Transit Center Public Counter and Admin Office		4.50	1000 sq ft	20.00	90.00	663.30
New Transit Center Vehicle Maintanence Shop		6.99	1000 sq ft	25.00	174.75	1,287.91
					517.97	3,817.42

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	38.6	1.1	98.7	0.2
Light Truck < 3750 lbs	5.0	2.0	92.0	6.0
Light Truck 3751-5750 lbs	11.5	0.9	98.7	0.4
Med Truck 5751-8500 lbs	5.1	1.0	99.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.1	0.0	76.2	23.8
Lite-Heavy Truck 10,001-14,000 lbs	0.4	0.0	55.6	44.4
Med-Heavy Truck 14,001-33,000 lbs	0.7	0.0	18.8	81.2
Heavy-Heavy Truck 33,001-60,000 lbs	0.2	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Urban Bus	36.3	0.0	0.0	100.0
Motorcycle	1.0	62.9	37.1	0.0
School Bus	0.0	0.0	0.0	100.0
Motor Home	0.0	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	10.8	7.3	7.3
Rural Trip Length (miles)	15.0	10.0	10.0	15.0	10.0	10.0
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Police Department Field Office Expansion				2.0	1.0	97.0
Neighborhood Services Expansion				2.0	1.0	97.0
Public Works and Code Compliance Office Expansion				2.0	1.0	97.0
New Transit Center Public Counter and Admin Office				2.0	1.0	97.0
New Transit Center Vehicle Maintanence Shop				2.0	1.0	97.0

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Urbemis 2007 Version 9.2.4

Combined Annual Emissions Reports (Tons/Year)

File Name: U:\Projects\Elk Grove\Elk Grove - Corp Yard IS_MND\Urbemis\Operational Emissions.urb924

Project Name: Corporation Yard - Operational Emissions

Project Location: Sacramento County AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (tons/year, unmitigated)	0.20	0.16	0.82	0.00	0.00	0.00	176.54

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (tons/year, unmitigated)	0.74	7.29	5.85	0.02	1.28	0.31	1,915.99

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (tons/year, unmitigated)	0.94	7.45	6.67	0.02	1.28	0.31	2,092.53

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Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.01	0.15	0.12	0.00	0.00	0.00	175.28
Hearth							
Landscape	0.06	0.01	0.70	0.00	0.00	0.00	1.26
Consumer Products	0.00						
Architectural Coatings	0.13						
TOTALS (tons/year, unmitigated)	0.20	0.16	0.82	0.00	0.00	0.00	176.54

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Police Department Field Office Expansion	0.08	0.72	0.58	0.00	0.13	0.03	188.76
Neighborhood Services Expansion	0.06	0.58	0.46	0.00	0.10	0.02	152.28
Public Works and Code Compliance Office Expansion	0.24	2.26	1.82	0.01	0.40	0.10	595.62
New Transit Center Public Counter and Admin Office	0.13	1.27	1.02	0.00	0.22	0.05	332.92
New Transit Center Vehicle Maintanence Shop	0.23	2.46	1.97	0.01	0.43	0.11	646.41
TOTALS (tons/year, unmitigated)	0.74	7.29	5.85	0.02	1.28	0.31	1,915.99

Operational Settings:

3/23/2010 11:37:38 AM

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2011 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Police Department Field Office Expansion		3.32	1000 sq ft	15.37	51.03	376.08
Neighborhood Services Expansion		3.32	1000 sq ft	12.40	41.17	303.41
Public Works and Code Compliance Office Expansion		3.32	1000 sq ft	48.50	161.02	1,186.72
New Transit Center Public Counter and Admin Office		4.50	1000 sq ft	20.00	90.00	663.30
New Transit Center Vehicle Maintanence Shop		6.99	1000 sq ft	25.00	174.75	1,287.91
					517.97	3,817.42

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	38.6	1.1	98.7	0.2
Light Truck < 3750 lbs	5.0	2.0	92.0	6.0
Light Truck 3751-5750 lbs	11.5	0.9	98.7	0.4
Med Truck 5751-8500 lbs	5.1	1.0	99.0	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.1	0.0	76.2	23.8
Lite-Heavy Truck 10,001-14,000 lbs	0.4	0.0	55.6	44.4
Med-Heavy Truck 14,001-33,000 lbs	0.7	0.0	18.8	81.2
Heavy-Heavy Truck 33,001-60,000 lbs	0.2	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Urban Bus	36.3	0.0	0.0	100.0
Motorcycle	1.0	62.9	37.1	0.0
School Bus	0.0	0.0	0.0	100.0
Motor Home	0.0	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	10.8	7.3	7.5	10.8	7.3	7.3
Rural Trip Length (miles)	15.0	10.0	10.0	15.0	10.0	10.0
Trip speeds (mph)	35.0	35.0	35.0	35.0	35.0	35.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Police Department Field Office Expansion				2.0	1.0	97.0
Neighborhood Services Expansion				2.0	1.0	97.0
Public Works and Code Compliance Office Expansion				2.0	1.0	97.0
New Transit Center Public Counter and Admin Office				2.0	1.0	97.0
New Transit Center Vehicle Maintanence Shop				2.0	1.0	97.0

Corporation Yard
GHG Emission Calculations

Land Use	Dwelling Units (DU) / Square Feet (SF) Proposed Project		Electricity Demand (kWh) per unit	Proposed Project	
Residential (DU)	-	-	6,992	-	-
Commercial (SF)	-	-	14.3	-	-
Office (SF)	-	-	17.3	-	-
Hospital	-	-	27.5	-	-
Public Facility	121,364	-	22.5	2,730,690	-
Industrial (SF)	-	-	7.6	-	-

Sources:

Energy Information Administration. 2009. http://www.eia.doe.gov/emeu/recs/recs2005/c&e/summary/pdf/tableus12.pdf (Accessed March 2010)

Energy Information Administration. 2006. http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set10/2003pdf/c14.pdf (Accessed March 2010)

Direct Emissions

Total Units	URBEMIS CO2 Output	Conversion Factor	Total CO2 Emissions
Area Source	176 tons/year	0.907 metric ton/English ton	160 MT/yr
Mobile Source	1,915 tons/year	0.907 metric ton/English ton	1,737 MT/yr

Indirect Emissions

Indirect Emissions from Electricity Consumption

		CO2 Emissions		CH4 Emissions		N2O Emissions		Total
	MWh/yr	lb/MWh	GWP	lb/MWh	GWP	lb/MWh	GWP	CO2e MT/yr
Total Units	2,731	724.12	1	0.03020	23	0.0081	296	901

Total Units Direct and Indirect Long-Term Emissions **2,797 CO2e metric tons per year**

Sources:

California Climate Action Registry. 2009. General Reporting Protocol v 3.1.

California Energy Commission. 2005. California Energy - Water Relationship Staff Report. http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF (Accessed March 2010)

Emission Reduction Estimates Summary

Mitigation Measure 7.1 Reductions

Anti-Idling

Operation Reductions

Decrease in idling time (hours)	415
Heavy-Duty Truck population targeted	9
Decrease in diesel consumption (gallons)	415
CO_2 Emission Reduction (kg/gallon)	4,212

Emission Reductions

Emission Reductions (Metric Tons CO_2e)	4

Methodology:

- Total construction operations calculated using Urbemis 9.2.4 -Assume heavy trucks idle for one hour per day
- According to http://www.cobbcountyga.gov/green/downloads/meassure37-reduction.pdf, vehicles consume 1 gallon of diesel fuel for every hour of idling. Assume 0.5 gallons per hour for passenger cars

Equipment Maintenance

Emission Reduction (Metric Tons CO_2e)	1

Methodology

Proper equipment maintenance can reduce construction related CO_2 emissions by 0.5%

Source

EPA *Potential for Reducing Greenhouse Gas Emissions in the Construction Sector,* February 2009

Employee Carpool

Emission Reductions

Emission Reduction Estimates Summary

Mitigation Measure 7.1 Reductions

Anti-Idling

Operation Reductions

Decrease in idling time (hours)	415
Heavy-Duty Truck population targeted	9
Decrease in diesel consumption (gallons)	415
CO_2 Emission Reduction (kg/gallon)	4,212

Emission Reductions

Emission Reductions (Metric Tons CO_2e)	4

Methodology:

- Total construction operations calculated using Urbemis 9.2.4 -Assume heavy trucks idle for one hour per day
- According to http://www.cobbcountyga.gov/green/downloads/meassure37-reduction.pdf, vehicles consume 1 gallon of diesel fuel for every hour of idling. Assume 0.5 gallons per hour for passenger cars

Equipment Maintenance

Emission Reduction (Metric Tons CO_2e)	1

Methodology

Proper equipment maintenance can reduce construction related CO_2 emissions by 0.5%

Source

EPA *Potential for Reducing Greenhouse Gas Emissions in the Construction Sector,* February 2009

Employee Carpool

Emission Reductions

then 1 tree reduces energy use by 128.16 kWh per year

C&D Waste Diversion

C&D Waste Reductions

Proposed Squre Footage	121,364
Average C&D Waste Generated (lb/s.f.)	4.34
Total Waste Generated (Metric Tons)	239
Total Waste Diverted from Landfill (Metric Tons)	179

Emission Reductions (Metric Tons CO2e)	32

Methodology:

EPA states the weighted average C&D waste generated in nonresidential construction is 4.34 lb/s.f. Assumed 75% diversion rate consistent with SMAQMD Air Quality Guidelines. Emission were calculated using EPA's WARM Model coefficients.

APPENDIX B
ENVIRONMENTAL SITE ASSESSMENTS

PHASE I ENVIRONMENTAL SITE ASSESSMENT 10250 IRON ROCK WAY ELK GROVE, CALIFORNIA

March 1, 2004

A Report Prepared for:

Ms. Julie D. Cline
City of Elk Grove
Development Services
8400 Laguna Palms Way
Elk Grove, California 95758

PHASE I ENVIRONMENTAL SITE ASSESSMENT
10250 IRON ROCK WAY
ELK GROVE, CALIFORNIA

Kleinfelder Job No. 41134

Prepared by:

Carol J. Hall, R.E.A.
Environmental Assessor

Reviewed by:

Pamela A. Wee
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March 1, 2004

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APPENDICES

1 SUMMARY

A Phase I Environmental Site Assessment (ESA) was conducted for the City of Elk Grove for the property located at 10250 Iron Rock Way. The subject site consists of two separate parcels, one of which has a warehouse/office structure constructed in 2000 and the other parcel remains undeveloped. In summary, Kleinfelder's assessment revealed the following recognized environmental conditions that may have affected the subject site.

1. Regional surface water and groundwater quality concerns were revealed in the local water district Water Quality and Supply Report 2003. Former land use included agricultural fields and pastures. It is possible that persistent pesticides remain onsite. If the City of Elk Grove requires a greater level of certainty as to whether or not residual, persistent pesticides remain onsite, soil samples can be collected for laboratory analyses.

2. Standpipes were apparent on Parcel 1. Buried piping associated with the standpipes may remain and, depending on the date and materials of construction, may contain "Transite". "Transite" is a possible asbestos containing material (ACM), which requires special handling and, if removed, must be disposed in accordance with applicable regulations. We recommend that subsurface piping, when removed, be evaluated as to whether it is likely to contain "Transite". Also, the standpipes were open at the time of the site visit and standpipes may act as conduits of hazardous substances to subsurface soil or groundwater. No obvious evidence of a release of a hazardous substance was observed during the site visit, however, subsurface conditions were not evaluated as a part of this assessment. If evidence of a release of a hazardous substance or petroleum product is observed (i.e. soil staining, unusual odor, etc.) during removal of these features, additional assessment may be required.

3. Three facilities within a ½ mile radius of the site may adversely affect the site if an airborne release of contaminant occurred under wind conditions that directed a release toward the site. These facilities are: World Asphalt (10144 Waterman Road), Georgia Pacific Resins (10144 Waterman Road) and the Suburban Propane facility (Grant Line Road/Waterman Road). Potential hazards included the potential for a hazardous chemical fire or vapor cloud explosion. Further assessment is not recommended, however, the site safety plan should include an evacuation plan.

4. Above ground storage tanks (ASTs) that contain lubricant and waste oil remain onsite. The Envirovault ASTs are constructed with internal secondary containment. Two 55-gallon drums were located on pavement inside the bermed AST storage area. Surface water in the bermed area was observed, and the pavement was stained with a reddish material. It was not clear whether the reddish material originated from the AST or from drums located adjacent to the ASTs, which contained an oily material. Cracks were apparent in the berm that allowed movement of liquid from inside the containment to nearby storm drains. Kleinfelder notified Mr. Scott Cable, Buzz Oates, Inc. and Mr. Cable stated that he would investigate further. We recommend that the unknown reddish material be characterized and properly disposed, the source of the material be identified and repairs made as needed. The 55-gallon drums located within the bermed area should be removed and properly disposed, and cracks in the berm should be repaired.

5. Also, 55-gallon drums which contained an oily material and unknown liquid materials were observed near the northern border of Parcel 2. These drums were not stored in secondary containment. We recommend that the drum contents be characterized and disposed in accordance with applicable regulations.

6. Oil is likely present in an AST in the elevator room in the warehouse on Parcel 2, which was not accessible at the time of the site visit. There was no obvious evidence of a release of oil apparent on walls and flooring outside the elevator room and the elevator was reportedly routinely serviced at the time the warehouse was used by the prior tenant. We recommend that a qualified elevator service company be contacted to evaluate the condition of the tank.

7. Inside the warehouse was a vehicle service pit. The subsurface feature had approximately 1-foot of standing water at the time of the site visit. No obvious sheen (i.e. sheen would be indicative of motor oil or fuel release) was observed, but some water discoloration was apparent. We recommend that the contents of the pit be pumped out, characterized, and that the source of the water be located to evaluate whether there are potential hazardous substance or petroleum product concerns.

In addition to these recognized environmental conditions and deviations, historical environmental conditions, and de minimus findings are discussed in Chapter 8 of this report. This report is subject to the limitations in Chapter 2.

2 INTRODUCTION

2.1 PURPOSE

Kleinfelder conducted an ESA of the subject property. Kleinfelder understands this report will assist the client in understanding environmental conditions associated with the subject property's past and current use. Kleinfelder performed this ESA in general accordance with the scope and limitations of the American Society of Testing and Materials (ASTM); Standard Practice for Phase I Environmental Site Assessment Process E1527-00 and our proposal number 02301PROP/SAC4P048 dated February 4, 2004.

The purpose of this assessment is to assist the client in recognizing "environmental conditions" at the site. A recognized environmental condition is defined by the ASTM standard as "the presence or likely presence of hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater or surface water of the property." The term includes hazardous substances or petroleum products even under conditions in compliance with laws.

Kleinfelder environmental professionals conducting this site assessment included Ms. Carol Hall, R.E.A. I (preparation) and Ms. Pamela A. Wee, D.Env., R.E.A. II (review). Resumes are available upon request.

2.2 DETAILED SCOPE-OF-SERVICES

The following sections describe Kleinfelder's work scope:

- Chapter 2, **Introduction**, includes a discussion of the purpose/reason for performing the Phase I ESA; additional services requested by the client (e.g. an evaluation of business environmental risk factors associated with the property); significant assumptions (e.g. property boundaries if not marked in the field); limitations, exceptions, and special terms and conditions (e.g. contractual); and user reliance parameters.

- Chapter 3, **Site Setting**, is a compilation of information concerning the site's location, legal description (if available), current and proposed use of the subject site, a description of structures and improvements on site at the time of Kleinfelder's assessment, and current uses of adjoining properties.

- Chapter 4, **Records Review**, is a compilation of Kleinfelder's review of several databases available from the federal, state, and local regulatory agencies regarding hazardous substance use, storage, or disposal at the subject site; and for off-site facilities up to a mile radius from the site. Environmental liens or activity and use limitations are included in this chapter. Records provided by the client are summarized and copies of relevant documents are included in the Appendices of this report. Interviews and telephone conversations conducted by Kleinfelder with regulatory agency representatives are included in Chapter 4. Other interviews with people knowledgeable about the site (including the client) are included in Chapter 7.

- Chapter 5, **History of the Site**, summarizes the history of the site and adjoining properties. This site history is based on various sources which may include: a review of aerial photographs, Sanborn Fire Insurance Maps, city or suburban directories, historical topographic maps, building department records, previous assessments, and a chain-of-title/ preliminary title report (if provided by the client).

- Chapter 6, **Site Reconnaissance**, describes Kleinfelder's site observations at the time of the site reconnaissance. The methodology used and limiting conditions are described.

- Chapter 7, **Interviews**, is a summary of telephone and personal interviews conducted with "Key Managers" that may include the owner/manager of the facility, occupants/tenants, local government officials, and the client. Additional interview sources may be contacted if "Key Managers" are not available prior to production of this report and may include adjacent landowners and people with historical knowledge of the area.

- Chapter 8, **Evaluation**, is a presentation of our findings and opinions regarding the information in Chapters 3 through 7, and presents our conclusion regarding the presence of environmental conditions of concern at the site.

- Chapter 9, **References**, is a summary of the resources used to compile this report.

Pertinent documentation regarding the subject site is included in Appendices of this report.

2.3 ADDITIONAL SERVICES

An evaluation of business environmental risk associated with the parcels was not included in Kleinfelder's scope of work. The ESA does not incorporate non-scope considerations, such as asbestos-containing materials, radon, lead-based paint, lead in drinking water, wetlands, regulatory compliance, cultural and historical resources, industrial hygiene, health and safety, ecological resources, endangered species, indoor air quality, and high voltage power lines.

2.4 SIGNIFICANT ASSUMPTIONS

The subject property is hereafter referred to as the "site.

2.5 LIMITATIONS AND EXCEPTIONS

Phase I ESAs are non-comprehensive by nature and are unlikely to identify all environmental problems or eliminate all risk. The attached report is a qualitative assessment. Kleinfelder offers a range of investigative and engineering services to suit the needs of our clients, including more quantitative investigations. Although risk can never be eliminated, more detailed and extensive investigations yield more information, which may help you understand and better manage your risks. Since such detailed services involve greater expense, we ask our clients to participate in identifying the level of service, which will provide them with an acceptable level of risk. Please contact the signatories of this report if you would like to discuss this issue of risk further.

Kleinfelder performed this environmental assessment in general accordance with the guidelines set forth in the ASTM Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process (Designation E-1527-00), and subsequently approved by you as our client. No warranty, either express or implied is made. Environmental issues not specifically addressed in the report were beyond the scope of our work and not included in our evaluation.

Land use, site conditions (both on-site and off-site) and other factors will change over time. Since site activities and regulations beyond our control could change at any time after the completion of this report, our observations, findings and opinions can be considered valid only as of the date of the site visit. This report should not be relied upon after 180 days from the date of its issuance (ASTM Standard E-1527, Section 4.6). Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party.

2.6 SPECIAL TERMS AND CONDITIONS

No special terms and conditions in addition to those discussed in the previous Chapters were agreed to by the User and Kleinfelder, Inc.

3 SITE SETTING

The site setting is presented to assess the significance of potential on- and off-site contaminant migration, if present. The site location is shown on Plate 1 in Appendix A. Tables 1 through 5 provide the physical characteristics of the site and bordering properties.

3.1 LOCATION AND LEGAL DESCRIPTION

The information presented in Table 1 describes the physical location and legal description of the subject site. This information was obtained from maps, public records, and interviews.

TABLE 1
LOCATION AND LEGAL DESCRIPTION

ADDRESS	10250 Iron Rock Way Elk Grove, California
LOCATION	The southern site border is Elkmont Way, the northern site border is Union Park Way, and the eastern site border is Iron Rock Way in Elk Grove, California. The site is located north of the Highway 99 and Grant Line Road intersection in Sacramento County.
TOWNSHIP & RANGE	Township 6 North, Range 6 East, Section 7
ASSESSOR'S PARCEL NUMBER	Parcel 1: 134-0630-013 Parcel 2: 134-0630-034
LEGAL DESCRIPTION	None provided
ACREAGE	Parcel 1: 5.62 ± acres Parcel 2: 6.10 ± acres
ZONING	Parcel 1: Vacant Industrial Economically ready for development (IGGCFA) Parcel 2: Industrial (GCGBOA - Industrial Distribution and Warehouse)

3.2 SITE AND VICINITY GENERAL CHARACTERISTICS

The site is located in an area of relatively level terrain. Land use on site and in the general vicinity appeared to be industrial/commercial mix at the time of Kleinfelder's assessment. Groundwater information is included on Table 2 below.

TABLE 2
GROUNDWATER INFORMATION

DEPTH TO REGIONAL GROUNDWATER (Source - for example: Sacramento County Department of Public Works, Fall 1999 Groundwater Elevations map)	The depth to groundwater was depicted at approximately 40 feet below Mean Sea Level. Therefore, based on surface elevation of approximately 45 feet above Mean Sea Level, depth to groundwater is estimated at approximately 85 feet below ground surface. General groundwater depth may be influenced by local pumping, rainfall, and irrigation patterns.
DIRECTION OF ANTICIPATED FLOW (Source - for example: Sacramento County Department of Public Works, Fall 1999 Groundwater Elevations map)	The estimated direction of groundwater flow is in a westerly direction because of the influence of a cone of depression associated with the City of Elk Grove.
REGIONAL GROUNDWATER QUALITY PROBLEMS (Source: EDR Radius Report, Geocheck Version 2.1 Summary)	Regional surface water and groundwater quality concerns were revealed during Kleinfelder's assessment (see discussion in Chapter 4.2).

3.3 CURRENT/PROPOSED USE OF THE PROPERTY

Current and proposed uses are described in Table 3.

TABLE 3
CURRENT/PROPOSED USES

CURRENT USE	Parcel 1: Vacant, undeveloped land with seasonal vegetation. Parcel 2: Industrial warehouse with offices and a parking area. Oil/lubricant above ground storage tanks are located adjacent to the south side of the warehouse.
PROPOSED USE	Parcel 1: Future development. Parcel 2: Similar land use.

3.4 DESCRIPTION OF STRUCTURES/IMPROVEMENTS

Structures and/or improvements observed on site at the time of Kleinfelder's site reconnaissance are described in Table 4.

TABLE 4
STRUCTURES/IMPROVEMENTS

	GENERAL OBSERVATIONS
STRUCTURES	Parcel 1: None observed. Parcel 2: Approximately 60,000 sq. ft. concrete tilt-up warehouse and office building, 2-story, with a pit for vehicle servicing.
IMPROVEMENTS	Parcel 1: None observed. Parcel 2: Pit for servicing vehicles inside warehouse and an elevator room.

3.5 CURRENT USES OF ADJOINING PROPERTIES

Kleinfelder conducted a brief drive-by survey of the parcels adjoining the site on the same day as the site reconnaissance. A summary of the surrounding properties is presented on Table 5.

TABLE 5
SURROUNDING PROPERTIES

NORTH	Vacant field north of Union Park Way.
SOUTH	Vacant field south of Elkmont Way.
EAST	Vacant field east of Iron Rock Way.
WEST	Hayes Brothers Collision Repair business.

The adjoining properties are not likely to adversely affect the subject site, based on apparent land use.

4 RECORDS REVIEW

4.1 STANDARD ENVIRONMENTAL RECORD SOURCES

The purpose of the records review is to obtain and review records that would help to evaluate recognized environmental conditions of potential concern in connection with the subject site and bordering properties.

Federal, state and local regulatory agencies publish databases or "lists" of businesses and properties that handle hazardous materials or hazardous waste, or are the known location of a release of hazardous substances to soil and/or groundwater. These databases are available for review and/or purchase at the regulatory agencies, or the information may be obtained through a commercial database service. Kleinfelder contracted with a commercial database service, Environmental Data Resources (EDR), to review the regulatory agency lists for references to the site and any listings within the appropriate ASTM minimum search distance to the site. The search radius was extended by ¼ mile because of the size of the parcels (i.e. greater than 4 acres). The EDR database search results are included in Appendix C, Regulatory Agency Database Summary. A description of the types of information contained in each of the databases reviewed and the agency responsible for compiling the data is included in the EDR Radius Report. Many of the federal and state databases reviewed by EDR are summarized on Table 6.

TABLE 6
RECORDS REVIEW-SEARCH DISTANCE

FEDERAL/LOCAL		STATE/LOCAL	
National Priority List (NPL)	1-mile	Cal-Sites, Bond Expenditure Plan (BEP), Annual Work Plan (AWP)	1-mile
Resource Conservation Recovery Act (RCRA)-CORRACTS TSDF	1-mile	CORTESE (formerly Hazardous Waste Substances)	½-mile
Comprehensive Environmental Response Compensation Liability Information System (CERCLIS)	½-mile	Leaking Underground Storage Tank (LUST)	½-mile
RCRA-non CORRACTS TSD	½-mile	(Spills, Leaks, Incidents, Complaints) SLIC	½-mile
RCRA-GEN, HAZNET, Sac County Master List (ML)	Site & adjoining	SWIS/SWAT/SWF/LF	½-mile
CERCLIS-NFRAP (No Further Remedial Action Planned)	Site & adjoining	UST, CaFID, HistUST	Site & adjoining
ERNS	Site	Sacramento County Master List (ML) and Contaminated Sites (CS)	Site & adjoining

The subject site was not listed on regulatory agency databases researched by EDR.

Off-site, there were 9 facilities listed within the ASTM search distance. One of these facilities, World Asphalt, has the potential to affect the site if there is a future airborne release. Two additional facilities were revealed during review of the City of Elk Grove Planning Department's environmental assessments (see Chapter 4.2). Otherwise, these facilities are not likely to have adversely affected the subject site for the reasons discussed in the summaries that follow:

Apple Computer, Inc. was formerly located at 10175 Iron Rock Way (cross-corner from the subject site). This building was vacant at the time of Kleinfelder's site visit. Apple Computer, Inc. stored small quantities of hazardous materials, but no violations were reported. Hazardous waste including inorganic solid waste and off-specification, aged, or surplus inorganic waste was removed to transfer stations for disposal. A review of the Sacramento County Master List (ML) at the Sacramento County Environmental Management Department (SCEMD) office did not reveal underground storage tanks (USTs) at this facility. Therefore, since there are no violations or releases reported, this facility is not likely to have adversely affected the subject site.

Hayes Brothers Collision Repair, located at 9141 Elkmont Way (adjacent to the west of the site) was listed on several databases that report generators of hazardous materials and waste. There were no violations reported. Hazardous waste disposed at transfer stations included oxygenated solvents and unspecified organic liquid mixtures. No USTs were reported at the facility according to the EDR Radius Report. Therefore, since there are no violations or releases reported, this facility is not likely to have adversely affected the subject site.

The Kingsford Charcoal Company located at 10000 Waterman Road (within ½ mile west of the site), was listed on the Sacramento County CS list following a release of diesel fuel on May 10, 1989 that affected soil. A second release of a hazardous substance was reported in the Toxics binder at SCEMD. The release reportedly occurred on February 2, 1992 and the case status was listed as closed May 3, 1994. Excavation and treatment were the listed remediation methods in the SCEMD file. Also, according to SCEMD records reviewed, this facility was out of business prior to July 1, 1998. Based on distance, case status, and the media affected (soil), these releases are not likely to have adversely affected the subject site.

ARCO #5752 located at 10466 Grant Line Road (within ½ mile south of the site) was listed on the leaking UST database following a release of gasoline. The media affected was not included in the EDR report. A preliminary site assessment was reported as underway on the EDR Radius

Report. However, the Toxics binder at SCEMD did not report action taken. Four USTs reportedly remain at this facility according to the Sacramento County ML. Permits for the USTs were requested in 1991 according to the UST Install binder at SCEMD. Based on the location of the facility relative to the anticipated direction of groundwater flow (westerly direction), it is not likely that a release from this facility would affect groundwater beneath the subject site. Therefore, additional assessment is not recommended.

World Asphalt located at 10144 Waterman Road (within ½ mile northeast of the site) had a reported release of Stoddard solvent in 1999 according to the Leaking Underground Storage Tank (LUST) database. Three USTs reportedly remain at this facility according to the Sacramento County ML file at SCEMD. The release was discovered on September 9, 1999. The Sacramento County CS database reported a release of mineral spirits on June 9, 1999 that affected soil only. Review of Sacramento County ML files at SCEMD revealed that the case has been closed, however the date of closure and method of remediation were not provided in the SCEMD record reviewed. This facility is reportedly an active underground storage tank location. Air contamination was reported at this facility that was associated with burning Ashland mineral spirits. Based on the proximity of the facility to the subject site and the anticipated direction of groundwater flow in a westerly direction, this facility is not likely to have affected groundwater beneath the subject site. Depending on direction and speed of wind, an airborne release may affect the subject site.

Transcon Lines located at 10401 Grant Line Road (within ½ mile southeast of the subject site) was listed on numerous databases because of a release of diesel that affected soil only in 1989. A preliminary site assessment workplan was submitted. The facility was listed on the Sacramento ML in the EDR Radius Report and at SCEMD as "Out of Business". Since soil was the only reported media affected and the facility is not located adjacent to the subject site, this facility is not likely to have adversely affected the subject site. Additional assessment is not recommended.

The Flying V Service Station (aka Chuck's Mini-Mart) located at 10473 Stockton Boulevard (approximately ½ mile west of the site was listed on the databases reporting a release of a petroleum product. A release of gasoline affected groundwater in 1990. The case has since been closed (April 15, 1998) and the service station is reportedly no longer active. Five USTs were reportedly removed from this facility according to the UST Removal list reviewed at SCEMD. Therefore, based on case status and inactive business status this reported release is not likely to have affected the subject site. Additional assessment is not recommended.

The Georgia Pacific Resins, Inc. business located at 10399 East Stockton Boulevard (approximately ½ mile west of the site) was listed on numerous databases that report large quantity generators of hazardous materials/waste, air contamination, and releases of hazardous substances or petroleum products. Several minor incidents were reported on the California Hazardous Materials Incident Report (CHMIRs) database, involving small quantities released that are not likely to have adversely affected the subject site (i.e. truck overfill, hose rupture, release of product to ditch at the facility). The facility was listed on the SLIC database based on a release of perchloroethylene (PCE) a solvent. Phenols reportedly affected soil only at the facility according to a Sacramento CS database listing. Based on distance and direction relative to groundwater flow, this facility is not likely to have affected the subject site. Additional assessment is not recommended.

The Conoco Asphalt Terminal at 10090 Waterman Road (approximately ½ mile northeast of the site) was listed on numerous databases that report releases of hazardous substances, waste discharges, and hazardous materials generators. A release of diesel occurred in 1986, which reportedly affected soil only. The case has been closed according to the EDR Radius Report and Geotracker (State of California, Department of Water Resources database). Additional assessment of this report is not recommended based on the case status as closed. The Toxics list at SCEMD listed this facility with an active case following a release on August 3, 1993 that was not included on the EDR Radius Report or Geotracker. Based on the business type, likely contaminants, and anticipated direction of flow, this facility is not likely to adversely affect the subject site. Further assessment is not recommended.

Facilities listed on EDR's Orphan Summary of unplottable facilities were not located within the ASTM search radius of the subject site. Numerous public water wells were located within a 1-mile radius of the subject site as described beginning on page A-6 of the EDR Radius Report in Appendix C. The Geotracker data included in Appendix D also provides some public well information.

4.2 ADDITIONAL AGENCY ENVIRONMENTAL RECORDS

Local regulatory agencies were contacted for reasonably ascertainable and practically reviewable documentation regarding recognized environmental conditions present at the subject site and adjacent facilities. Interviews with local regulatory agency representatives are included in Chapter 7.0 of this report. The following agencies were contacted for documentation.

☒.......Sacramento County Air Quality Management District (SCAQMD)
☒.......Sacramento County Agricultural Commissioner's office
☒.......Sacramento County Building Department
☒.......Sacramento County Environmental Management Department (SCEMD)
☒.......Sacramento County Environmental Health (SCEMD)
☒.......City of Elk Grove Fire Department
☒.......City of Elk Grove Planning Department
☒.......County Office of Emergency Services (included in SCEMD)
☒.......State of California, Regional Water Quality Control Board
☐.......State of California, Department of Conservation, Division of Oil and Gas
☐.......State of California, Department of Toxic Substances Control
☐.......State of California, Department of Water Resources
☒.......State of California, Fire Marshall, Pipeline Safety Office
☒.......Sacramento Municipal Utility District
☒.......Elk Grove Water District

The State of California Department of Conservation, Division of Oil and Gas was not contacted because information about oil wells and gas fields was obtained from the Munger Maps (see Table 7). The State of California Department of Toxic Substances Control were not contacted because there were no facilities revealed through database review or the site reconnaissance likely to have had a release where this department is the lead agency according to the EDR Radius Report. The State of California Department of Water Resources was not contacted for public well information because this information is now available as a part of the EDR Radius Report (see Appendix C).

Sacramento County Air Quality Management District (SCAQMD)

Mr. Jim Jester, SCAQMD was contacted by facsimile to provide information about air permits for the subject site and adjacent properties. Mr. Jester reported three active permits and three violations for Hayes Brothers Collision at 9141 Elkmont Way (adjacent to the west of the subject site). There were no violations reported for the subject site or the collision shop at 9131 Elkmont Way (adjacent to the west of Hayes Brothers Collision). Permits for 9141 Elkmont Way are for paint spray booths. The violations reported are associated with prior occupants of the building, with the exception of a violation dated December 12, 2001, which was for failure to apply for a permit to operate. Prior violations were dated 1998 and 1999 and included failure to close containers of volatile organic chemicals (VOCs) and failure to maintain records, respectively.

None of these violations are associated with environmental conditions likely to adversely affect the subject site.

Sacramento County Agricultural Commissioner's Office

Mr. Danny Sarasino was contacted via facsimile for information about the use of pesticides at the subject site. A response to our request for information was not received prior to production of this report. If a response, once received, changes our conclusions or recommendations we will contact the City of Elk Grove.

Sacramento County Building Department

Information obtained from the Sacramento County Building Department is primarily historical information, and therefore is provided in Chapter 5.5.

Sacramento County Environmental Management Department (SCEMD)

SCEMD maintains a set of binders that were reviewed to evaluate whether there were potential environmental conditions associated with nearby facilities (e.g. hazardous material generators, water wells, underground storage tanks, complaints, incidents, or toxic sites). In summary, review of the binders listed below did not reveal additional facilities likely to have adversely affected the site.

1. UST Removal Binder, November 15, 1999.
2. UST Installations Binder, November 15, 1999.
3. Complaints Binder, February 3, 2004.
4. Toxic Sites, January 29, 2004.
5. Master List-Out of Business, July 1, 1998.
6. Master List (ML)-Inspection Inventory Report, February 3, 2004.
7. Wells, December 4, 1998.

Information obtained from SCEMD binders concerning nearby facilities has been included with the discussion of information provided in the EDR Radius Report, Chapter 4.1. The subject site was not listed on any of the SCEMD binders reviewed.

City of Elk Grove, Fire Department

The City of Elk Grove Community Service District Fire Department was contacted by telephone (916-685-9502) for information about hazardous material incidents onsite or in the vicinity of the site. Their receptionist stated that they do not maintain incident reports for public review and suggested that we contact the SCEMD (see SCEMD results in prior paragraph).

City of Elk Grove Planning Department

The web page for the City of Elk Grove's Planning Department was reviewed for information concerning hazardous materials in the vicinity of the site. Kleinfelder reviewed an environmental report prepared by EDAW for the City of Elk Grove's Grant Line Road/SR 99 Interchange Reconstruction Project listed on the web page. Excerpts of the report are included in Appendix D. The Georgia Pacific Resins facility and Suburban Propane terminal were considered potential risk facilities according to the summary in Chapter 3.8, Hazards/Toxic and Hazardous Waste. A release of propane at the Suburban Propane terminal has the potential to result in a hazardous chemical fire and a vapor cloud explosion could result in exposure to a blast wave. Potential risks at the Georgia Pacific Resins facility were associated with a potential for release of formalin and exposure to toxic gas in the form of a toxic vapor cloud. Based on the proximity of the study area and these facilities with reference to the subject site, it appears that the subject site may also be affected from an accidental incident or intentional act (e.g. vandalism, terrorism) at these two facilities.

State of California, Regional Water Quality Control Board

The Geotracker database was used to obtain information about LUST facilities listed in the EDR Radius Report (Chapter 4.1). Copies of information received are included in Appendix D.

State of California, Fire Marshall, Pipeline Safety Office

Mr. Medasdo Belrosario was contacted by facsimile to provide information about oil and gas pipelines nearby the site. A response to our request for information was not received prior to production of this report. If a response, once received, changes our conclusions or recommendations we will contact the City of Elk Grove.

Sacramento Municipal Utility District (SMUD)

Mr. John Sheridan, SMUD was contacted by telephone (916-732-5730) to provide information about the pad mounted transformer located on the southeast corner of the site. A response to our request for information was not received prior to production of this report. If a response, once received, changes our conclusions or recommendations we will contact the City of Elk Grove.

Water District

The Elk Grove Water District service area includes the subject site. According to their Water Quality and Supply Report (June 2003, www.egws.org), drinking water in the area may contain small amounts of some contaminants. Contaminants that may be present in source water include: microbial contaminants (e.g. viruses and bacteria), inorganic contaminants (e.g. salts and metals), pesticides and herbicides, organic chemical contaminants, and radioactive contaminants. Iron and manganese in groundwater appear to exceed the Maximum Contaminant Level (MCL) for drinking water according to the Water Quality Report Card 2002. A copy of the Water Quality and Supply Report is included in Appendix D.

4.3 PHYSICAL SETTING SOURCE(S)

Table 7 presents information about the physical setting of the site. This information was obtained from published maps.

TABLE 7
PHYSICAL SETTING

USGS TOPOGRAPHIC QUADRANGLE	Elk Grove Quadrangle, 7.5 Minute Map, Mount Diablo Base and Meridian (1968, photo-revised 1975).	The site is located at approximately 45 feet above Mean Sea Level, and slopes gradually to the southwest. There were no wells or water features observed onsite. A small structure (e.g. residence or similar) was depicted on the northeast section of the site (Parcel 1). Unimproved roads were constructed on the northern and eastern site borders. Land use in the vicinity of the site was rural. The Southern Pacific Railroad (currently Union Pacific Railroad) was depicted several hundred feet to the east of the site.
GEOLOGIC MAP	Geologic Map of California, State of California Department of Conservation 1977; Scale: 1 inch = 12 miles	The subject site lies on the north central margin of the Great Valley Geomorphic Province in north central California. Alluvium, lake, playa, and terrace deposits; that were mostly marine and unconsolidated and semi-consolidated were depicted on the map.

TABLE 7 (Continued)
PHYSICAL SETTING

SOIL TYPE	Soil Survey of Sacramento County, April 1993, Sheet 12.	Soil onsite was depicted as San Joaquin-Galt complex, leveled, 0 to 1 percent slopes and San Joaquin silt loam, leveled, 0 to 1 percent slopes on Parcel 1; and San Joaquin-Galt complex, leveled, 0 to 1 percent slopes on Parcel 2. The Soil Survey description of these soil types are included in Appendix D. In summary: The San Joaquin soil is in areas that were slightly cut when leveled and the Galt soil is in areas that were slightly filled when leveled. The soil is moderately deep and moderately well drained. Permeability is slow in both the San Joaquin and Galt soil. *Note: A feature resembling a soil or debris pile was evident in the northeast corner of the agricultural field on Parcel 1. The soil survey map was compiled by the U.S. Department of Agriculture and cooperating agencies using aerial photographs from1970-1977.*
OIL AND GAS FIELDS	Munger Map, 1997, Page W-13.	Oil and gas fields were not depicted on the map.

Information about the regional geology is presented on Table 8. This information was obtained from published data and maps, interviews with public agencies, and/or from previous investigations conducted by Kleinfelder in the vicinity of the site.

TABLE 8
REGIONAL GEOLOGY AND HYDROGEOLOGY

REGIONAL GEOMORPHIC PROVINCE	The site is located in the Great Valley Geographic Province in Central California. This province was formed by the filling of a large structural trough or downwarp of the underlying bedrock. The trough is situated between the Sierra Nevada Mountains on the east and the Coast and Cascade Ranges on the west. The trough, which underlies the valley, is asymmetrical with the greatest depth of sediments along the western margin. The sediments that fill the trough originated as erosional debris from the adjacent mountains and foothills.
REGIONAL GEOMORPHIC PROVINCE	The site is located within the northern one-third of the Great Valley, which is known as the Sacramento Valley. The Sacramento Valley is characterized by deep accumulations of Cretaceous to Quaternary Age sediments. Total thickness of these sediments is in the order of thousands of feet. The majority of the native sediments in the area consist of Pliocene to Holocene continental rocks and deposits consisting of heterogeneous mix of generally poor sorted clay, silt, sand, and some gravel. The valley geomorphology includes dissected uplands, low alluvial plains and fans, river floodplains and channels, and overflow lands and lake bottoms.

4.4 USER PROVIDED INFORMATION

Information provided by the client, included maps of the site and real estate sale/lease information.

5 HISTORICAL USE OF THE PROPERTY AND ADJOINING PROPERTIES

The history of the site was reviewed to identify obvious uses of the site from the present to first developed use, or back to 1940, whichever is earlier, from readily available resources. Table 9 summarizes the availability of information reviewed during this assessment.

TABLE 9
HISTORICAL SOURCES

	Years reviewed	Availability
AERIAL PHOTOGRAPHS	1937, 1952, 1961, 1971, 1981, 1993	EDR, Inc.
SANBORN FIRE INSURANCE MAPS		EDR, Inc. reported none available.
POLK AND HAINES CRISS-CROSS DIRECTORIES		EDR, Inc. reported none available.
HISTORICAL TOPOGRAPHIC MAP REPORT	1947, 1968, 1975, 1979	EDR, Inc.
BUILDING DEPARTMENT	2000 to 2002	Sacramento County Building Department
PREVIOUS ASSESSMENT(S)		None provided for Kleinfelder's review.
CHAIN-OF-TITLE OR PRELIMINARY TITLE REPORT		None provided for Kleinfelder's review.

5.1 AERIAL PHOTOGRAPHY

Historical aerial photographs were reviewed to evaluate past land use at the site and in the surrounding area. Aerial photographs covering 56 years were available during the time frame of this report. Reference information (e.g. scale, reference id, photograph provider) is provided at the bottom of the copies of the monoscopic aerial photographs provided by EDR, Inc., which are included in Appendix B. The quality of the photographs was generally good, however, some features were not clearly depicted because of the scale of the photograph available.

In 1937, the subject site boundaries were not readily apparent because they do not appear to follow former drainage and unimproved roadways, as is often the case. In 1937 an unimproved roadway bisected Parcel 1 in an east-west direction at the approximate current location of a row of fencing and standpipes (see site reconnaissance description in Chapter 6.0). To the south of the unimproved roadway onsite was an area that appeared to have several large trees and a few structures, likely barns and sheds. The surrounding area was not developed in 1937. A railroad track, which remains today, was apparent approximately 600 feet to the east of the site. Highway 99 was apparent almost 2,000 feet to the west of the site. General land use onsite and in the surrounding area appeared to be flood irrigated crops or dry crops. Field boundaries were apparent, but shaded areas indicated water features.

By 1952 the structures were no longer apparent onsite. Land use onsite and in the surrounding area remained agricultural with defined rows apparent. In 1981 the area where former structures were observed appeared to be disturbed. The clarity of the photograph prevented identification of the features or evaluation as to whether they were associated with dumping, spilling, leaking or disposal of wastes. Large tanks were apparent off-site in 1981 approximately 800 feet south of Parcel 2. These tanks may have been associated with a large propane business (Suburban Propane) currently located just north of Grant Line Road. A large pond was constructed approximately 150 feet south of the site. It was not clear whether the pond was associated with the propane facility or was a man-made drainage feature.

By 1993 roads were apparent on the northern, eastern, and southern boundaries of the site. The site remained undeveloped. Numerous warehouses were apparent to the west of the railroad tracks in the vicinity of the site. Two warehouse-size structures matching the footprint of buildings currently located adjacent to the west of the site (see Chapter 6.0 discussion) were apparent. The parcels to the north, south, and east of the site were undeveloped.

NOTE: Aerial photographs only provide information on indications of land use and no conclusions can be drawn from photographs alone.

5.2 SANBORN FIRE INSURANCE MAPS

Sanborn Fire Insurance Maps provide historical land use information for some metropolitan and small established towns. Kleinfelder, Inc. requested a search of Sanborn Fire Insurance Maps by EDR. Sanborn Fire Insurance Maps were not available for the subject site (see Appendix B).

5.3 POLK AND HAINES CRISS-CROSS DIRECTORIES

Polk City Directories and Haines Criss-Cross Directories provide information regarding property occupants by address. The subject site was not developed with a building likely to have an address until 2000. The 1937 aerial photograph depicted structures onsite, however, there was no obvious address associated with the structures because current roads were not constructed at that time. Kleinfelder ordered a Historical Directories report from EDR, Inc. to substantiate this information. EDR did not report the subject site as listed on directories reviewed. A copy of the EDR, Inc. Historical Directory report is included in Appendix B.

5.4 HISTORICAL TOPOGRAPHIC MAP REVIEW

Historical topographic maps (7.5 and 15 Minute Series) from EDR, Inc. were provided for Kleinfelder's review. Copies are provided in Appendix B. A residential size structure was apparent on the south side of an unimproved road in the approximate current location of Union Park Way on the 1947 topographic map. Union Park Way forms the northern site border, therefore, this feature appears to have been located onsite. No other features were apparent in 1947 onsite. Highway 99, the current Union Pacific Railroad tracks, and Grant Line Road were apparent in the vicinity of the site; to the west, east, and south of the site respectively. The structure was no longer apparent on the 1968 topographic map. An unimproved road matching the approximate location of Elkmont Way was apparent on the south side of the site by 1968. Also, adjacent to the south of the site was a water well. The subject site remained relatively unchanged in 1975 topographic map. By 1975 a pond was apparent off-site and adjacent to the well to the south of the site. Two large above ground storage tanks were depicted in 1975 at the approximate location of the propane tanks currently located adjacent to the north of Grant Line Road and west of the Union Pacific Railroad tracks. There were no significant changes to the site and surrounding area between 1975 and 1979.

5.5 BUILDING DEPARTMENT RECORDS

Construction records and Certificate of Occupancy records were reviewed at the Sacramento County Building Department on February 26, 2004. A copy of the site map and Certificate of Occupancy are included in Appendix D. The Certificate of Occupancy lists Auto Choice as the tenant on October 20, 2000. The building owner was listed as Mr. Marvin Oates (Permit No. CBN1999-00159). The site map includes detail diagrams of the work stations, mechanics module (subsurface feature inside the warehouse), and lift station. The mechanics module includes a parts washer, tire changer, brake service area, battery charger, and general workstation. A lift station on the northwest corner of the building was depicted as having electrical lifts. A Napa Parts room likely was used for storage of materials. There was no obvious evidence of a release of petroleum product or hazardous substance observed in this room at the time of the site visit.

5.6 PREVIOUS ASSESSMENTS

Previous assessments were not provided for Kleinfelder's review and were not revealed during research of other historical sources for this report.

5.7 PRELIMINARY TITLE REPORT

A draft Preliminary Title Report was not provided for Kleinfelder's review. A Chain of Title Report was not provided to Kleinfelder, Inc. for review prior to production of this report. These documents may provide information about land including ownership and other interests in the land, easements, and liens. Not all liens, defects, and encumbrances affecting title to the land may be included on the Preliminary Title Report.

6 SITE RECONNAISSANCE

6.1 METHODOLOGY AND LIMITING CONDITIONS

A representative from Kleinfelder, Ms. Carol Hall, R.E.A. I, conducted a site reconnaissance on February 17, 2004 to assess and photograph site conditions. Access to the site was provided by Mr. Scott Cable (916-379-3825). The approximate site boundaries are shown on Plate 2, "Site Map," and color photographs of the site are presented on Plate 3. The site boundaries were not clearly marked, but were assumed to be associated with fences. The site conditions discussed below are limited to readily apparent environmental conditions observed. The only access restriction encountered was for a room likely associated with the oil reservoir for the elevator onsite. There was no apparent release observed on the flooring or walls outside the locked room. The elevator was routinely serviced when the warehouse was being used. It is currently vacant and intended to be leased.

6.2 GENERAL SITE SETTING

The subject site consists of two separate parcels. The northern-most parcel (Parcel 1) is an approximately 5.6-acre vacant field at the intersection of Iron Rock Way and Union Park Way that appeared to have been formerly used for livestock and/or agricultural fields. The southern-most parcel (Parcel 2) is an approximately 6.6-acre developed site with an approximately 60,000 sq. ft. concrete tilt-up warehouse and office structure and paved parking area.

Parcel 1: Fenced areas resembling corrals were apparent and wood remnants from a former structure were observed. Also concrete and metal standpipes and water distribution piping were observed along the fenced areas of the site. A partially paved area was observed along the fence separating Parcels 1 and 2, which appeared to be onsite (not clearly marked in field). The shape implied that it was the location of a former trailer or truck trailer. Soil piles more than 5-feet high in some places were along the eastern and near the southern section of Parcel 1. It was not clear whether former soil piles had been evened out along the northern border to form a ridge, or if the ridge was associated with earth movement to construct Union Park Way. There was no area of stressed vegetation apparent on the soil piles. Grasses and weeds were abundant. The only area where stressed vegetation was observed was near the former structure, which appeared to be an area where concrete or similar materials were disposed. Black plastic sheets were located in a pile inside the fenced area. This type of material is sometimes used to stockpile contaminated soil. There was no obvious evidence that the plastic sheets were used for this purpose and an apparent source of soil contamination was not observed. Miscellaneous household debris, primarily solid waste with a few waste tires and a shopping bag with several intact 1-quart to 1-gallon containers of oil were observed along the eastern site border on Iron Rock Way.

Parcel 2: A two-story office (10,000 sq. ft.) was situated on the western side of the two-story 60,000 sq. ft. warehouse structure. An approximately 10-foot by 40-foot pit was located near the south side of the warehouse, which was reportedly formerly used to service vehicles (e.g. oil changes). The pit was filled with approximately 1-foot of water at the time of the site visit. The source of the water was not readily apparent because there was no roof leak apparent. The site visit was conducted during the rainy season in Sacramento, and prior storm events may have caused seepage or a floor drain that was not apparent may have backed-up. There was no apparent sheen observed on the water. The elevator room was not readily accessible at the time of the site visit, however, there was no apparent release observed on walls or flooring outside the elevator room. There was no major staining of the warehouse flooring where equipment was formerly located. Minor stains observed are considered to be de minimus conditions. Outside the structure were four 55-gallon drums that were partially-filled or filled and two Envirovault above ground storage tanks (ASTs) with lubricants, as follows:

- A 55-gallon white poly-drum with approximately 6-inches of an unknown liquid was observed in a pile of debris (empty containers, drums, metal) on the north side of the parking area. The drum was closed and was not labeled as to the contents.

- A 55-gallon metal drum, was also located in a pile of debris (empty containers, drums, metal) on the north side of the parking area. The metal drum was closed and appeared to be filled. The drum was labeled as grease sweep.

- One of the 55-gallon metal drums located on the south side of the building was labeled the Euclid Chemical Company Construction Product VOX (possibly a cure/sealant based on a limited web-site search conducted for Euclid Chemical Company) and had a rusted top with a slight bulge.

- The other 55-gallon drum located on the south side of the building was labeled Union 76, Grease 2 Lubricant (400 lb.). The lid had a small opening where a fill pipe had been removed. The inside product had a petroleum product odor. No release was apparent and the drum appeared to be intact and approximately three-fourths full.

- One of the Envirovault ASTs was labeled "Waste Oil". It was a Bakersfield Tank, Company EV-2000 model, built in August 2000. The AST was UL 2085 listed as meeting requirements for secondary containment.

- The other Envirovault AST was a dual compartment Bakersfield Tank Company AST. One compartment contained a 1,000 gallon capacity for 76 Super PTF Lubricant and the other a 3,000 gallon capacity for 76 Super Motor Oil (10W-30). The AST was UL 2085 listed as meeting requirements for secondary containment.

In addition, there were two other 55-gallon drums onsite, one containing solid waste and the other empty (i.e. top and bottom cut out). A small empty metal container was observed in a debris pile, which appeared to have been a former fuel container.

Kleinfelder notified Mr. Scott Cable about the staining observed near the ASTs, which extended beyond the boundary of the secondary containment berm into the roadway. Mr. Cable stated he would evaluate the burgundy staining observed in this area. Breaks in the containment berm were apparent.

6.3 SITE OBSERVATIONS

Site observations are further described in Table 10.

TABLE 10
SITE OBSERVATIONS

General Observations	Remarks	Observed	Not Observed
Current Use	Parcel 1: Vacant field. Parcel 2: Vacant warehouse	X	
Past Use	Parcel 1: Prior agricultural or pasture (i.e. corral) likely.	X	
Structures	Parcel 1: None observed. Parcel 2: Concrete tilt-up warehouse/offices with parking lot.	X	

TABLE 10 (Continued)
SITE OBSERVATIONS

Interior and exterior observations or environmental conditions that may involve the use, storage, disposal or generation of hazardous substances or petroleum products.		Observed	Not Observed
Terrain	Parcel 1: The central area is relatively level with the exception of ridge along Union Park Way and ridges formed by soil piles on the southern and eastern side of the parcel. Parcel 2: Level.	X	
Aboveground storage tank (AST)	Two Envirovault ASTs at Parcel 2; One 2,000 gallon waste oil and one dual-compartment AST containing lubricant. (See discussion in Chapter 6.2)	X	
Asbestos and lead	The building on Parcel 2 was constructed in 2000 and asbestos containing materials (ACMs) were not used according to Mr. Scott Cable.		X
Below grade vaults	Parcels 1 and 2: Associated with utilities (storm drains, sewer, electric, telephone).	X	
Burned or buried debris			X
Chemical storage or agricultural chemical mixing areas	Petroleum products and wastes stored in ASTs and 55-gallon drums at Parcel 2. (See discussion in Chapter 6.2)	X	
Discolored soil or water	Liquid in bermed area around the ASTs at Parcel 2 was a burgundy color (i.e. possible lubricant release).	X	
Drains and piping	Associated with storm drains and bathrooms at Parcel 2.	X	
Drums	Empty, partially filled, and filled on Parcel 2 as described in Chapter 6.2.	X	
Electrical equipment (Polychlorinated biphenyls [PCBs])	Pad mounted transformer (2KMP4) outside the facility fencing at Parcel 2 on Iron Rock Way was not labeled as to the PCB content.	X	

TABLE 10 (Continued)
SITE OBSERVATIONS

Interior and exterior observations or environmental conditions that may involve the use, storage, disposal or generation of hazardous substances or petroleum products.		Observed	Not Observed
Fill dirt from an unknown source.	Fill dirt in soil piles on Parcel 1 likely resulted from road construction and/or development of Parcel 2 according to Mr. Scott Cable.		X
Hazardous chemical and petroleum products in connection with known use.	The ASTs and some of the 55-gallon drums containing petroleum products at Parcel 2 were labeled as to contents. Batteries (power supply) located on the 2nd floor equipment room were in good condition and no release was apparent.	X	
Hazardous chemical and petroleum products in connection with unknown use.	One white-poly 55-gallon drum at Parcel 2 was not labeled as to the contents (See bulleted items in Chapter 6.2).	X	
Hazardous Waste Storage	Waste oil was stored in the AST at Parcel 2. The 55-gallon metal drum with oil product, the unknown material in the white-poly drum, and the VOX material were not labeled as wastes, however, are not associated with ongoing activities at the site.	X	
Heating and Cooling System	Electric.	X	
Industrial waste treatment equipment			X
Loading and unloading areas	Roll-up doors apparent throughout the warehouse area at Parcel 2. No drains were associated with the loading/ unloading areas and no staining was observed in these areas.	X	
Odors	Product in open 55-gallon containers at Parcel 2 had a petroleum product odor.	X	

TABLE 10 (Continued)
SITE OBSERVATIONS

Interior and exterior observations or environmental conditions that may involve the use, storage, disposal or generation of hazardous substances or petroleum products.		Observed	Not Observed
Pits, Ponds, or Lagoons	Pit used for vehicle service in the warehouse at Parcel 2. The pit had approximately 1-foot of water, the source of which was not readily apparent. A sheen was not apparent on the water.	X	
Pools of Liquid	See above.	X	
Process waste water			X
Raw material storage or chemical storage areas	Raw materials were stored in ASTs on Parcel 2.	X	
Sanitary System (Sewer)	Sewer manholes apparent along the west side and south side of the warehouse on Parcel 2.	X	
Septic system (Tank and leach fields)			X
Soil piles	Over 5-feet tall in some parts of Parcel 1. None were apparent on Parcel 2.	X	
Solid Waste	Primarily portions of the property bordering Iron Rock Way and Union Park Way (See discussion in Chapter 6.2).	X	
Stained pavement or concrete	Staining apparent on paved section adjacent to ASTs at Parcel 2.	X	
Stains or corrosion (interior)	De minimus amounts of staining on interior flooring.	X	
Storm basins/catch			X
Storm drains	Throughout the parking lot at Parcel 2.	X	
Stressed vegetation	One location near a possible former structure at Parcel 1 (3-foot diameter) likely an area used for concrete mix.	X	

TABLE 10 (Continued)
SITE OBSERVATIONS

Interior and exterior observations or environmental conditions that may involve the use, storage, disposal or generation of hazardous substances or petroleum products.		Observed	Not Observed
Sumps & clarifiers	Unknown if a sump is associated with the pit formerly used for vehicle maintenance.		X
Surface water	As previously described near the ASTs at Parcel 1.	X	
Underground storage tanks			X
Unidentified substance containers	VOX label incomplete to identify contents of a 55-gallon metal drum near the ASTs. Also, unlabeled white-poly 55-gallon drum with an unknown liquid in a debris pile. Both drums are located at Parcel 2.	X	
Waste Water			X
Water supplies (potable and process)	City water system.	X	
Wells (irrigation, monitoring, or domestic)	Standpipes were apparent and open piping with standing water and mud at the base were observed on Parcel 1 that appeared to be associated with water conveyance not wells.		X
Wells (dry)			X
Wells (Oil and Gas)			X

7 INTERVIEWS

The City of Elk Grove representative, Ms. Julie Cline asked that Kleinfelder contact Mr. Scott Cable to obtain site access and information about the site. Mr. Cable is therefore considered a "key site manager". In addition, Kleinfelder contacted several government agencies to obtain information about the site (see Chapter 4.2 and below). Copies of telephone conversation records are included in Appendix D. The following sections highlight general information and environmental conditions revealed during the interviews.

7.1 INTERVIEW WITH OWNER/MANAGER

A large development company owns the site. Mr. Scott Cable (see interview in Chapter 7.4 below) provided site access to Kleinfelder.

7.2 INTERVIEW WITH OCCUPANTS

The site was not occupied at the time of the site visit.

7.3 INTERVIEWS WITH LOCAL GOVERNMENT OFFICIALS

Local government officials were interviewed to obtain further information about environmental enforcement actions pending or ongoing at the site and adjacent facilities, or relevant permits (e.g. building, air quality, well abandonment, etc.) for the site and adjacent facilities. Interviews conducted with local government officials are described in Section 4.3. Copies of telephone conversation records are included in Appendix D.

7.4 INTERVIEW WITH CLIENT/OTHERS

An interview was conducted with Mr. Scott Cable (916-379-3825) at the time of the site visit. Mr. Cable works with Buzz Oates, Inc. and provided site access for the site visit.

According to Mr. Cable, the subject site was purchased approximately 20-years ago and has been undeveloped until 2000 when the building currently at 10250 Iron Rock Way (Parcel 2) was constructed. The prior tenant onsite used the building for motor servicing. Mr. Cable provided the following additional information about the site land use:

- The site was constructed in 2000 and asbestos containing materials were reportedly not used. Also, Mr. Cable stated that there were no buried pipelines onsite that were likely constructed using asbestos materials.
- According to Mr. Cable the hazardous materials currently and formerly onsite included lubricants and oils (both waste oil and new product). Hazardous materials/waste are stored in above ground storage tanks that were installed in 2000 when the building onsite was constructed.
- Fill dirt observed in soil piles on Parcel 1 likely originated from construction activity at Parcel 2 or road construction. Mr. Cable did not think the soil originated from an off-site location.
- Mr. Cable stated that he was not aware of stained soil or flooring, drains, walls or other features that were stained or emitting a foul odor.
- Mr. Cable stated that he was not aware of any underground storage tanks or below grade sumps onsite. A service repair subsurface chamber was located within the warehouse onsite(further description in Chapter 6.0), which Mr. Cable said was used by the prior tenant for vehicle servicing (e.g. oil changes, etc.).
- Mr. Cable stated that the heating and cooling onsite in the warehouse is electric. Transformers located within the building are reportedly dry (do not use oil). According to Mr. Cable, the site is connected to the city water system and is not served by a private well. Also, Mr. Cable stated that there are no oil/gas well or oil/gas vents located onsite.
- The discharge of water from the site is limited to storm water from parking areas according to Mr. Cable.
- The elevator onsite received routine maintenance when the prior tenant was using the facility, but Mr. Cable was not sure what the current maintenance status was. (Note: The elevator room was locked at the time of the site visit, however, no apparent release was apparent on walls or flooring outside the elevator room.)

- Mr. Cable stated that he does not have any knowledge of environmental liens or governmental notification relating to past or recurrent violations of environmental laws with respect to the property.
- Mr. Cable stated that he has not been informed of the current existence of environmental violations with respect to the property.
- Mr. Cable stated that he did not know of any past, threatened, or pending lawsuits or administrative proceedings concerning a threatened release of any hazardous substance or petroleum product involving the property.
- Mr. Cable stated that he did not know of any hazardous substances or petroleum products, unidentified waste materials, tires, automotive or industrial batteries, or other waste materials that have been dumped above grade, buried and/or burned on the property.

8 EVALUATION

Kleinfelder performed this ESA of the subject site in conformance with the scope and limitations of ASTM Practice E1527. The following sections describe Kleinfelder's findings and provide a general background information about the site. Findings include recognized environmental conditions, historically recognized environmental conditions, and de minimus quantities, as applicable to the subject site. Business environmental risk issues are discussed in section 8.3, Deviations. In summary, Kleinfelder's assessment revealed the following information about the subject site:

8.1 BACKGROUND

The subject site consists of two parcels; one of which is an undeveloped field (Parcel 1) and the other developed with a warehouse, offices, and above ground storage tanks (Parcel 2). Regional groundwater quality concerns were revealed in the local water district Water Quality and Supply Report 2003. Concerns identified in the report included elevated concentrations of microbial contaminants, inorganic contaminants, pesticides and herbicides, organic chemical contaminants, and radioactive contaminants in source water. Iron and manganese in groundwater reportedly exceeded the Maximum Contaminant Level (MCL) for drinking water in California. The direction of groundwater flow is anticipated to be in a westerly direction at a depth of approximately 85 feet below ground surface according to Sacramento County maps reviewed.

8.2 FINDINGS AND OPINIONS

Historical documents reviewed revealed structures on Parcel 1 in 1937 and 1947 (aerial photograph and topographic map, respectively). The structures were no longer apparent by 1952 according to an aerial photograph. The structures may have been rural residential buildings because land use onsite and in the area appeared to be associated with agriculture or pasture. The warehouse/office structure and the above ground storage tanks on Parcel 2 were constructed in 2000. Auto Choice was the former tenant onsite according to Sacramento County Building Department records reviewed. The design maps reviewed included storage areas, work stations, a mechanics module, and electric lift station.

Kleinfelder contacted the Sacramento County Agricultural Commissioner's office to obtain information about prior crops onsite and possible persistent pesticide application that may adversely affect the site. A response to our inquiry was not received prior to production of this report. Therefore, likely crops and pesticides applied historically onsite were not revealed during this assessment.

Standpipes apparent on Parcel 1, were likely associated with former agricultural land use or land use associated with livestock (i.e. fenced corral area apparent onsite). Buried piping associated with the standpipes may remain and, depending on the date and materials of construction, may contain "Transite". "Transite" is a possible asbestos containing material (ACM), which requires special handling and if removed must be disposed in accordance with applicable regulations. Also, the standpipes were open at the time of the site visit and may act as conduits of hazardous substances to subsurface soil or groundwater. Subsurface conditions were not evaluated as a part of this assessment. If evidence of a release of a hazardous substance or petroleum product is observed (i.e. soil staining, unusual odor, etc.) during removal of these features, additional assessment may be required.

Regulatory agencies were contacted for information about the site and adjacent parcels. Sacramento County Air Quality Management District (SCAQMD) provided information about permit violations. The SCAQMD records did not reveal permits or air quality violations onsite. Permits on file for adjacent properties were not associated with environmental conditions likely to affect the subject site. There were no oil or gas pipelines reported in the area by Kinder Morgan in response to our inquiry to the State of California, Fire Marshall's office. The Munger Maps did not reveal oil or gas wells or fields located onsite or in the vicinity of the site. Kleinfelder contacted the Sacramento Municipal Utility District (SMUD) about the pad mounted transformer on the east side of Parcel 2 to inquire whether it was likely to contain polychlorinated biphenyls (PCBs) based on date of construction. A response to our inquiry was not received prior to production of this report, however, based on the date of construction of the warehouse, it is likely that the transformer was constructed during a similar time period and therefore would not be likely to contain PCBs (i.e. after 1980).

A database service, Environmental Data Resources, Inc. (EDR), was contacted to provide information about the site and facilities within a one-mile radius of the site that handle hazardous materials/waste or have had a reported release of a hazardous substance or petroleum product and, therefore, may affect the subject site. In addition to review of the listings provided by EDR, subsequent review of records was conducted at the Sacramento County Environmental

Management Department (SCEMD), and also facilities listed by EDR on the State of California's Geotracker web-based database were reviewed. Regulatory review revealed that only one of the nine facilities listed on the EDR Radius Report with the standard ASTM search radius may adversely affect the site, however, this would only be the case if an airborne release of contaminant occurred under wind conditions that directed a release from the World Asphalt facility (10144 Waterman Road) toward the site.

Two additional facilities, the Georgia Pacific Resins facility (10144 Waterman Road) and the Suburban Propane facility (Grant Line Road/Waterman Road) have the potential to result in a hazardous chemical fire or vapor cloud explosion that may affect the subject site, if a hazardous substance release occurred, according to an environmental report for the Grant Line Road/SR 99 Interchange Reconstruction Project (prepared by EDAW for City of Elk Grove).

Hazardous materials were likely used and stored onsite by the prior tenant, Auto Choice (i.e. fuels, oil, batteries, etc.) however, there were none reported on SCEMD lists of businesses that handle hazardous materials. Above ground storage tanks (ASTs) remain onsite that contain lubricant and waste oil. The Envirovault ASTs are constructed with internal secondary containment. Also, 55-gallon drums were observed onsite, which contain an oily material and unknown liquid materials. Not all drums were labeled as to the content and potential hazards. The drums were located adjacent to the ASTs inside a bermed area and on pavement near the mid-point of the northern border of Parcel 2. Cracks were apparent in the berm that allowed movement of liquid from inside the containment to nearby storm drains. The pavement inside the bermed AST storage area had water and was stained with a reddish material. In addition, oil is likely in an AST in the elevator room, which was not accessible at the time of the site visit. There was no obvious evidence of a release of oil apparent on walls and flooring outside the elevator room and the elevator was reportedly routinely serviced at the time the warehouse was used by the prior tenant.

Inside the warehouse was a vehicle service pit, referred to on County Building Department records as a mechanic's module. The subsurface feature had approximately 1-foot of standing water at the time of the site visit. No obvious sheen (i.e. sheen would be indicative of motor oil or fuel release) was observed, but some water discoloration was apparent.

The partially paved area on Parcel 1 along the border with Parcel 2 may have been associated with a construction staging area for development of Parcel 2. The small circular area of stressed vegetation apparent near some wood debris on Parcel 1 may have resulted from disposal of cement and related materials also associated with development of Parcel 2. Soil piles apparent on Parcel 1 had new vegetation growth and also appeared to be associated with development of Parcel 2. No obvious evidence of a release of a hazardous substance or petroleum product was observed in these areas.

According to an interview with Mr. Scott Cable, associated with Buzz Oates, Inc. at the time of the site visit, there are no underground storage tanks, sumps, or other below grade features onsite with the exception of utility vaults and the vehicle service pit. The heating and cooling onsite are electric. Transformers located within the building are "dry" and therefore do not contain PCBs. Mr. Cable stated that he was not aware of environmental liens or governmental notifications relating to past or current violations of environmental laws. Mr. Cable also stated that he did not know of any hazardous substances or petroleum products, unidentified waste materials, tires, automotive or industrial batteries, or other waste materials dumped above grade, buried or burned on the property.

8.3 DEVIATIONS

An evaluation of business environmental risk associated with the parcel(s) was not included in Kleinfelder's scope of work. The ESA does not incorporate non-scope considerations, such as asbestos-containing materials testing, radon, lead-based paint testing, lead in drinking water testing, wetlands, regulatory compliance, cultural and historical resources, industrial hygiene, health and safety, ecological resources, endangered species, indoor air quality, and high voltage power lines.

8.4 CONCLUSIONS AND RECOMMENDATIONS

We have performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E 1527 of 10250 Iron Rock Way, the property. Any exceptions to, or deletions from this practice are described in Chapter 8.3 of this report.

In summary, this assessment has revealed no evidence of recognized environmental conditions in connection with the property except for the following:

1. Regional groundwater quality concerns were revealed in the local water district Water Quality and Supply Report 2003. Concerns identified in the report included elevated concentrations of microbial contaminants, inorganic contaminants, pesticides and

herbicides, organic chemical contaminants, and radioactive contaminants in source water. Iron and manganese in groundwater reportedly exceeded the Maximum Contaminant Level (MCL) for drinking water in California. Kleinfelder contacted the Sacramento County Agricultural Commissioner's office to obtain information about prior crops onsite and possible persistent pesticide application that may have adversely affected the site. A response to our inquiry was not received prior to production of this report. Therefore, likely crops and pesticides applied historically onsite were not revealed during this assessment. If the City of Elk Grove requires a greater level of certainty as to prior residual, persistent pesticides remaining onsite, if any, soil samples can be collected for laboratory analyses.

2. Standpipes were apparent on Parcel 1. Buried piping associated with the standpipes may remain and, depending on the date and materials of construction, may contain "Transite". "Transite" is a possible asbestos containing material (ACM), which requires special handling and, if removed, must be disposed in accordance with applicable regulations. We recommend that subsurface piping, when removed, be evaluated as to whether it is likely to contain "Transite". Also, the standpipes were open at the time of the site visit and standpipes may act as conduits of hazardous substances to subsurface soil or groundwater. No obvious evidence of a release of a hazardous substance was observed during the site visit, however, subsurface conditions were not evaluated as a part of this assessment. If evidence of a release of a hazardous substance or petroleum product is observed (i.e. soil staining, unusual odor, etc.) during removal of these features, additional assessment may be required.

3. Three facilities within a ½ mile radius of the site may adversely affect the site if an airborne release of contaminant occurred under wind conditions that directed a release toward the site based on EDR's Radius Report and an environmental report prepared for the City of Elk Grove. These facilities are: World Asphalt (10144 Waterman Road), Georgia Pacific Resins (10144 Waterman Road) and the Suburban Propane facility (Grant Line Road/Waterman Road). Potential hazards included the potential for a hazardous chemical fire or vapor cloud explosion. Further assessment is not recommended, however, the site safety plan should include an evacuation plan.

4. Above ground storage tanks (ASTs) that contain lubricant and waste oil remain onsite. The Envirovault ASTs are constructed with internal secondary containment. Two 55-gallon drums were located on pavement inside the bermed AST storage area. Surface water in the bermed area was observed, and the pavement was stained with a reddish

material. It was not clear whether the reddish material originated from the AST or from drums located adjacent to the ASTs, which contained an oily material. Cracks were apparent in the berm that allowed movement of liquid from inside the containment to nearby storm drains. Kleinfelder notified Mr. Scott Cable, Buzz Oates, Inc. and Mr. Cable stated that he would investigate further. We recommend that the unknown reddish material be characterized and properly disposed, the source of the material be identified and repairs made as needed. The 55-gallon drums located within the bermed area should be removed and properly disposed, and cracks in the berm should be repaired.

5. Also, 55-gallon drums, which contained an oily material and unknown liquid materials, were observed near at the northern border of Parcel 2. These drums were not stored in secondary containment. We recommend that the drum contents be characterized and disposed in accordance with applicable regulations.

6. Oil is likely present in an AST in the elevator room in the warehouse on Parcel 2, which was not accessible at the time of the site visit. There was no obvious evidence of a release of oil apparent on walls and flooring outside the elevator room and the elevator was reportedly routinely serviced at the time the warehouse was used by the prior tenant. We recommend that a qualified elevator service company be contacted to evaluate the condition of the tank.

7. Inside the warehouse was a vehicle service pit. The subsurface feature had approximately 1-foot of standing water at the time of the site visit. No obvious sheen (i.e. sheen would be indicative of motor oil or fuel release) was observed, but some water discoloration was apparent. We recommend that the contents of the pit be pumped out, characterized, and that the source of the water be located to evaluate whether there are potential hazardous substance or petroleum product concerns.

9 REFERENCES

1. Environmental Data Resources, Proposed Corporation Yard, 10250 Iron Rock Way, Report ID: 1130525.4s, February 17, 2004.

2. Munger Map Book, California Oil & Gas Well Report, December 1, 1997.

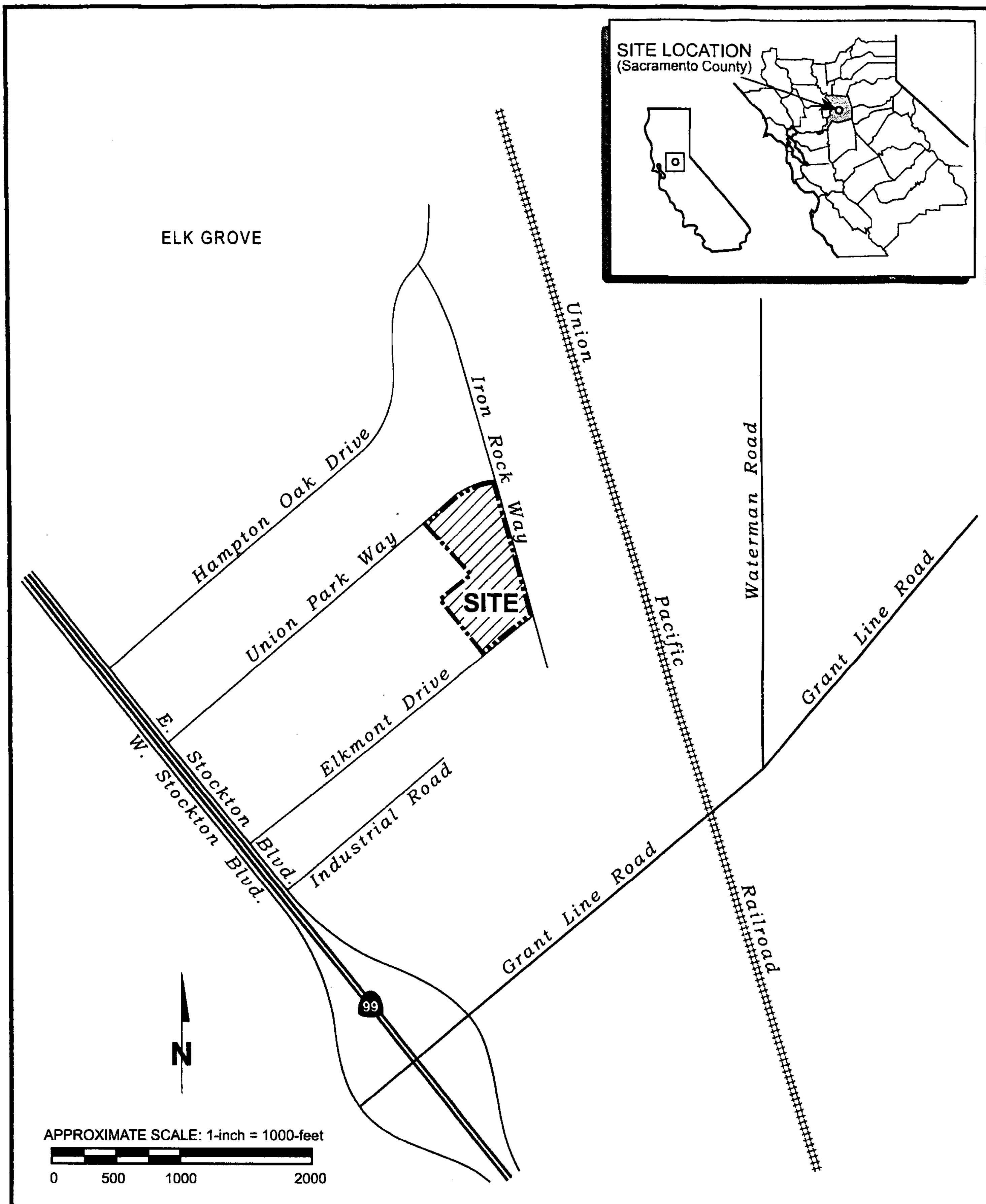
3. Geologic Map of California, State of California Department of Conservation 1977; (Scale: 1 inch = 12 miles).

4. Soil Survey of Sacramento County, California, United States Department of Agriculture, Soil Conservation Service publication, issued 1993.

Additional sources are referenced separately in the report text.

APPENDIX A

PLATES



KLEINFELDER

Drawn By: D. Shelhart
Project No. 41134-1

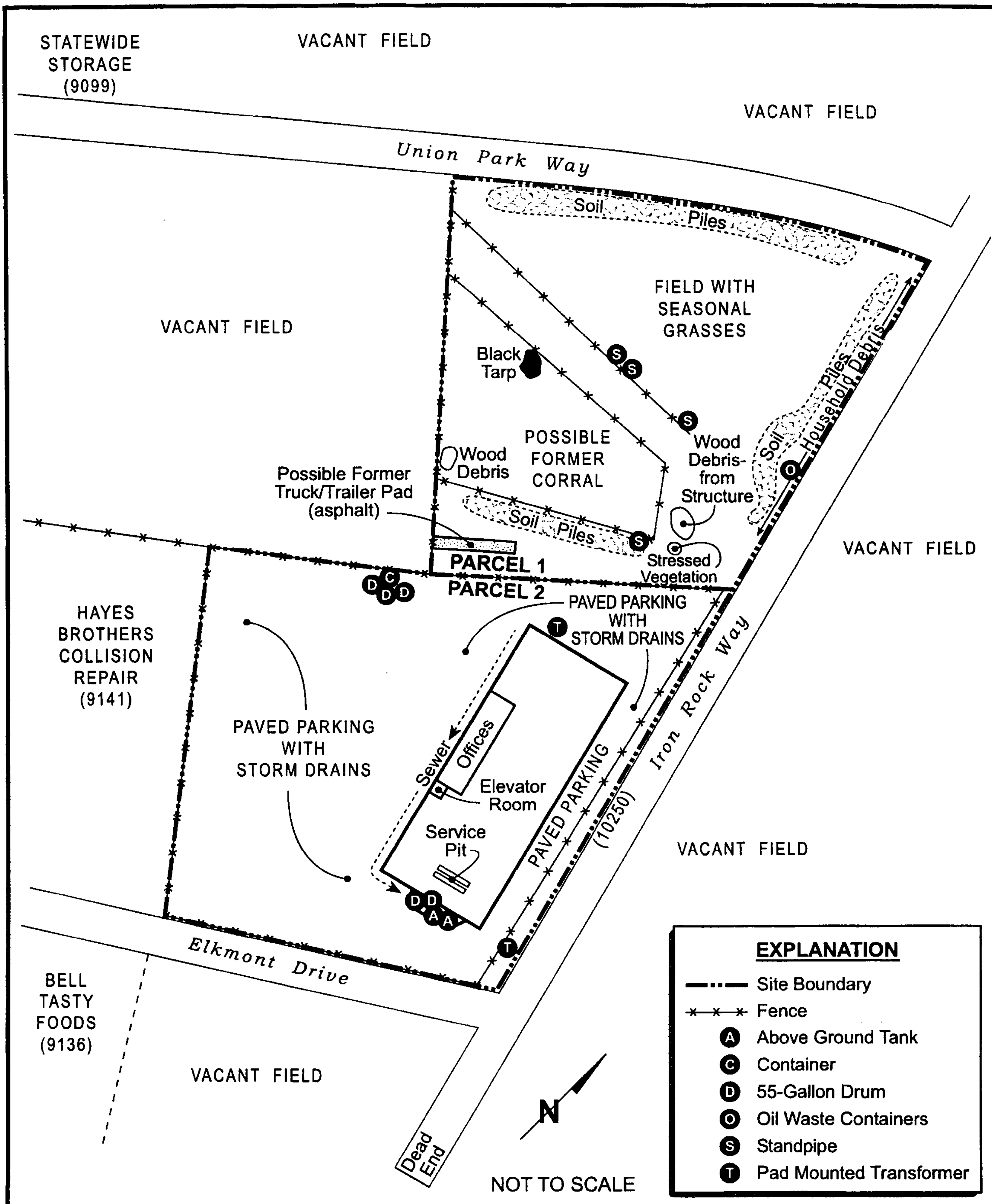
Date: 2-25-2004
Filename: 2930a.fh10

SITE LOCATION MAP

PROPOSED CORPORATION YARD
10250 IRON ROCK WAY
ELK GROVE, CALIFORNIA

PLATE

1



KLEINFELDER

Drawn By: D. Shelhart
Project No. 41134-1

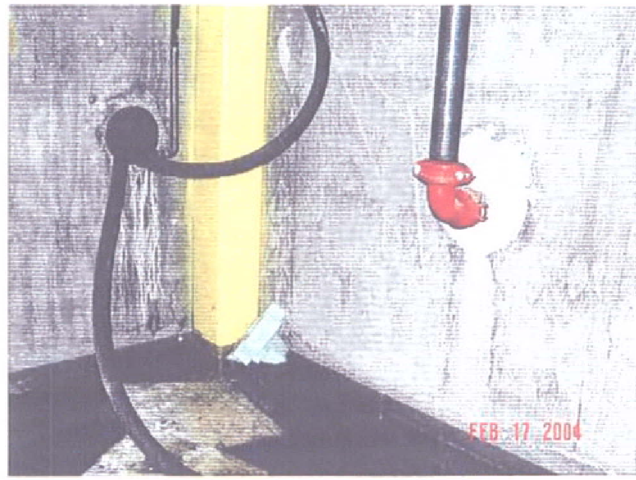
Date: 2-25-2004
Filename: 2930b.fh10

SITE MAP

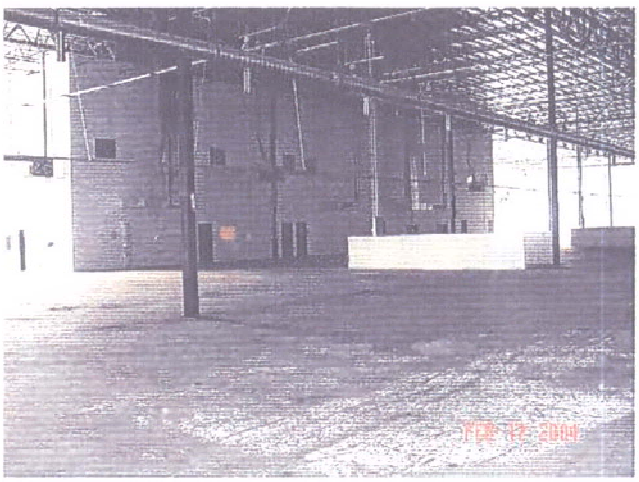
PROPOSED CORPORATION YARD
10250 IRON ROCK WAY
ELK GROVE, CALIFORNIA

PLATE
2

Photograph 1: Vehicle service area (subsurface) inside the warehouse on Parcel 1.

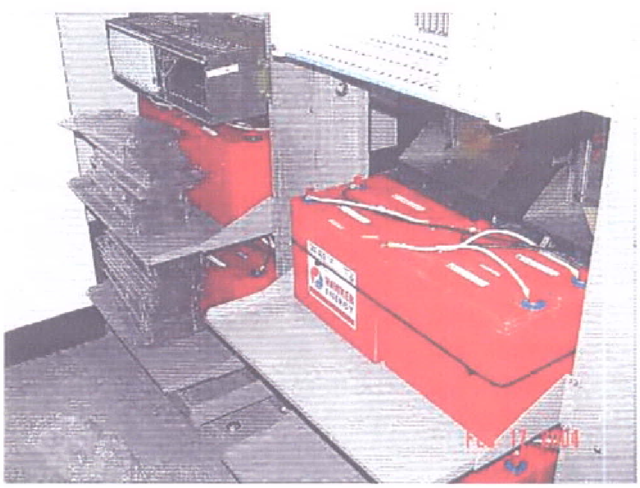


Photograph 2: Piping and water inside vehicle service area (see also photograph 1).

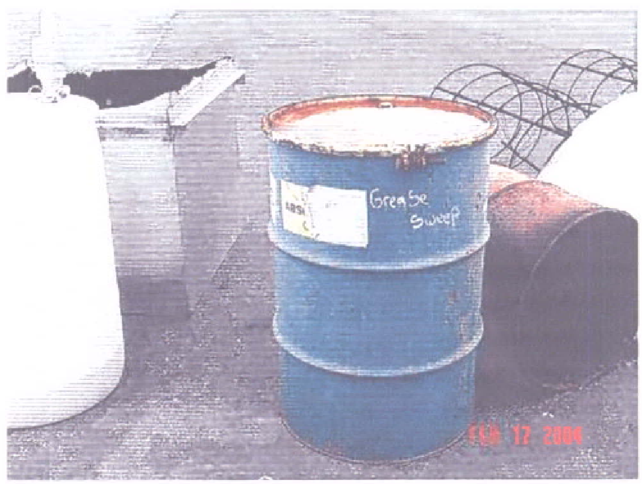


Photograph 3: Interior of warehouse.

Photograph 4: Loading/unloading area of warehouse (northeast side).



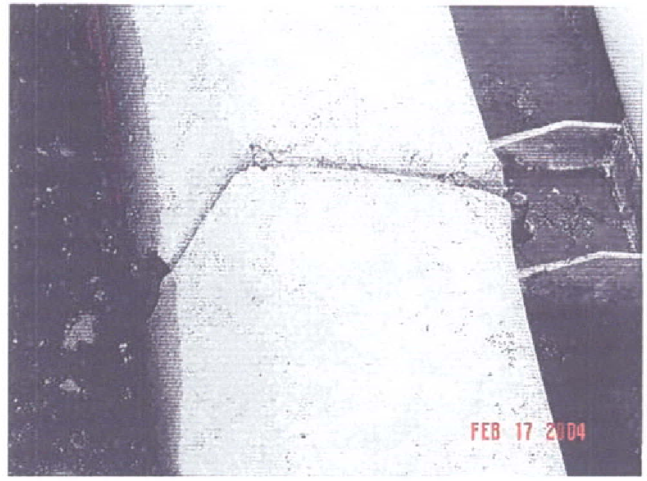
Photograph 5: Batteries for equipment on second floor of the warehouse. No release observed.



Photograph 6: Waste disposal area. Three 55-gallon drums on north side of the parking lot onsite. Blue drum was full and labeled grease sweep. White poly-drum had an unknown liquid and no label. The rusted metal drum between them was empty. Gas can at far right was empty.

KLEINFELDER		**SITE PHOTOGRAPHS** PROPOSED CORPORATION YARD 10250 IRON ROCK WAY ELK GROVE, CALIFORNIA	PLATE 3
Drawn By: D. Shelhart	Date: 2-25-2004		
Project No. 41134-1	Filename: 2930c.fh10		

Photograph 7: Blue drum contained grease/lubricant. White drum contained a construction product. Two Envirovault ASTs contained lubricant/oil.



Photograph 8: Berm around ASTs had breaks that allowed fluid to release to storm drain. No valves observed. Stains to pavement apparent.

Photograph 9: Pad mounted transformer onsite not labeled as to PCB content.

Photograph 10, 11, & 12: Parcel 1 facing west from atop soil piles. Soil piles along fencing on left side, standpipes along fence lines. Wood debris appeared to have formerly been part of a structure.

KLEINFELDER		SITE PHOTOGRAPHS PROPOSED CORPORATION YARD 10250 IRON ROCK WAY ELK GROVE, CALIFORNIA	PLATE 4
Drawn By: D. Shelhart	Date: 2-25-2004		
Project No. 41134-1	Filename: 2930d.fh10		

Photograph 13: Stressed vegetation on Parcel 1. Compacted soil with some concrete mix.

Photograph 14: Stand pipe on Parcel 1 adjacent to fence. Liquid and solid at base.

Photograph 15: Former truck or trailer parking area likely. Partial asphalt base on Parcel 1.

Photograph 16: Oil containers in household waste observed on site on Parcel 1 along Iron Rock Way.

KLEINFELDER		SITE PHOTOGRAPHS PROPOSED CORPORATION YARD 10250 IRON ROCK WAY ELK GROVE, CALIFORNIA	PLATE 5
Drawn By: D. Shelhart	Date: 2-25-2004		
Project No. 41134-1	Filename: 2930e.fh10		

APPENDIX C
TRANSPORTATION IMPACT STUDY

Transportation Impact Study for the

PROPOSED ELK GROVE TRANSIT FACILITIES

Submitted by:

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Submitted to:

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FEHR & PEERS

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EXECUTIVE SUMMARY

This study addresses the potential transportation impacts associated with development of the proposed relocation and expansion of the Elk Grove transit service (E-Tran) facilities. The transit service currently operates in the Elk Grove Corporation Yard, located in the northwest quadrant of the Elkmont Way/Iron Rock Way intersection, near the SR 99/Grant Line Road interchange.

Three potential sites are being considered to locate the facility:

- Site A: Fronts Grant Line Road just east of Survey Road; access to Grant Line Road would likely be provided via Survey Road and a right-in/right-out driveway on Grant Line Road.
- Site B: Fronts Iron Rock Way, with access to East Stockton Boulevard via Elkmont Drive and Union Park Way.
- Site C: Fronts Union Park Way, with access to East Stockton Boulevard via Union Park Way.

This study analyzes the expansion of the transit facilities at all three potential sites, as well as the off-site traffic impacts of the proposed project on intersections, roadways, and freeway facilities in the study area under existing and cumulative conditions. The number of employees would increase from 158 to 340 employees. The main difference among the sites is in how each site would access the surrounding roadway network.

The following summarizes the study findings.

EXISTING CONDITIONS

The existing operating conditions of selected roadway segments, intersections, and freeway ramp junctions were evaluated. All of the facilities operate at level of service (LOS) C or better under existing conditions.

Class II bike lanes (on-street with signing and striping) are provided on East Stockton Boulevard and Grant Line Boulevard, between East Stockton Boulevard and Promenade Parkway. Within the study area, crosswalks are generally provided at signalized intersections, and sidewalks exist along the frontage of most developed properties.

The City of Elk Grove operates fixed-route bus service (E-Tran) within the study area, which is the focus of this study. Numerous routes with stops are available within the study area, including East Stockton Boulevard (Routes 60, 57, and 162), Elk Grove-Florin Road (Routes 59, 57, and 162), Elk Grove Boulevard (Routes 66, 59, 52, 162, and 156), and Grant Line/Waterman Road (Routes 58 and 160). E- Tran is currently running a reduced schedule due to temporary budget cuts.

EXISTING PLUS PROJECT CONDITIONS

The project's trip generation was developed based on the trip generation of the existing transit facility, which was calculated using driveway counts and transit route information. The trip generation estimated the number of transit buses and passenger cars accessing the facility. Bus volumes were converted into passenger car equivalents (PCEs) to account for the additional strain that buses put on the transportation network. The trip generation of the expansion was estimated by extrapolating the current trip generation based on the number of current and future employees. Sites B and C are located close to the current transit center; therefore the existing counts already capture much of the project trip generation. However, Site A is farther away and required that the trips currently generated by the transit facility be removed from existing counts and then redistributed based on the proposed location south of Grant Line Road.

All of the study facilities will continue to operate with an acceptable LOS with the addition of project traffic; therefore, no significant impacts will occur on study intersections, roadways, or freeway ramp junctions under existing plus project conditions.

Project impacts to bicycle, pedestrian, and transit facilities and services were considered to be less than significant.

CUMULATIVE CONDITIONS

Cumulative (General Plan Build-Out) weekday and peak hour traffic volume forecasts were developed using v.01 of the SACMET regional travel demand model. This version of the SACMET travel demand model contains the latest land uses for the full build-out of the Laguna Ridge Specific Plan, Southeast Area Specific Plan, Sterling Meadows, and Elk Grove Marketplace retail parcels. The model also assumes full build-out of the roadway network identified in the City of Elk Grove General Plan.

Two of the study roadway segments would operate unacceptably under cumulative no project conditions:

- Kammerer Road – SR 99 to Lotz Parkway (90,500 ADT, LOS F)
- Grant Line Road – SR 99 to Waterman Road (78,100 ADT, LOS F)

Three study intersections would operate unacceptably under the cumulative no project conditions:

- Grant Line Road / East Stockton Blvd / Survey Road (LOS F in AM and PM peak hours)
- Grant Line Road / Waterman Road (LOS F and E in the AM and PM peak hours, respectively)
- Kammerer Road / Promenade Parkway (LOS E and F in the AM and PM peak hours, respectively)

All of the freeway ramp junctions will operate acceptably under cumulative no project conditions.

CUMULATIVE PLUS PROJECT CONDITIONS

The cumulative plus project traffic forecasts for daily, AM peak hour, and PM peak hour conditions were developed using the same methodology as the existing plus project forecasts. All of the sites were analyzed with and without the proposed expansion. The scenario without the expansion was increased to include four additional transit routes to serve the planned Lent Ranch Marketplace and Laguna Ridge area.

The distribution of project trips under cumulative conditions would differ from existing conditions due to anticipated development of residential and commercial uses in the City of Elk Grove. The existing bus routes are assumed to remain the same under cumulative conditions; however, planned roadway improvements are expected to change existing bus route paths. For example, Commuter Route 53, which starts at the Franklin Community Library off Whitelock Parkway, may currently use Elk Grove Boulevard to reach the library, but Kammerer Road will be more direct and efficient under General Plan Build-out conditions.

While project traffic increases volumes on all of the study facilities, in no case would the addition of project traffic trigger a significant impact.

Cumulative project impacts to bicycle, pedestrian, and transit facilities and services were considered to be less than significant.

1. INTRODUCTION

This study addresses the potential transportation impacts associated with two projects involving the City of Elk Grove's transit service, E-Tran. The first project consists of moving the transit facilities and operations from the current location in the Elk Grove Corporation Yard on Elkmont Way to one of three nearby locations. Figure 1 displays the study area, intersections, and the possible project site locations. The second project is the expansion of the transit facilities from 158 employees to 340 employees.

This study analyzes the off-site traffic impacts of the proposed project on roadways, intersections, and freeway facilities in the study area under the following scenarios:

- Existing Conditions
- Existing Plus Project – Site A without expansion
- Existing Plus Project – Site A with expansion
- Existing Plus Project – Sites B and C without expansion
- Existing Plus Project – Sites B and C with expansion
- Cumulative No Project
- Cumulative Plus Project – Site A without expansion
- Cumulative Plus Project – Site A with expansion
- Cumulative Plus Project – Sites B and C without expansion
- Cumulative Plus Project – Sites B and C with expansion

Due to their close proximity, Sites B and C are expected to have the same effect on the transportation system; therefore, they were analyzed as one scenario.

STUDY AREA

The following six intersections, four roadway segments, and six freeway ramp junctions were selected for analysis based on their proximity to the project sites, their expected usage by project traffic, and the project's expected travel characteristics. Refer to Figure 1 for study intersections.

Intersections

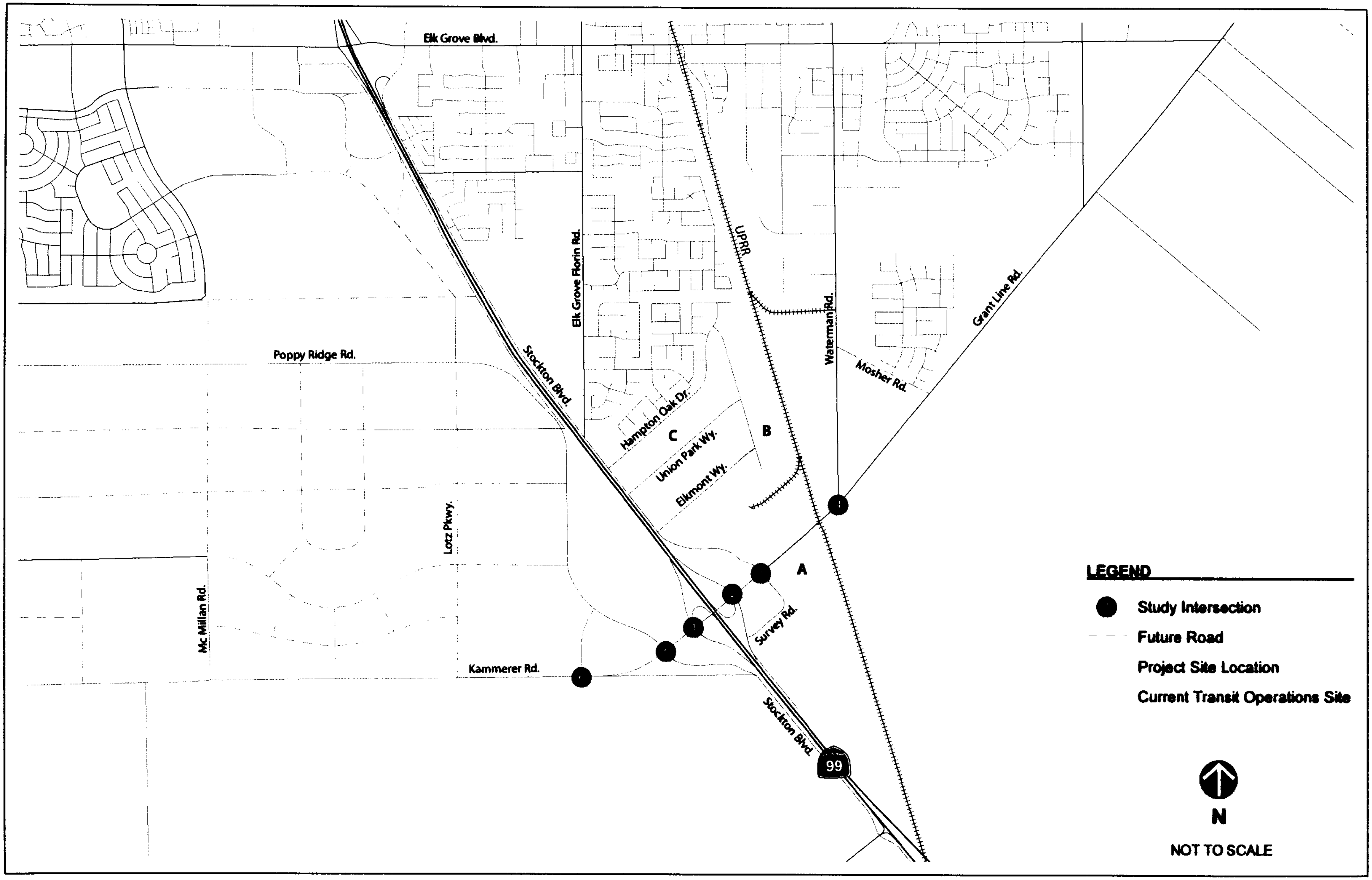
1. Grant Line Road / SR 99 Southbound Ramps
2. Grant Line Road / SR 99 Northbound Ramps
3. Grant Line Road / East Stockton Boulevard / Survey Road
4. Grant Line Road / Waterman Road
5. Kammerer Road / Promenade Parkway (cumulative conditions only)
6. Kammerer Road / Lent Ranch Parkway (cumulative conditions only)

Roadway Segments

1. Grant Line Road – SR 99 to Waterman Road
2. Kammerer Road – SR 99 to Lotz Parkway
3. Waterman Road – Elk Grove Boulevard to Grant Line Road
4. Elk Grove Florin Road – Elk Grove Boulevard to East Stockton Boulevard

Ramp Junctions

1. SR 99 Northbound Grant Line Road Off-Ramp
2. SR 99 Northbound Grant Line Road Loop On-Ramp
3. SR 99 Northbound Grant Line Road Slip On-Ramp
4. SR 99 Southbound Grant Line Road Off-Ramp
5. SR 99 Southbound Grant Line Road Loop On-Ramp
6. SR 99 Southbound Grant Line Road Slip On-Ramp



FEHR & PEERS
TRANSPORTATION CONSULTANTS
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STUDY AREA
FIGURE 1

ANALYSIS METHODOLOGY

Level of service (LOS) is a qualitative measure describing the operating condition of intersections and roadways. LOS ranges from A through F, which represents driving conditions from best to worst, respectively. In general, LOS A represents free-flow conditions with no congestion, and LOS F represents severe congestion and delay under stop-and-go conditions.

Intersections

The study intersections were analyzed using procedures and methodologies contained in the *Highway Capacity Manual* (HCM, 2000). Table 1 displays the average control delay per vehicle for each LOS range for signalized and unsignalized intersections. The LOS for signalized and all-way stop-controlled intersections is based on the average delay of all vehicles passing through the intersection. The LOS for side-street stop-controlled intersections is based on the delay for the minor street movement with the greatest delay.

TABLE 1
LEVEL OF SERVICE DEFINITIONS FOR STUDY INTERSECTIONS

Level of Service	Average Control Delay (seconds/vehicle)	
	Signalized	Unsignalized
A	≤ 10.0	≤ 10.0
B	10.1 – 20.0	10.1 – 15.0
C	20.1 – 35.0	15.1 – 25.0
D	35.1 – 55.0	25.1 – 35.0
E	55.1 – 80.0	35.1 – 50.0
F	> 80.0	> 50.0

Source: *Highway Capacity Manual*, Transportation Research Board, 2000.

Roadway Segments

Roadway segments were analyzed by comparing average daily traffic volumes to capacity thresholds presented in the City of Elk Grove's *Traffic Impact Analysis Guidelines* (July 2000). Consistent with assumptions in the City's General Plan background report, all study roadways were assumed to have moderate access control. Table 2 shows daily volume thresholds for each LOS category for two-, four-, six-, and eight-lane roadways with moderate access control.

TABLE 2 LEVEL OF SERVICE DEFINITIONS FOR STUDY ROADWAYS					
Number of Lanes[1]	Maximum Daily Volume				
	LOS A	LOS B	LOS C	LOS D	LOS E
2	10,800	12,600	14,400	16,200	18,000
4	21,600	25,200	28,800	32,400	36,000
6	32,400	37,800	43,200	48,600	54,000
8	43,200	50,400	57,600	64,800	72,000

Notes: [1] Elk Grove GP Background Report shows all study roadways with moderate access control.
Source: City of Elk Grove's *Traffic Impact Analysis Guidelines*, July 2000.

Freeway Facilities

Per Caltrans standards, the freeway on- and off-ramps were analyzed using procedures from the *Highway Capacity Manual, 2000.* This procedure determines the LOS based on the computed density, which is expressed in passenger cars per lane per mile.

Analysis Evaluation Criteria

Consistent with the City's *Traffic Impact Analysis Guidelines*, the transportation analysis used the following thresholds to determine the significance of project impacts:

Roadway System

An impact is considered significant on roadways, intersections, and freeway facilities if the project causes the facility to change from LOS D or better to LOS E or F. For facilities that are operating at unacceptable levels of service without the project, an impact is considered significant if the project:

- Increases the delay at study intersections by more than five seconds.
- Increases the volume-to-capacity (V/C) ratio by 0.05 or more on a roadway.
- Exacerbates the density on a freeway ramp junction.

According to the *Guide for the Preparation of Traffic Impact Studies* (Caltrans, June 2001), Caltrans strives to maintain a target LOS at the transition between LOS C and LOS D on State highway facilities; therefore, LOS D was selected as the minimum standard for freeway on- and off-ramp junction operations.

Transit System

An impact is considered significant if implementation of the project will disrupt or interfere with existing or planned transit operations or transit facilities.

Bicycle/Pedestrian System

An impact is considered significant if implementation of the project will disrupt or interfere with existing or planned bicycle or pedestrian facilities.

REPORT ORGANIZATION

The remainder of this report consists of the following chapters:

- Chapter 2 – Existing Conditions
- Chapter 3 – Existing Plus Project Conditions
- Chapter 4 – Cumulative Conditions
- Chapter 5 – Cumulative Plus Project Conditions

2. EXISTING CONDITIONS

This chapter describes the existing transportation system and traffic operations near the project site.

ROADWAY SYSTEM

The following freeway facilities and local roadways would serve the project:

State Route 99 (SR 99) is a north-south freeway within the study area with interchanges at Elk Grove Boulevard and Grant Line Road. It consists of two lanes in each direction from south of Grant Line Road to just south of Elk Grove Boulevard, where a High Occupancy Vehicle (HOV) lane is added in each direction.

Waterman Road is a north-south two-lane roadway that extends from Grant Line Road to north of Calvine Road.

East Stockton Boulevard is a north-south roadway that extends from south of Grant Line Road to Mack Road. East Stockton Boulevard has two lanes within the study area. East Stockton Boulevard becomes Survey Road south of Grant Line Road.

Grant Line Road is a major east-west roadway that extends from SR 99 to White Rock Road in unincorporated Sacramento County. Through the study area, Grant Line Road varies from two to six lanes.

Kammerer Road is an east-west roadway that extends from SR 99 to Bruceville Road. Kammerer Road has six lanes through the study area. Kammerer Road becomes Grant Line Road east of the SR 99 interchange.

TRAFFIC OPERATIONS ANALYSIS

This section describes the conditions of the existing intersections, roadway segments, and freeway ramp junctions.

Intersection Operations

The traffic counts for the study intersections were collected in September 2009. The intersections were counted during the AM (7 – 9 AM) and PM (4 – 6 PM) peak periods. The two study intersections located on Kammerer Road (Kammerer Road/Promenade Parkway and Kammerer Road/Lent Ranch Road) are not analyzed under existing conditions because the project is not anticipated to produce any traffic along this roadway under this scenario.

Figure 2 displays the existing AM and PM peak hour traffic volumes at the study intersections. This figure also shows the existing lane configurations and traffic control devices at each intersection. As shown, three of the four intersections are controlled by traffic signals and the other intersection is controlled by a stop sign on the southbound approach. Signal timings at these intersections were supplied by the City of Elk Grove.

Traffic operations were analyzed at the study intersections using the methodology described in Chapter 1. Table 3 summarizes the results; refer to Appendix A for technical calculations. Table 3 indicates that all of the study intersections operate at an acceptable LOS during the AM and PM peak hours.

TABLE 3
INTERSECTION LEVEL OF SERVICE – EXISTING CONDITIONS

Intersection	Traffic Control	AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
1. Grant Line Road / SR 99 SB Ramps	Signal	9	A	10	A
2. Grant Line Road / SR 99 NB Ramps	Signal	14	B	13	B
3. Grant Line Road / East Stockton Boulevard	Signal	32	C	32	C
4. Grant Line Road / Waterman Road	Side-Street Stop	23	C	17	C

Notes: For signalized and all-way stop-controlled intersections, the overall average intersection control delay is reported in seconds per vehicle. For side-street stop-controlled intersections, the average control delay for the worst movement is reported in seconds per vehicle.

Level of Service based on *Highway Capacity Manual* (Transportation Research Board, 2000).

Source: Fehr & Peers, 2010.

Roadway Segment Operations

The roadway segments were counted mid-week over a 24-hour period in September 2009. Table 4 shows the average daily traffic (ADT) volume, V/C Ratio, and LOS on the study roadway segments. As shown, all of the study roadways operate at LOS A under existing conditions.

TABLE 4
ROADWAY SEGMENT LEVEL OF SERVICE – EXISTING CONDITIONS

Roadway Segment	Daily Capacity[1]	Existing Conditions		
		ADT	V/C Ratio	LOS[2]
1. Grant Line Road – SR 99 to Waterman Road	36,000	16,000	0.44	A
2. Kammerer Road – SR 99 to Lotz Parkway	54,000	3,700	0.07	A
3. Waterman Road – Elk Grove Blvd. to Grant Line Road	18,000	5,600	0.31	A
4. Elk Grove Florin Road – Elk Grove Blvd. to East Stockton Blvd.	18,000	5,500	0.31	A

Notes: [1] The capacity of each roadway is based on the number of lanes and the facility type.

[2] Level of Service (LOS) based on *Traffic Impact Analysis Guidelines*, City of Elk Grove, July 2000.

Source: Fehr & Peers, 2010.

Freeway Ramp Junction Operations

The freeway ramp junctions were analyzed using the intersection traffic counts collected at the ramp terminals in September 2009. The volume on the SR 99 mainline was determined using the Caltrans

Transportation Systems Network (TSN) database for 2007. Table 5 displays the density and LOS, which are the result of the HCM analysis.

TABLE 5
FREEWAY FACILITY LEVEL OF SERVICE – EXISTING CONDITIONS

Freeway Facility	Existing Conditions			
	AM Peak Hour		PM Peak Hour	
	Density[1]	LOS[2]	Density[1]	LOS[2]
1. SR 99 NB Grant Line Rd. Off-Ramp	14	B	13	B
2. SR 99 NB Grant Line Rd. Loop On-Ramp	11	A	10	A
3. SR 99 NB Grant Line Rd. Slip On-Ramp	13	B	14	B
4. SR 99 SB Grant Line Rd. Off-Ramp	11	B	13	B
5. SR 99 SB Grant Line Rd. Loop On-Ramp	12	B	14	B
6. SR 99 SB Grant Line Rd. Slip On-Ramp	13	B	15	B

Notes: [1] Density reported in passenger cars per mile per lane.
[2] Level of Service based on *Highway Capacity Manual* (Transportation Research Board, 2000).
Source: Fehr & Peers, 2010.

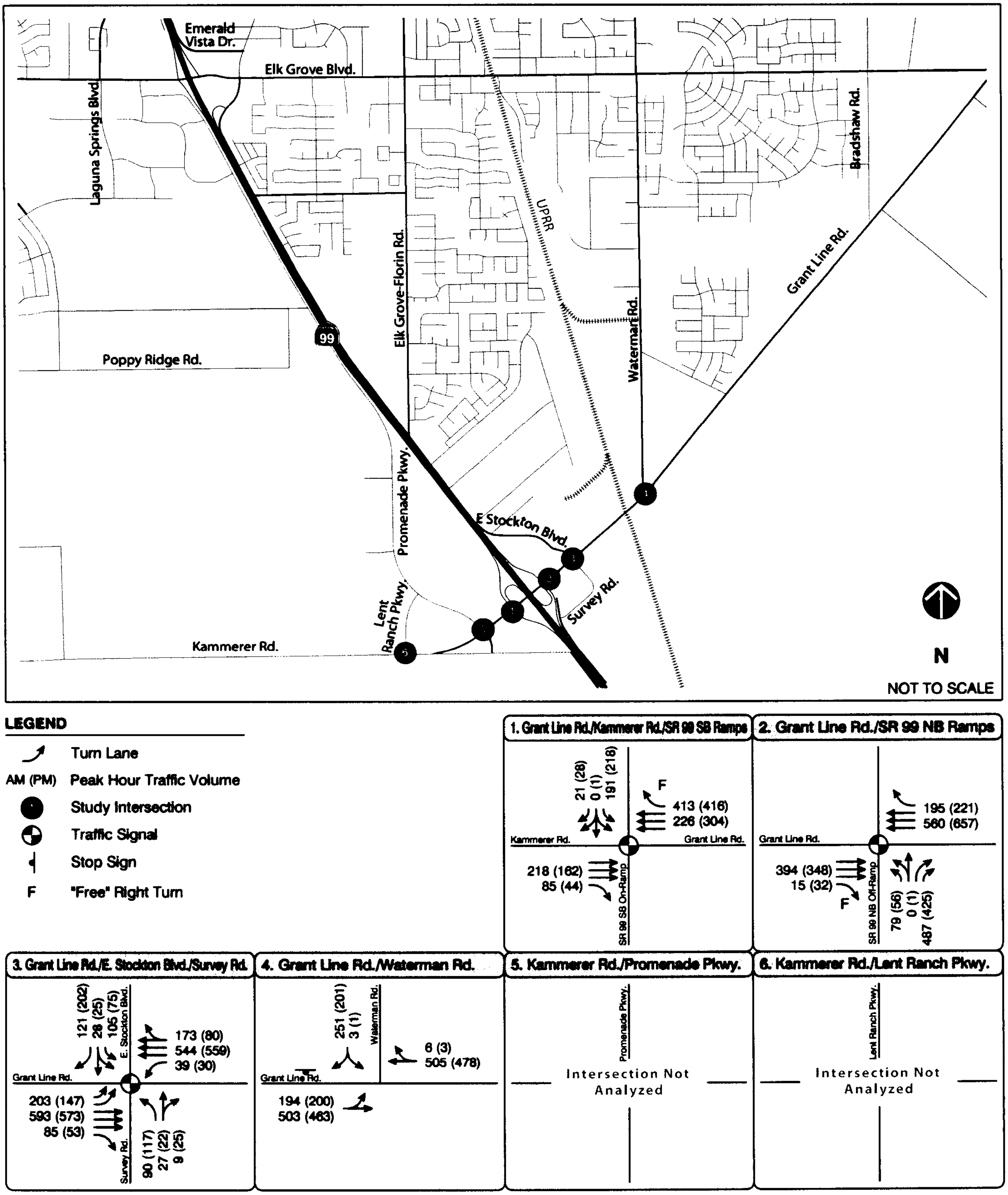
As shown in Table 5, all of the ramp junctions at the Grant Line Road interchange operate at LOS B or better during both the AM and PM peak hours. Refer to Appendix A for technical calculations.

Bicycle and Pedestrian Facilities

Class II bike lanes (on-street with signing and striping) are provided on East Stockton Boulevard and Grant Line Boulevard between East Stockton Boulevard and Promenade Parkway. Within the study area, crosswalks are generally provided at signalized intersections, and sidewalks exist along the frontage of most developed properties.

Transit Service

The City of Elk Grove operates fixed-route bus service (E-Tran) within the study area, which is the focus of this study. Numerous routes with stops are available within the study area, including East Stockton Boulevard (Routes 60, 57, and 162), Elk Grove-Florin Road (Routes 59, 57, and 162), Elk Grove Boulevard (Routes 66, 59, 52, 162, and 156), and Grant Line/Waterman Road (Routes 58 and 160). E-Tran is currently running a reduced schedule due to temporary budget cuts.



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PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - EXISTING CONDITIONS

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FIGURE 2

3. EXISTING PLUS PROJECT CONDITIONS

This chapter evaluates the potential impacts of relocating and expanding the E-Tran facilities on the existing transportation system. E-Tran currently operates out of the Elk Grove Corporation Yard located on Elkmont Way with 158 employees.

The City has identified three potential locations for the E-Tran facilities. All of the sites are undeveloped and located near the SR 99/Grant Line Road interchange. Site A is located south of Grant Line Road and east of Survey Road. Sites B and C are located off of East Stockton Boulevard, near E-Tran's current location. Site B is on Iron Rock Way, while Site C is located on Union Park Way.

The number of transit employees is estimated to increase from 158 to 340 employees after the proposed expansion. The expansion of the transit facilities is analyzed for all three proposed locations.

PROJECT TRAFFIC FORECASTS

The amount of traffic associated with the proposed project was estimated using a three-step process:

1. Trip generation – Estimated the amount of traffic entering and exiting the project site.
2. Trip distribution – Projected the paths used to approach and depart from the site, along with the percentage of traffic using each path.
3. Trip assignment – Assigned the trips to specific roadway segments and intersection turning movements.

The results of this process are described in detail below.

Trip Generation

The trip generation of the proposed project is a compilation of three sets of data: current trip generation levels, the increase in current transit trips to reach normal levels of operation (discussed further below), and the trip generation associated with the expansion of the transit services. The trip generation of each and the corresponding assumptions are described below.

Current Transit Operations

This trip generation data is associated with the E-Tran operations that currently operate out of the Corporation Yard. The transit facility currently generates two different types of vehicles: E-Tran buses and passenger cars. Trip generation was estimated for each type of vehicle separately because of their differing trip generation and operational characteristics.

To determine the current trip generation of the privately owned vehicles, we used information provided by the City regarding when employees arrive and depart during the course of a typical day. The City used current route information and assumed employees will enter or exit the facility within 15 minutes of their route departing or arriving. For E-Tran employees who drive more than one route each day, it was assumed that the employee left the transit facility only if the time between the routes is greater than 90 minutes. The number of private vehicles arriving and departing throughout the day can be found in Appendix B.

The current trip generation characteristics of the E-Tran buses were determined by conducting a 24-hour traffic count at the driveway of the existing transit location, the Elk Grove Corporation Yard on Elkmont

Way. The peak hours of the transit buses was found to be 9:00-10:00 AM and 2:00-3:00 PM, while the peak hour of the adjacent roadway network was found to be 7:15-8:15 AM and 4:15-5:15 PM. To remain conservative, this study analyzed the peak hour of the roadway system. The count data can be found in Appendix B.

The transit buses have specialized operational characteristics, such as frequent stops and long acceleration and deceleration lengths, differentiating it from a passenger car. Therefore, a Passenger Car Equivalent (PCE) factor of 1.5 was used to convert the bus trips into passenger car trips. This factor was selected based on studies of vehicles with similar characteristics to the transit bus.

Table 6 shows the current vehicle trip generation of the transit facilities for daily, AM, and PM peak hours.

TABLE 6
CURRENT TRANSIT TRIP GENERATION

Vehicle Types	PCE Ratio[1]	Daily			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
E-Trans Buses	1.5	164	183	347	20	2	22	20	3	23
Private Vehicles	1.0	99	85	184	0	7	7	1	8	9
Total	-	**263**	**268**	**531**	**20**	**9**	**29**	**21**	**11**	**32**

Notes: [1] PCE = Passenger Car Equivalent.
Source: Fehr & Peers, 2010.

<u>Increase in Transit Service</u>

When the counts were collected, the transit service in Elk Grove had been temporarily reduced due to budget constraints. This study analyzes the effects of the full transit service; therefore, the existing trip generation shown in Table 6 is factored up by 7.5 percent for both vehicle types, based on discussions with City staff. Table 7 displays the volume associated with the increase. Per City staff direction, the 7.5 percent increase in transit service applies only to the "without expansion" scenarios.

TABLE 7
TRIP GENERATION OF 7.5% INCREASE IN TRANSIT SERVICE

Vehicle Types	PCE Ratio[1]	Daily			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
E-Trans Buses	1.5	12	14	26	1	0	1	1	0	1
Private Vehicles	1.0	7	6	13	0	1	1	0	1	1
Total	-	**19**	**20**	**39**	**1**	**1**	**2**	**1**	**1**	**2**

Notes: [1] PCE = Passenger Car Equivalent.
Source: Fehr & Peers, 2010.

Proposed Expansion

With the proposed transit service expansion, employment at the transit facility would increase by approximately 115 percent, from 158 to 340 employees. The trip generation is expected to increase by the same percentage. The expansion-only trip generation is shown in Table 8.

TABLE 8
EXPANSION-ONLY TRIP GENERATION

Vehicle Types	PCE Ratio[1]	Daily			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
E-Trans Buses	1.5	189	210	399	23	2	25	23	3	26
Private Vehicles	1.0	114	98	212	0	8	8	1	9	10
Total	-	**302**	**308**	**611**	**23**	**10**	**33**	**24**	**13**	**37**

Notes: [1] PCE = Passenger Car Equivalent.
Source: Fehr & Peers, 2010.

The location of each proposed transit site also affects the trip generation assumptions. Since Sites B and C are close to the existing transit facility, the current trip generation of these sites is already captured in the existing count data. Therefore, the "plus project" trip generation adds only the trip generation associated with the 7.5 percent increase shown in Table 7 and the expansion-only trip generation shown in Table 8, as appropriate by scenario.

Site A is located south of Grant Line Road. Traffic volumes would be different at certain study intersections, especially Grant Line Road/Survey Road. For example, a transit vehicle traveling from Site B or Site C to SR 99 would make a southbound right turn at this intersection, while a vehicle from Site A would make a northbound left turn at Grant Line Road/Survey Road. Since the existing volumes already include the current transit vehicles coming from the Corporation Yard, these trips were removed from the network using the trip generation shown in Table 6. These trips were added back into the network assuming Site A access. The "plus project" volumes for Site A also include the trip generation associated with the 7.5 percent increase shown in Table 7 and the expansion-only trip generation shown in Table 8, as appropriated by scenario.

The following summarizes the trip generation used for each scenario:

- Existing Plus Project Site A Without Expansion – the existing counts are reduced using the current trip generation shown in Table 6. The trip generation for this scenario is the sum of the current trip generation (accounting for Site A access) and the 7.5 percent increase in transit service.

- Existing Plus Project Site A With Expansion – the existing counts are reduced using the current trip generation shown in Table 6. The trip generation for this scenario is the sum of the current trip generation (accounting for Site A access) and the expansion-only trip generation.

- Existing Plus Project Sites B and C Without Expansion – the trip generation for this scenario is the 7.5 percent increase in transit service. This is added to the existing counts.

- Existing Plus Project Sites B and C With Expansion – the trip generation for this scenario is the expansion-only trips. This is added to the existing counts.

Table 9 shows the total trip generation of each existing plus project scenario.

TABLE 9
PROJECT TRIP GENERATION BY SCENARIO – EXISTING PLUS PROJECT CONDTIONS

Scenario	Daily			AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total	In	Out	Total
Site A Without Expansion[1]	282	288	570	21	10	31	22	12	34
Site A With Expansion[1]	565	576	1142	43	19	62	45	24	69
Sites B & C Without Expansion	19	20	39	1	1	2	1	1	2
Sites B & C With Expansion	302	308	611	23	10	33	24	13	37

Note: [1]Site A also requires reduction of the current trip generation, which is not included in the values in this table.
Source: Fehr & Peers, 2010.

The detailed trip generation of each scenario can be found in Appendix B.

Trip Distribution

Trip distribution was also determined by analyzing private vehicles and E-Tran buses independently. Private vehicle distribution is based on the location of residential land uses in Elk Grove. This data is compiled using Geographic Information System (GIS) data from the Elk Grove area. The data produced a map of existing residential properties near the project sites. The private vehicle trip distribution was created based on the proportion of residential properties and their relative distance from the three possible project locations.

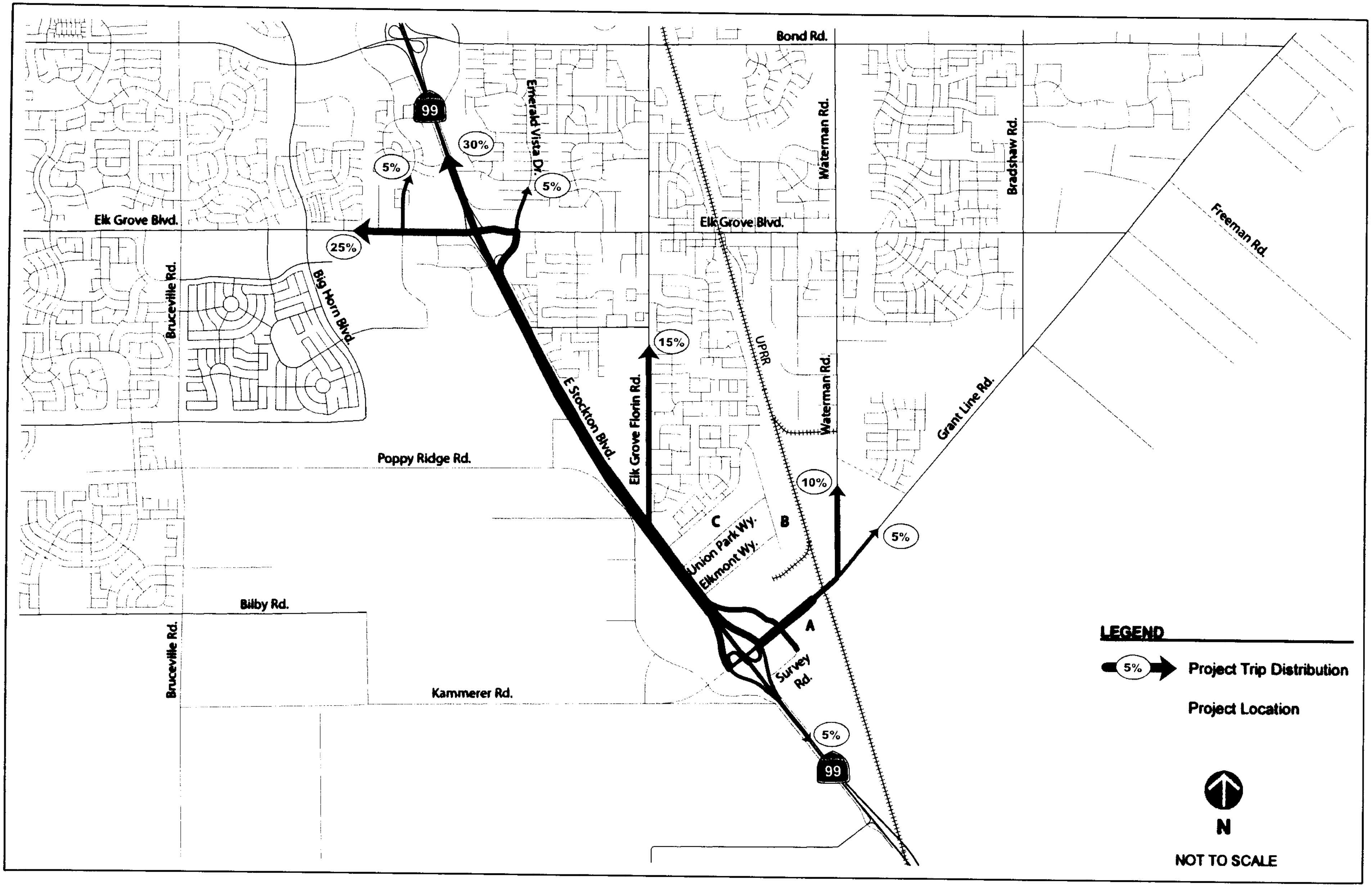
The E-Tran bus distribution is based on the City's current transit route maps. From the transit maps, the direction of travel for each bus was established based on which site it originated from. The percentage of E-Tran buses using each of the study facilities was calculated to determine the bus trip distribution.

The two types of distribution showed similar patterns; therefore, they were combined into one overall project distribution shown in Figure 3.

Trip Assignment

The trip generation and distribution estimates described above were used to assign trips for transit service to the surrounding roadway network for each scenario.

Site access will determine project turning movement volumes at the study intersections. Site A is assumed to have a right-in/right-out access on Grant Line Road, as well as a full access driveway on Survey Road. Sites B and C are assumed to have one or more full access driveways along their project frontage, accessible by East Stockton Boulevard. Figures 4 – 7 display the peak hour turning movements and lane configurations for the existing plus project scenarios.



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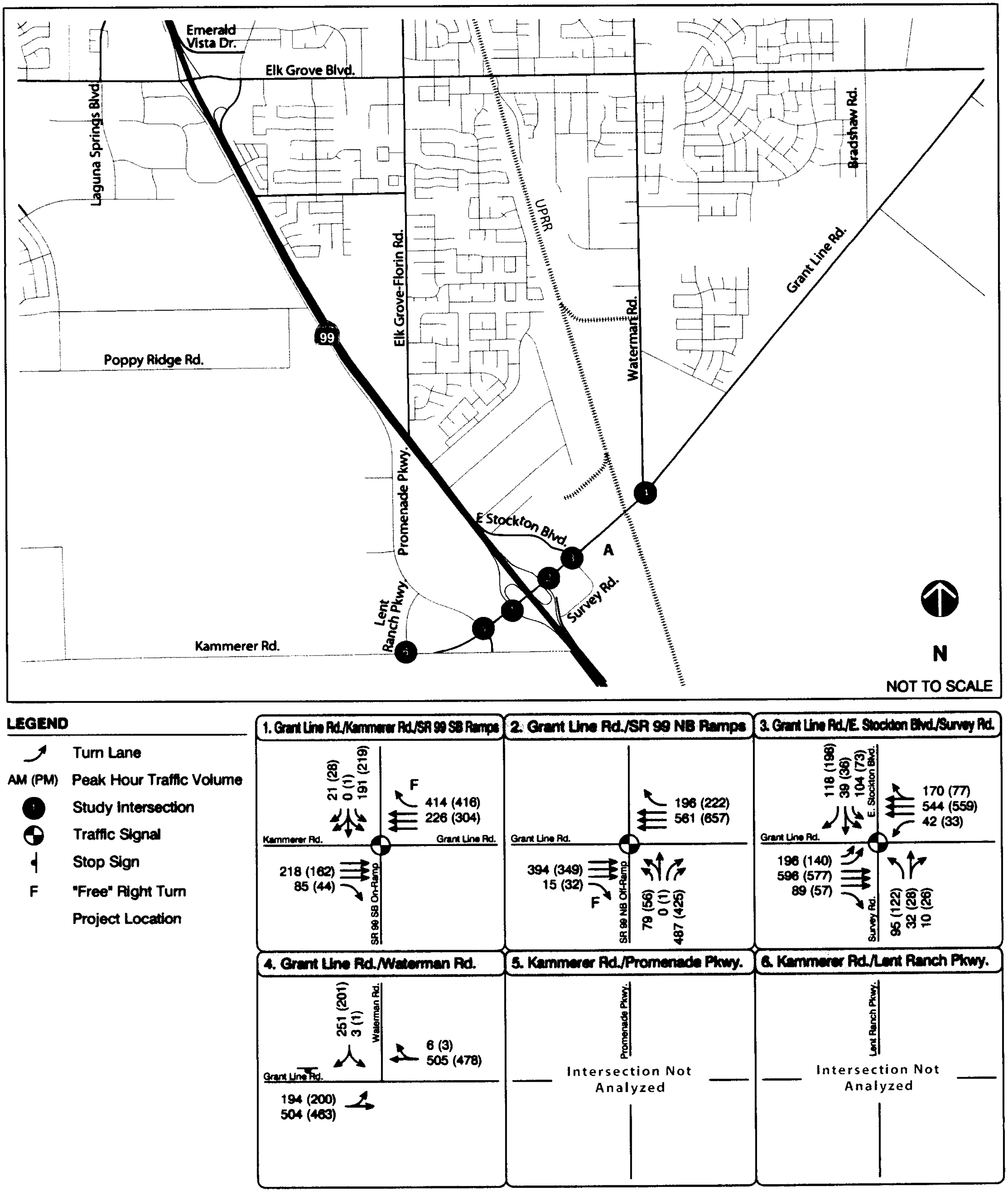
EXISTING PLUS PROJECT TRIP DISTRIBUTION

FIGURE 3



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PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - EXISTING PLUS PROJECT SITE A WITHOUT EXPANSION

FIGURE 4

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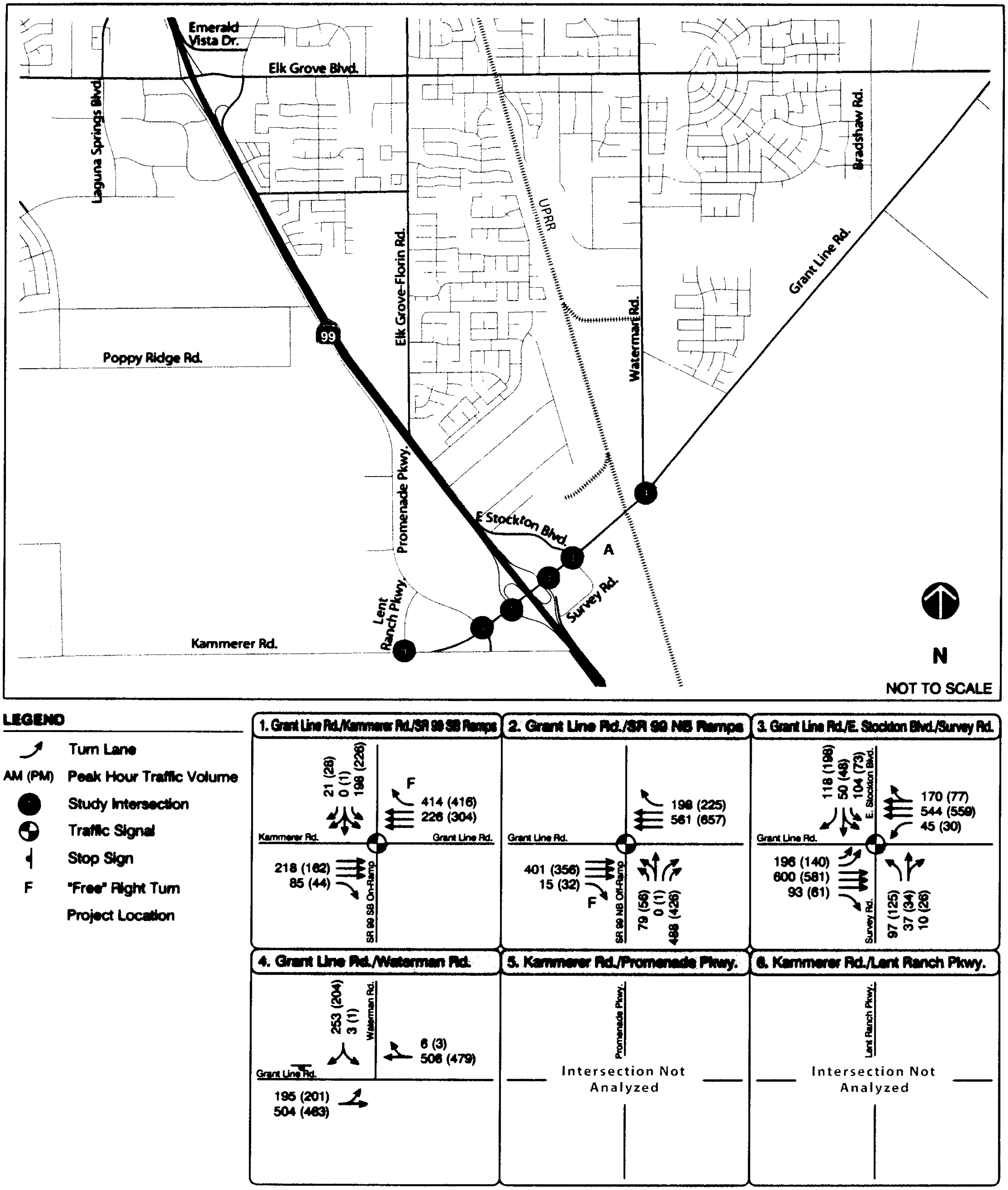

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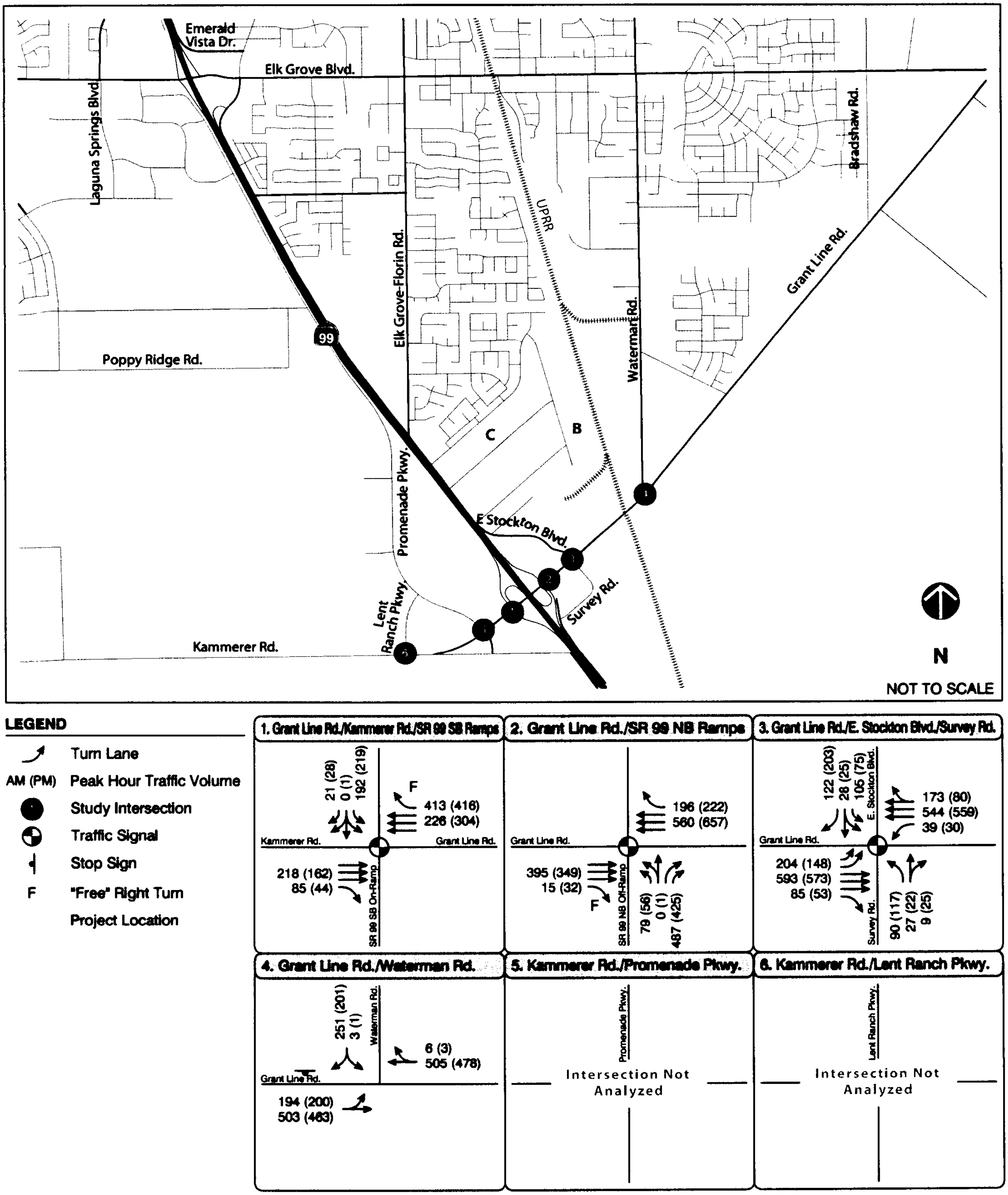
PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - EXISTING PLUS PROJECT SITE A WITH EXPANSION

FIGURE 5



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PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - EXISTING PLUS PROJECT SITE B & C WITHOUT EXPANSION

FIGURE 6

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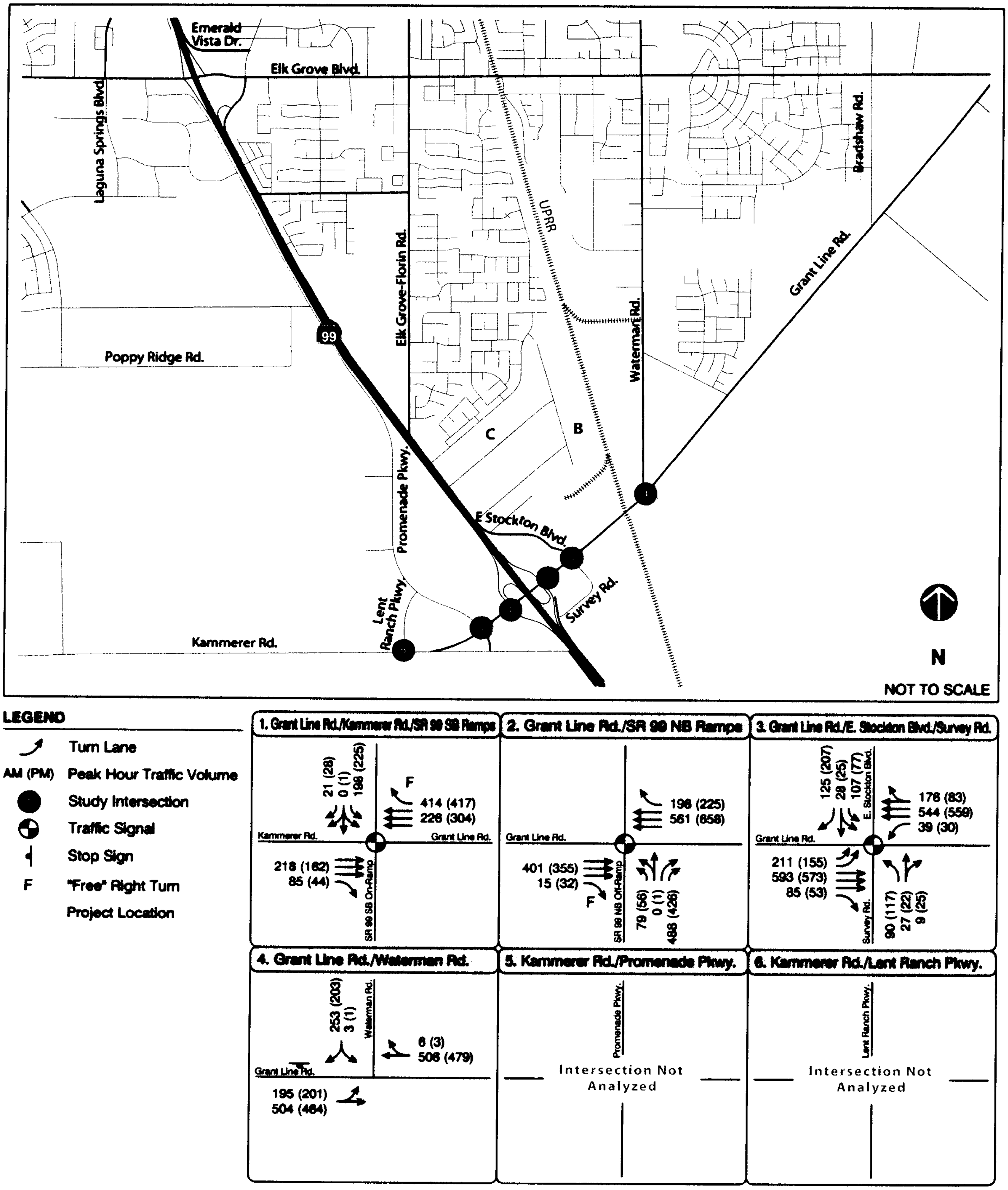

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PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - EXISTING PLUS PROJECT SITE B & C WITH EXPANSION

FIGURE 7

TRAFFIC OPERATIONS ANALYSIS

This section presents the technical analysis of intersections, roadways, and freeway facilities under existing plus project conditions. Refer to Appendix B for the technical calculations.

Intersection Operations

The study intersections were analyzed under all existing plus project scenarios using the procedures described in Chapter 1. Table 10 displays the LOS for each study intersection assuming the project is located at Site A; Table 11 displays the results for Sites B & C. The analysis shows all of the study intersections continue to operate acceptably with or without the proposed expansion and regardless of the location chosen. Therefore the project will not cause a significant impact at any of the study intersections under the existing plus project scenario.

TABLE 10
INTERSECTION CONTROL DELAY AND LEVEL OF SERVICE – EXISTING PLUS PROJECT CONDITIONS
SITE A

Intersection	Traffic Control	Existing Conditions				Existing Plus Project Without Expansion				Existing Plus Project With Expansion			
		AM		PM		AM		PM		AM		PM	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Grant Line Road / SR 99 SB Ramps	Signal	9	A	10	A	9	A	10	A	9	A	10	A
2. Grant Line Road / SR 99 NB Ramps	Signal	14	B	13	B	14	B	13	B	14	B	13	B
3. Grant Line Road / East Stockton Boulevard	Signal	32	C	32	C	33	C	33	C	33	C	33	C
4. Grant Line Road / Waterman Road	Side-Street Stop	23	C	17	C	23	C	17	C	23	C	17	C

Notes: For signalized and all-way stop-controlled intersections, the overall average intersection control delay is reported in seconds per vehicle. For side-street stop-controlled intersections, the average control delay for the worst movement is reported in seconds per vehicle.
Level of Service based on *Highway Capacity Manual* (Transportation Research Board, 2000).
Source: Fehr & Peers, 2010.

TABLE 11
INTERSECTION CONTROL DELAY AND LEVEL OF SERVICE – EXISTING PLUS PROJECT CONDITIONS
SITES B AND C

Intersection	Traffic Control	Existing Conditions				Existing Plus Project Without Expansion				Existing Plus Project With Expansion			
		AM		PM		AM		PM		AM		PM	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Grant Line Road / SR 99 SB Ramps	Signal	9	A	10	A	9	A	10	A	9	A	10	A
2. Grant Line Road / SR 99 NB Ramps	Signal	14	B	13	B	14	B	13	B	14	B	13	B
3. Grant Line Road / East Stockton Boulevard	Signal	32	C	32	C	32	C	32	C	33	C	33	C
4. Grant Line Road / Waterman Road	Side-Street Stop	23	C	17	C	23	C	17	C	23	C	17	C

Notes: For signalized and all-way stop-controlled intersections, the overall average intersection control delay is reported in seconds per vehicle. For side-street stop-controlled intersections, the average control delay for the worst movement is reported in seconds per vehicle.

Level of Service based on *Highway Capacity Manual* (Transportation Research Board, 2000).

Source: Fehr & Peers, 2010.

Roadway Segment Operations

The roadway segments were analyzed under existing plus project conditions, with and without the proposed expansion. As shown in Table 12, all of the study segments continue to operate at LOS A with the addition of project traffic. Since the three prospective project sites are located near each other, the roadway volumes will remain the same regardless of the project location. The study roadway segments have no significant impacts under the existing plus project scenario.

TABLE 12
ROADWAY SEGMENT LEVEL OF SERVICE – EXISTING PLUS PROJECT CONDITIONS
ALL SITES

Roadway Segment	Daily Capacity[1]	Existing Conditions			Existing Plus Project Without Expansion			Existing Plus Project With Expansion		
		ADT	V/C Ratio	LOS[2]	ADT	V/C Ratio	LOS[2]	ADT	V/C Ratio	LOS[2]
1. **Grant Line Road** – SR 99 to Waterman Road	36,000	16,000	0.44	A	16,000	0.44	A	16,200	0.45	A
2. **Kammerer Road** – SR 99 to Lotz Parkway	54,000	3,700	0.07	A	3,700	0.07	A	3,700	0.07	A
3. **Waterman Road** – Elk Grove Blvd. to Grant Line Road	18,000	5,600	0.31	A	5,600	0.31	A	5,700	0.32	A
4. **Elk Grove Florin Road** – Elk Grove Blvd. to East Stockton Blvd.	18,000	5,500	0.31	A	5,500	0.31	A	5,600	0.31	A

Notes: [1] The capacity of each roadway is based on the number of lanes and the facility type.
[2] Level of Service (LOS) based on *Traffic Impact Analysis Guidelines*, City of Elk Grove, July 2000.
Source: Fehr & Peers, 2010.

Freeway Ramp Junctions Operations

The freeway ramp junctions were analyzed under existing plus project conditions using the analysis procedures specified in the *Highway Capacity Manual, 2000.* The three sites were analyzed simultaneously because the ramp volumes are almost identical. As shown in Table 13, all freeway facilities continue to operate at an acceptable level of service after the project traffic is added, regardless of which site location is selected.

TABLE 13
FREEWAY FACILITY LEVEL OF SERVICE – EXISTING PLUS PROJECT CONDITIONS
ALL SITES

Intersection	Existing Conditions				Existing Plus Project Without Expansion				Existing Plus Project With Expansion			
	AM		PM		AM		PM		AM		PM	
	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
1. SR 99 NB Grant Line Rd. Off-Ramp	14	B	13	B	14	B	13	B	14	B	13	B
2. SR 99 NB Grant Line Rd. Loop On-Ramp	11	A	10	A	11	A	10	A	11	A	10	A
3. SR 99 NB Grant Line Rd. Slip On-Ramp	13	B	14	B	13	B	14	B	13	B	14	B
4. SR 99 SB Grant Line Rd. Off-Ramp	11	B	13	B	11	B	13	B	11	B	13	B
5. SR 99 SB Grant Line Rd. Loop On-Ramp	12	B	14	B	12	B	14	B	12	B	14	B
6. SR 99 SB Grant Line Rd. Slip On-Ramp	13	B	15	B	13	B	15	B	13	B	15	B

Notes: Density reported in passenger cars per mile per lane.
Level of Service based on *Highway Capacity Manual* (Transportation Research Board, 2000).
Source: Fehr & Peers, 2010.

Bicycle, Pedestrian, and Transit Facilities

The project will not inhibit bicyclists or pedestrians from using the facilities in the project's vicinity. Project impacts to bicycle and pedestrian facilities are considered less than significant.

Given that transit service is assumed to increase from the current levels under the existing plus project conditions, the project impacts to transit are considered less than significant.

4. CUMULATIVE CONDITIONS

This chapter analyzes cumulative transportation conditions in the study area prior to the proposed relocation of the E-Tran facility.

TRAFFIC MODEL ASSUMPTIONS AND FORECASTING METHODOLOGIES

Cumulative (General Plan Build-Out) weekday and peak hour traffic volume forecasts for study roadways, intersections, and freeway facilities were developed using the City of Elk Grove version of the SACMET regional travel demand model. This version of the SACMET travel demand model contains the latest land uses for the full build-out of the Laguna Ridge Specific Plan, Sterling Meadows, Southeast Area Specific Plan, and Elk Grove Marketplace retail parcels. No development was assumed south of Kammerer Road.

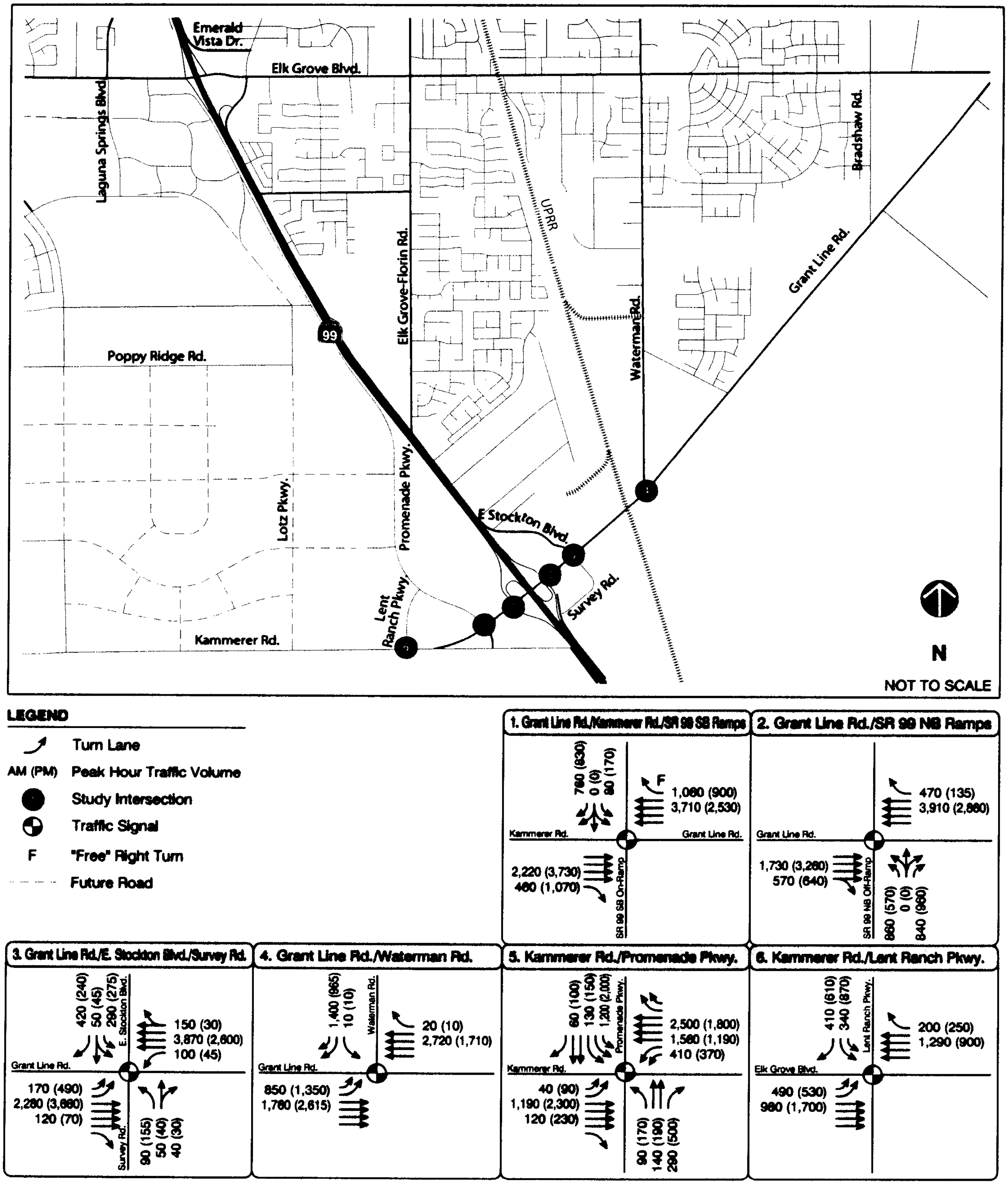
This version of the SACMET model also assumes full build-out of the roadway network identified in the City of Elk Grove General Plan (refer to Figure 8 for the cumulative roadway network). The following are key roadway improvements within the study area:

- Grant Line Road/Kammerer Road constructed as six lanes from Calvine Road to Bradshaw Road, as eight lanes from Bradshaw Road to Lotz Parkway, and as six lanes to I-5, where it is assumed to connect with the present Hood Franklin Road interchange.
- Waterman Road widened to four lanes from Grant Line Road to Calvine Road.
- Bradshaw Road widened to six lanes from Grant Line Road to north of Calvine Road.

The analysis did not assume a loop on-ramp from East Stockton Boulevard (at the SR 99/Elk Grove Boulevard interchange) onto northbound SR 99 per City direction. It also did not assume a new interchange on SR 99 between Elk Grove Boulevard and Grant Line Road.

TRAFFIC FORECASTS

The cumulative traffic forecasts for daily, AM peak hour, and PM peak hour conditions without the proposed project were developed by adding the difference between the cumulative and existing year traffic model forecast to the existing counts. In situations where the street currently does not exist or was not counted, the cumulative forecast was used directly and then balanced with forecasts from intersections where an existing traffic count was collected. Figure 8 shows the peak hour turning movements at study intersections under cumulative conditions.



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PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - CUMULATIVE NO PROJECT CONDITIONS

FIGURE 8

TRAFFIC OPERATIONS ANALYSIS

This section presents the analysis of intersections, roadways, and freeway ramp junctions under cumulative conditions without the proposed project. Refer to Appendix C for technical calculations.

Intersection Operations

The study intersections were analyzed under cumulative conditions, without the proposed project, using the procedures described in Chapter 1. The analysis assumes the intersection turning volumes and lane configurations shown in Figure 8. The results of that analysis are displayed in Table 14. Prior to the addition of project traffic, three of the six study intersections would operate unacceptably during both the AM and PM peak hours.

TABLE 14
INTERSECTION CONTROL DELAY AND LEVEL OF SERVICE – CUMULATIVE CONDITIONS

Intersection	Traffic Control	AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
1. Grant Line Road / SR 99 SB Ramps	Signal	23	C	26	C
2. Grant Line Road / SR 99 NB Ramps	Signal	40	D	39	D
3. Grant Line Road / East Stockton Blvd/Survey Road	Signal	**>80**	F	>80	F
4. Grant Line Road / Waterman Road	Signal	**>80**	F	**76**	E
5. Kammerer Road / Promenade Parkway	Signal	**62**	E	>80	F
6. Kammerer Road / Lent Ranch Parkway	Signal	28	C	25	C

Notes: For signalized and all-way stop-controlled intersections, the overall average intersection control delay is reported in seconds per vehicle. For side-street stop-controlled intersections, the average control delay for the worst movement is reported in seconds per vehicle. Delay is reported as >80 when Synchro is unable to calculate the average control delay for intersections due to oversaturated conditions.
Level of Service based on *Highway Capacity Manual* (Transportation Research Board, 2000).
Shading indicates that the intersection operates unacceptably based on the significance criteria.
Source: Fehr & Peers, 2010.

Roadway Segment Operations

Roadway segments were analyzed using the methodology described in Chapter 1. The analysis results are displayed in Table 15. They indicate that two of the study roadway segments would operate unacceptably under cumulative conditions prior to the addition of project traffic. Grant Line Road and Kammerer Road are assumed to be 8-lane facilities, while Waterman Road has four lanes, and Elk Grove-Florin Road is assumed to have two lanes under the cumulative scenario in the study area.

TABLE 15
ROADWAY SEGMENT LEVEL OF SERVICE – CUMULATIVE NO PROJECT CONDITIONS

Roadway Segment	Daily Capacity[1]	Cumulative No Project Conditions		
		ADT	V/C Ratio	LOS[2]
1. Grant Line Road – SR 99 to Waterman Road	72,000	78,100	1.08	F
2. Kammerer Road – SR 99 to Lotz Parkway	72,000	90,500	1.26	F
3. Waterman Road – Elk Grove Blvd. to Grant Line Road	36,000	29,300	0.81	D
4. Elk Grove-Florin Rd – Elk Grove Blvd. to East Stockton Blvd.	18,000	4,500	0.25	A

Notes: [1] The capacity of each roadway is based on the number of lanes and the facility type.
[2] Level of Service (LOS) based on *Traffic Impact Analysis Guidelines*, City of Elk Grove, July 2000.
Shading indicates that the roadway operates unacceptably based on the significance criteria.
Source: Fehr & Peers, 2010.

Freeway Ramp Junction Operations

The density and LOS for the freeway ramp junctions were calculated using the methodology described in Chapter 1. The analysis results, displayed in Table 16, indicate that all of the study facilities will operate acceptably in the LOS B to D range under cumulative no project conditions.

TABLE 16
FREEWAY FACILITY LEVEL OF SERVICE – CUMULATIVE NO PROJECT CONDITIONS

Freeway Facility	Cumulative No Project Conditions			
	AM Peak Hour		PM Peak Hour	
	Density[1]	LOS[2]	Density[1]	LOS[2]
1. SR 99 NB Grant Line Rd. Off-Ramp	24	C	23	C
2. SR 99 NB Grant Line Rd. Loop On-Ramp	17	B	17	B
3. SR 99 NB Grant Line Rd. Slip On-Ramp	21	C	18	B
4. SR 99 SB Grant Line Rd. Off-Ramp	17	B	17	B
5. SR 99 SB Grant Line Rd. Loop On-Ramp	18	B	22	C
6. SR 99 SB Grant Line Rd. Slip On-Ramp	22	C	30	D

Notes: [1] Density reported in passenger cars per mile per lane.
[2] Level of Service based on *Highway Capacity Manual* (Transportation Research Board, 2000).
Source: Fehr & Peers, 2010.

5. CUMULATIVE PLUS PROJECT CONDITIONS

This chapter evaluates the potential impacts of relocating the E-Tran facilities on the cumulative transportation network.

PROJECT TRAFFIC FORECASTS

The cumulative plus project traffic forecasts for daily, AM peak hour, and PM peak hour conditions were developed by adding the project trips to the cumulative no project volumes. The cumulative trip generation was developed using the same methodology as the existing trip generation. However, per City staff's direction, the "without expansion" scenario's trip generation was increased to include four new transit routes that will serve the planned Lent Ranch Marketplace and Laguna Ridge area. Table 17 displays the Laguna Ridge-only transit trip generation.

TABLE 17
LAGUNA RIDGE-ONLY TRANSIT TRIP GENERATION

Vehicle Types	PCE Ratio[1]	Daily			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
E-Trans Buses	1.5	25	28	53	3	0	3	3	1	4
Private Vehicles	1.0	16	13	29	0	1	1	0	1	1
Total	-	**41**	**41**	**82**	**3**	**1**	**4**	**3**	**2**	**5**

Notes: [1] PCE = Passenger Car Equivalent.
Source: Fehr & Peers, 2010.

The following summarizes the trip generation used for each scenario:

- Cumulative Plus Project Site A Without Expansion – the cumulative forecasts are reduced using the current trip generation shown in Table 6. The trip generation for this scenario is the sum of the current trip generation, the 7.5 percent increase in transit service, and the Laguna Ridge-only transit trip generation.
- Cumulative Plus Project Site A With Expansion – the cumulative forecasts are reduced using the current trip generation shown in Table 6. The trip generation for this scenario is the sum of the current trip generation and the expansion-only trip generation.
- Cumulative Plus Project Sites B and C Without Expansion – the trip generation for this scenario is the sum of the 7.5 percent increase in transit service and the Laguna Ridge-only transit trip generation. This is added to the cumulative no project forecasts.
- Cumulative Plus Project Sites B and C With Expansion – the trip generation for this scenario is the expansion-only trips. This is added to the cumulative no project forecasts.

Table 18 displays the cumulative plus project trip generation for each scenario.

TABLE 18
PROJECT TRIP GENERATION BY SCENARIO – CUMULATIVE PLUS PROJECT CONDTIONS

Scenario	Daily			AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total	In	Out	Total
Site A Without Expansion[1]	323	329	652	24	11	35	25	14	39
Site A With Expansion[1]	565	576	1,142	43	19	62	45	24	69
Sites B and C Without Expansion	60	61	121	4	2	6	4	3	7
Sites B and C With Expansion	302	308	611	23	10	33	24	13	37

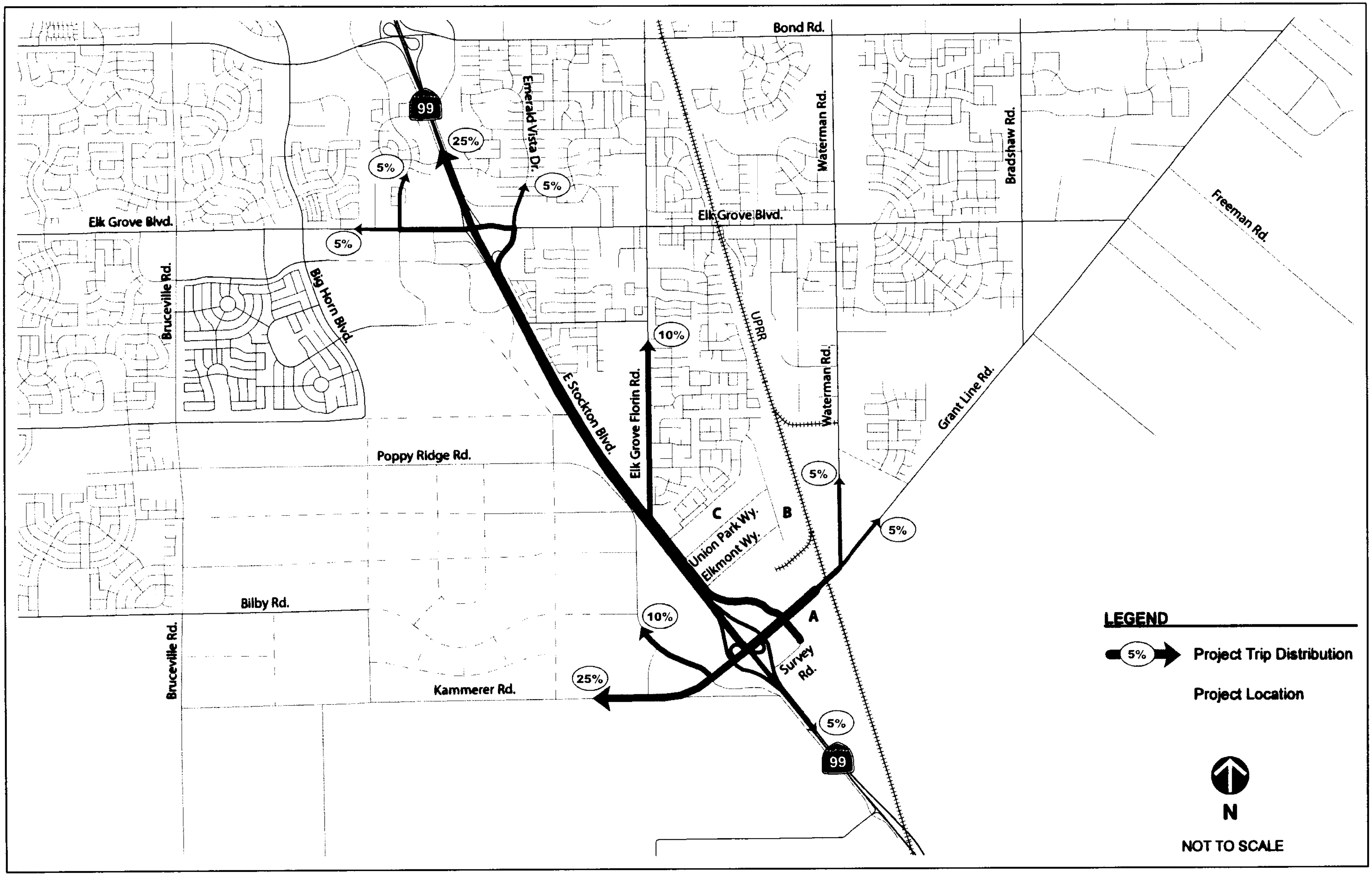
Note: [1]Site A also requires reduction of the current trip generation, which is not included in the values in this table.
Source: Fehr & Peers, 2010.

The trip generation of each scenario can be found in Appendix D.

The distribution of project trips under cumulative conditions would differ from existing conditions due to anticipated development of residential and commercial uses in the City of Elk Grove. The existing bus routes are assumed to remain the same under cumulative conditions; however, planned roadway improvements are expected to change the existing bus route paths. For example, Commuter Route 53, which starts at the Franklin Community Library off of Whitelock Parkway, may currently use Elk Grove Boulevard to reach the library, but Kammerer Road will be more direct and efficient under General Plan Build-out conditions.

In addition to shifts in traffic patterns, the cumulative trip distribution also accounts for the new transit lines serving planned development west of SR 99. Figure 9 shows the expected distribution of project trips under cumulative conditions.

Figures 10 – 13 displays the cumulative plus project turning movement volumes and assumed lane configurations.



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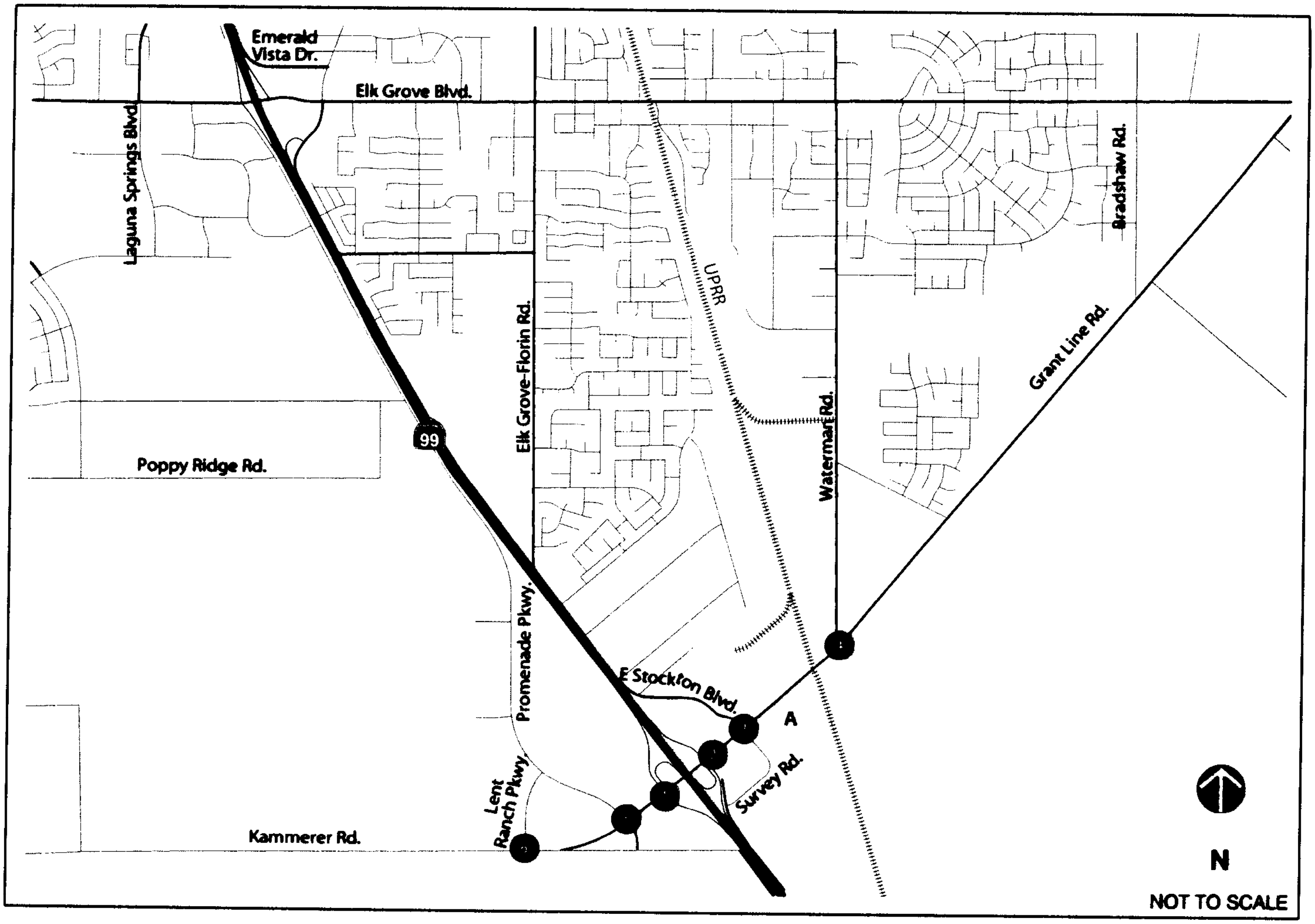
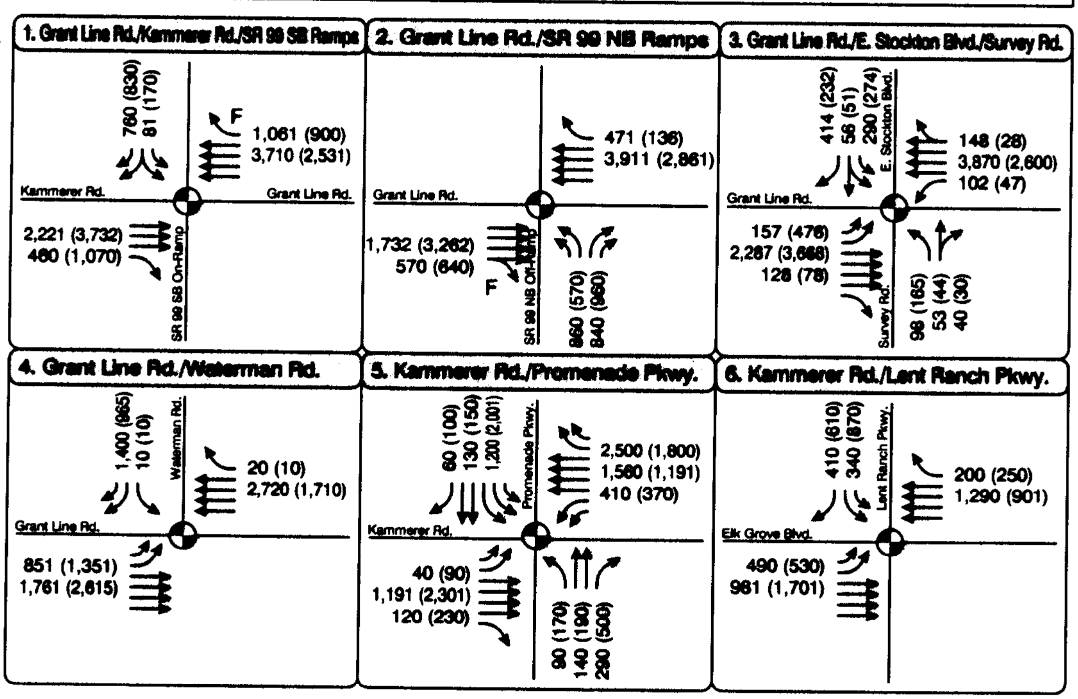
CUMULATIVE PLUS PROJECT TRIP DISTRIBUTION

FIGURE 9



LEGEND

- Turn Lane
- AM (PM) Peak Hour Traffic Volume
- Study Intersection
- Traffic Signal
- F "Free" Right Turn
- Project Location



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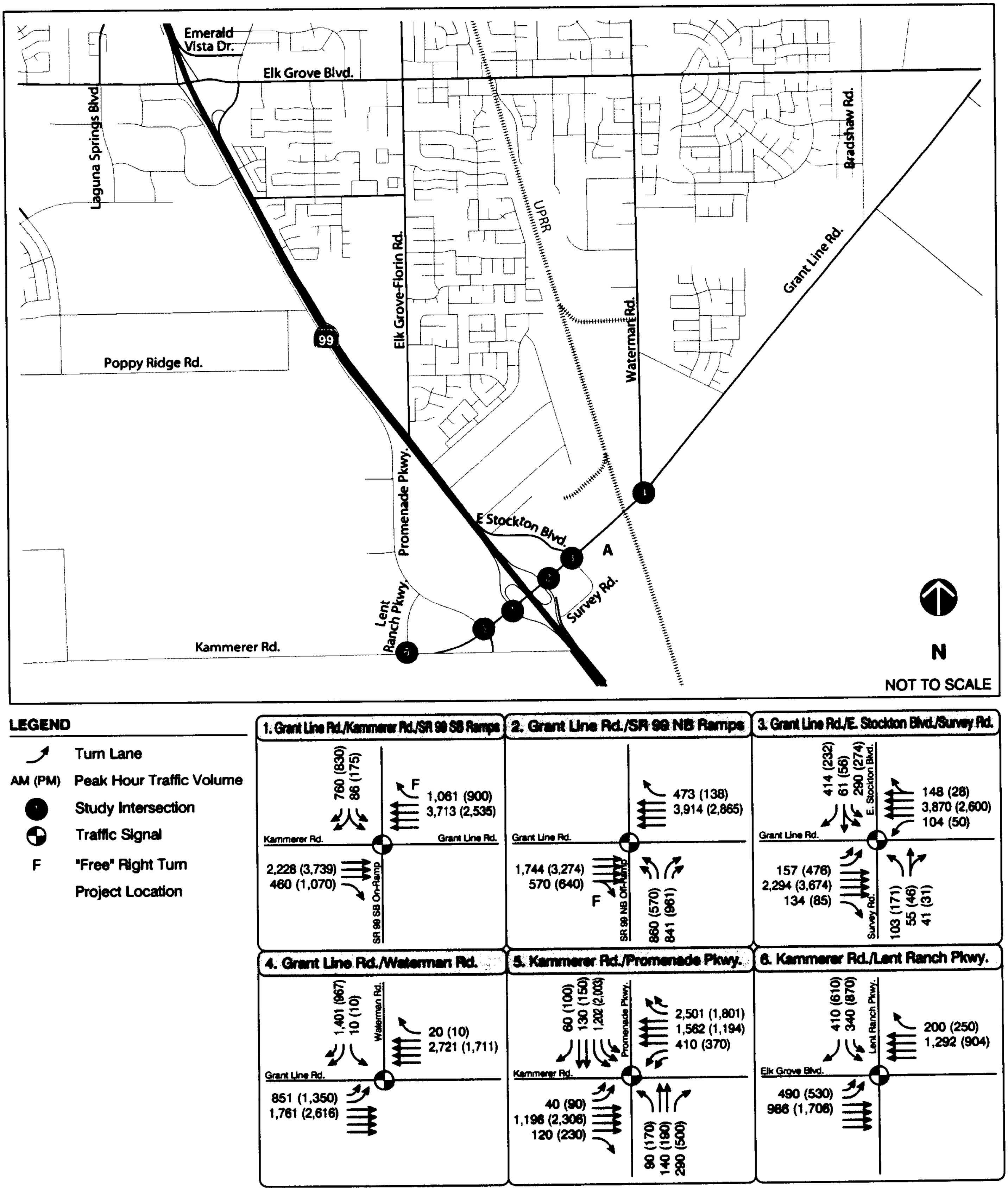
PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - CUMULATIVE PLUS PROJECT SITE A WITHOUT EXPANSION

FIGURE 10



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PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - CUMULATIVE PLUS PROJECT SITE A WITH EXPANSION

FIGURE 11

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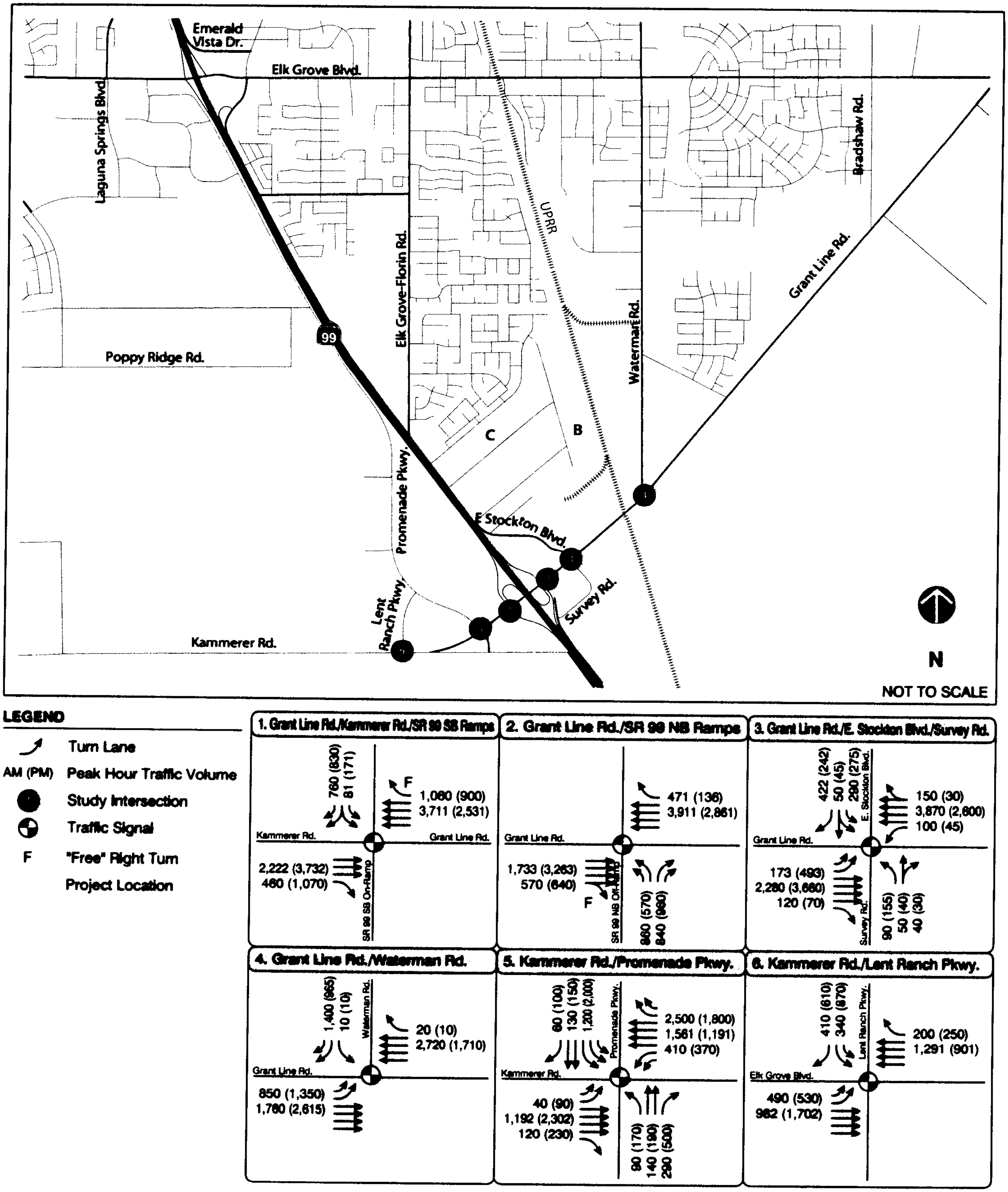

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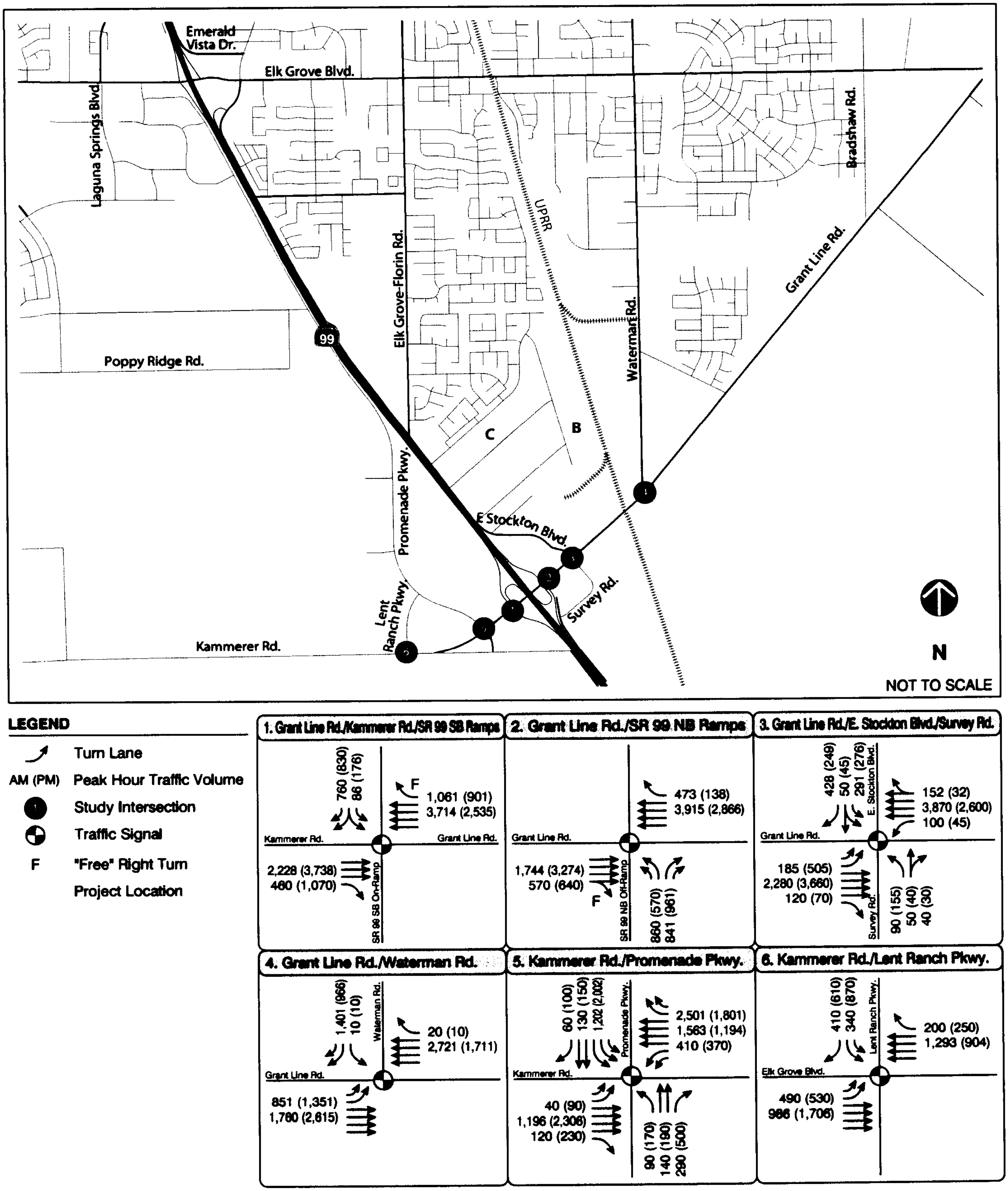
PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - CUMULATIVE PLUS PROJECT SITE B & C WITHOUT EXPANSION

FIGURE 12



PEAK HOUR TRAFFIC VOLUMES AND LANE CONFIGURATIONS - CUMULATIVE PLUS PROJECT SITE B & C WITH EXPANSION

FIGURE 13

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TRAFFIC OPERATIONS ANALYSIS

This section presents the analysis of intersections, roadways, and freeway facilities under cumulative plus project conditions. Refer to Appendix D for the technical calculations.

Intersection Operations

The study intersections were analyzed under cumulative plus project conditions using the procedures described in Chapter 1. The results of the analysis for Site A are shown in Table 19; analysis results for Sites B and C are shown in Table 20. Although the project does increase the average delay at intersections that already operate at LOS E or F, all increases are less than the significance threshold of five seconds; therefore, these are not considered significant impacts. The project, with or without expansion and regardless of the site, will not cause a significant impact at any of the study intersections under cumulative plus project conditions.

TABLE 19
INTERSECTION CONTROL DELAY AND LEVEL OF SERVICE – CUMUALTIVE PLUS PROJECT CONDITIONS
SITE A

Intersection	Traffic Control	Cumulative No Project				Cumulative Plus Project Without Expansion				Cumulative Plus Project With Expansion			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Grant Line Road / SR 99 SB Ramps	Signal	23	C	26	C	23	C	26	C	24	C	26	C
2. Grant Line Road / SR 99 NB Ramps	Signal	40	D	39	D	41	D	39	D	41	D	40	D
3. Grant Line Road / East Stockton Boulevard	Signal	>80	F	>80	F	>80	F	>80	F	>80	F	>80	F
4. Grant Line Road / Waterman Road	Signal	>80	F	76	E	>80	F	76	E	>80	F	76	E
5. Kammerer Road / Promenade Parkway	Signal	62	E	>80	F	62	E	>80	F	62	E	>80	F
6. Kammerer Road / Lent Ranch Parkway	Signal	28	C	25	C	28	C	25	C	28	C	25	C

Notes: For signalized and all-way stop-controlled intersections, the overall average intersection control delay is reported in seconds per vehicle. For side-street stop-controlled intersections, the average control delay for the worst movement is reported in seconds per vehicle. Delay is reported as >80 when Synchro is unable to calculate the average control delay for intersections due to oversaturated conditions.

Level of Service based on *Highway Capacity Manual* (Transportation Research Board, 2000).

Shading indicates that the intersection operates unacceptably based on the significance criteria.

Source: Fehr & Peers, 2010.

TABLE 20
INTERSECTION CONTROL DELAY AND LEVEL OF SERVICE – CUMUALTIVE PLUS PROJECT CONDITIONS
SITES B AND C

Intersection	Traffic Control	Cumulative No Project				Cumulative Plus Project Without Expansion				Cumulative Plus Project With Expansion			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. Grant Line Road / SR 99 SB Ramps	Signal	23	C	26	C	23	C	26	C	23	C	26	C
2. Grant Line Road / SR 99 NB Ramps	Signal	40	D	39	D	41	D	39	D	41	D	40	D
3. Grant Line Road / East Stockton Boulevard	Signal	>80	F	>80	F	>80	F	>80	F	>80	F	>80	F
4. Grant Line Road / Waterman Road	Signal	>80	F	76	E	>80	F	76	E	>80	F	76	E
5. Kammerer Road / Promenade Parkway	Signal	62	E	>80	F	62	E	>80	F	62	E	>80	F
6. Kammerer Road / Lent Ranch Parkway	Signal	28	C	25	C	28	C	25	C	28	C	25	C

Notes: For signalized and all-way stop-controlled intersections, the overall average intersection control delay is reported in seconds per vehicle. For side-street stop-controlled intersections, the average control delay for the worst movement is reported in seconds per vehicle. Delay is reported as >80 when Synchro is unable to calculate the average control delay for intersections due to oversaturated conditions.
Level of Service based on *Highway Capacity Manual* (Transportation Research Board, 2000).
Shading indicates that the intersection operates unacceptably based on the significance criteria.
Source: Fehr & Peers, 2010.

Roadway Segment Operations

Roadway segments were analyzed using the methodology described in Chapter 1. The analysis results are displayed in Table 21. They indicate that two of the study roadway segments would continue to operate unacceptably under cumulative plus project conditions.

While project traffic increases ADT volumes on all study segments, in no case would the addition of project traffic increase ADT volumes enough to result in additional segments operating unacceptably or to increase the volume-to-capacity ratio of already-deficient segments by 0.05.

TABLE 21
ROADWAY SEGMENT LEVEL OF SERVICE – CUMULATIVE PLUS PROJECT CONDITIONS
ALL SITES

Roadway Segment	Daily Capacity[1]	Cumulative No Project			Cumulative Plus Project Without Expansion			Cumulative Plus Project With Expansion		
		ADT	V/C Ratio	LOS[2]	ADT	V/C Ratio	LOS[2]	ADT	V/C Ratio	LOS[2]
1. Grant Line Road – SR 99 to Waterman Road	72,000	78,100	1.08	F	78,200	1.09	F	78,500	1.09	F
2. Kammerer Road – SR 99 to Lotz Parkway	72,000	90,500	1.26	F	90,500	1.26	F	90,700	1.26	F
3. Waterman Road – Elk Grove Blvd. to Grant Line Road	36,000	29,300	0.81	D	29,300	0.81	D	29,300	0.81	D
4. Elk Grove Florin Road – Elk Grove Blvd. to East Stockton Blvd.	18,000	4,500	0.25	A	4,500	0.25	A	4,600	0.25	A

Notes: [1] The capacity of each roadway is based on the number of lanes and the facility type.
[2] Level of Service (LOS) based on *Traffic Impact Analysis Guidelines*, City of Elk Grove, July 2000.
Source: Fehr & Peers, 2010.

Freeway Ramp Junction Operations

The density and level of service for the freeway ramp junctions were calculated using the methodology procedures from the *Highway Capacity Manual*, 2000. As shown in Table 22, the analysis indicates that all of the study facilities will continue to operate at an acceptable LOS under cumulative plus project conditions.

TABLE 22
FREEWAY FACILITY LEVEL OF SERVICE – CUMULATIVE PLUS PROJECT CONDITIONS
ALL SITES

Intersection	Cumulative No Project				Cumulative Plus Project Without Expansion				Cumulative Plus Project With Expansion			
	AM		PM		AM		PM		AM		PM	
	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS	Density	LOS
1. SR 99 NB Grant Line Rd. Off-Ramp	24	C	23	C	24	C	23	C	24	C	23	C
2. SR 99 NB Grant Line Rd. Loop On-Ramp	17	B	17	B	17	B	17	B	17	B	17	B
3. SR 99 NB Grant Line Rd. Slip On-Ramp	21	C	18	B	21	C	18	B	21	C	18	B
4. SR 99 SB Grant Line Rd. Off-Ramp	17	B	17	B	17	B	17	B	17	B	17	B
5. SR 99 SB Grant Line Rd. Loop On-Ramp	18	B	22	C	18	B	22	C	18	B	22	C
6. SR 99 SB Grant Line Rd. Slip On-Ramp	22	C	30	D	22	C	30	D	22	C	30	D

Notes: Density reported in passenger cars per mile per lane.
Level of Service based on *Highway Capacity Manual* (Transportation Research Board, 2000).
Source: Fehr & Peers, 2010.

The project will not cause significant impacts to the study freeway facilities.

Bicycle, Pedestrian, and Transit Facilities

The project will not inhibit bicyclists or pedestrians from using the facilities in the project's vicinity. Project impacts to bicycle and pedestrian facilities are considered less than significant.

Given that transit service is assumed to increase from the current levels under the cumulative plus project conditions, the project impacts to transit are considered less than significant.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱				↰	✥	↱
Volume (vph)	0	218	85	0	226	413	0	0	0	191	0	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7		5.7	4.0				6.6	6.6	6.6
Lane Util. Factor		0.91	1.00		0.91	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		5085	1583		5085	1583				1681	1611	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		5085	1583		5085	1583				1681	1611	1504
Peak-hour factor, PHF	0.84	0.84	0.84	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93
Adj. Flow (vph)	0	260	101	0	238	435	0	0	0	205	0	23
RTOR Reduction (vph)	0	0	28	0	0	0	0	0	0	0	1	18
Lane Group Flow (vph)	0	260	73	0	238	435	0	0	0	105	101	3
Turn Type			Perm			Free				Split		Perm
Protected Phases		6			2					8	8	
Permitted Phases			6			Free						8
Actuated Green, G (s)		71.8	71.8		71.8	100.0				15.9	15.9	15.9
Effective Green, g (s)		71.8	71.8		71.8	100.0				15.9	15.9	15.9
Actuated g/C Ratio		0.72	0.72		0.72	1.00				0.16	0.16	0.16
Clearance Time (s)		5.7	5.7		5.7					6.6	6.6	6.6
Vehicle Extension (s)		2.0	2.0		2.0					2.0	2.0	2.0
Lane Grp Cap (vph)		3651	1137		3651	1583				267	256	239
v/s Ratio Prot		0.05			0.05					0.06	c0.06	
v/s Ratio Perm			0.05			c0.27						0.00
v/c Ratio		0.07	0.06		0.07	0.27				0.39	0.40	0.01
Uniform Delay, d1		4.2	4.2		4.2	0.0				37.7	37.7	35.4
Progression Factor		1.00	1.00		0.76	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.0	0.1		0.0	0.4				0.3	0.4	0.0
Delay (s)		4.2	4.3		3.2	0.4				38.1	38.1	35.5
Level of Service		A	A		A	A				D	D	D
Approach Delay (s)		4.2			1.4			0.0			37.8	
Approach LOS		A			A			A			D	

Intersection Summary

HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	21.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱	↰	↰↑	↱↱			
Volume (vph)	0	394	15	0	560	195	79	0	487	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2	4.0		5.7	5.7	4.6	4.6	4.6			
Lane Util. Factor		0.91	1.00		0.91	1.00	0.95	0.95	0.88			
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		5085	1583		5085	1583	1681	1681	2787			
Flt Permitted		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		5085	1583		5085	1583	1681	1681	2787			
Peak-hour factor, PHF	0.87	0.87	0.87	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92
Adj. Flow (vph)	0	453	17	0	629	219	84	0	518	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	54	0	0	429	0	0	0
Lane Group Flow (vph)	0	453	17	0	629	165	42	42	89	0	0	0
Turn Type			Free			Perm	Split		Perm			
Protected Phases		6			2		4	4				
Permitted Phases			Free			2			4			
Actuated Green, G (s)		74.9	100.0		75.4	75.4	14.3	14.3	14.3			
Effective Green, g (s)		74.9	100.0		75.4	75.4	14.3	14.3	14.3			
Actuated g/C Ratio		0.75	1.00		0.75	0.75	0.14	0.14	0.14			
Clearance Time (s)		6.2			5.7	5.7	4.6	4.6	4.6			
Vehicle Extension (s)		2.0			2.0	2.0	2.0	2.0	2.0			
Lane Grp Cap (vph)		3809	1583		3834	1194	240	240	399			
v/s Ratio Prot		0.09			c0.12		0.02	0.02				
v/s Ratio Perm			0.01			0.10			c0.03			
v/c Ratio		0.12	0.01		0.16	0.14	0.17	0.17	0.22			
Uniform Delay, d1		3.5	0.0		3.5	3.4	37.7	37.7	37.9			
Progression Factor		0.81	1.00		1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		0.1	0.0		0.1	0.2	0.1	0.1	0.1			
Delay (s)		2.9	0.0		3.5	3.6	37.8	37.8	38.0			
Level of Service		A	A		A	A	D	D	D			
Approach Delay (s)		2.8			3.6			38.0			0.0	
Approach LOS		A			A			D			A	

Intersection Summary

HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	33.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	203	593	85	39	544	173	90	27	9	105	28	121
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	5085	1583	1770	4901		1770	1794		1681	1720	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	5085	1583	1770	4901		1770	1794		1681	1720	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.93	0.93	0.93	0.73	0.73	0.73	0.85	0.85	0.85
Adj. Flow (vph)	216	631	90	42	585	186	123	37	12	124	33	142
RTOR Reduction (vph)	0	0	41	0	24	0	0	10	0	0	0	126
Lane Group Flow (vph)	216	631	49	42	747	0	123	39	0	78	79	16
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	13.1	75.3	75.3	6.8	69.0		17.9	17.9		15.6	15.6	15.6
Effective Green, g (s)	13.1	75.3	75.3	6.8	69.0		17.9	17.9		15.6	15.6	15.6
Actuated g/C Ratio	0.09	0.54	0.54	0.05	0.50		0.13	0.13		0.11	0.11	0.11
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	323	2753	857	87	2431		228	231		189	193	178
v/s Ratio Prot	c0.06	c0.12		0.02	c0.15		c0.07	0.02		c0.05	0.05	
v/s Ratio Perm			0.03									0.01
v/c Ratio	0.67	0.23	0.06	0.48	0.31		0.54	0.17		0.41	0.41	0.09
Uniform Delay, d1	60.9	16.7	15.1	64.4	20.8		56.7	54.0		57.5	57.5	55.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.0	0.2	0.1	1.5	0.3		1.2	0.1		0.5	0.5	0.1
Delay (s)	64.9	16.9	15.2	66.0	21.2		58.0	54.1		58.0	58.0	55.5
Level of Service	E	B	B	E	C		E	D		E	E	E
Approach Delay (s)		27.8			23.5			56.9			56.8	
Approach LOS		C			C			E			E	

Intersection Summary

HCM Average Control Delay	32.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	139.1	Sum of lost time (s)	29.2
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	194	503	505	6	3	251
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.97	0.97	0.77	0.77
Hourly flow rate (vph)	223	578	521	6	4	326
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	527				1548	524
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	527				1548	524
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	79				96	41
cM capacity (veh/h)	1040				99	553

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	801	527	330
Volume Left	223	0	4
Volume Right	0	6	326
cSH	1040	1700	525
Volume to Capacity	0.21	0.31	0.63
Queue Length 95th (ft)	20	0	108
Control Delay (s)	4.8	0.0	22.8
Lane LOS	A		C
Approach Delay (s)	4.8	0.0	22.8
Approach LOS			C

Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱				↰	↔	↱
Volume (vph)	0	162	44	0	304	416	0	0	0	218	1	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7		5.7	4.0				6.6	6.6	6.6
Lane Util. Factor		0.91	1.00		0.91	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		5085	1583		5085	1583				1681	1611	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		5085	1583		5085	1583				1681	1611	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	176	48	0	334	457	0	0	0	237	1	30
RTOR Reduction (vph)	0	0	14	0	0	0	0	0	0	0	2	23
Lane Group Flow (vph)	0	176	34	0	334	457	0	0	0	121	118	4
Turn Type			Perm			Free				Split		Perm
Protected Phases		6			2					8	8	
Permitted Phases			6			Free						8
Actuated Green, G (s)		71.1	71.1		71.1	100.0				16.6	16.6	16.6
Effective Green, g (s)		71.1	71.1		71.1	100.0				16.6	16.6	16.6
Actuated g/C Ratio		0.71	0.71		0.71	1.00				0.17	0.17	0.17
Clearance Time (s)		5.7	5.7		5.7					6.6	6.6	6.6
Vehicle Extension (s)		2.0	2.0		2.0					2.0	2.0	2.0
Lane Grp Cap (vph)		3615	1126		3615	1583				279	267	250
v/s Ratio Prot		0.03			0.07					0.07	c0.07	
v/s Ratio Perm			0.02			c0.29						0.00
v/c Ratio		0.05	0.03		0.09	0.29				0.43	0.44	0.02
Uniform Delay, d1		4.3	4.3		4.5	0.0				37.5	37.5	34.9
Progression Factor		1.00	1.00		0.74	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.0	0.0		0.1	0.5				0.4	0.4	0.0
Delay (s)		4.4	4.3		3.4	0.5				37.9	38.0	34.9
Level of Service		A	A		A	A				D	D	C
Approach Delay (s)		4.3			1.7			0.0			37.6	
Approach LOS		A			A			A			D	

Intersection Summary

HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱	↰	↰	↱↱			
Volume (vph)	0	348	32	0	657	221	56	1	425	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2	4.0		5.7	5.7	4.6	4.6	4.6			
Lane Util. Factor		0.91	1.00		0.91	1.00	0.95	0.95	0.88			
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		5085	1583		5085	1583	1681	1688	2787			
Flt Permitted		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		5085	1583		5085	1583	1681	1688	2787			
Peak-hour factor, PHF	0.90	0.90	0.90	0.86	0.86	0.86	0.91	0.91	0.91	0.92	0.92	0.92
Adj. Flow (vph)	0	387	36	0	764	257	62	1	467	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	62	0	0	403	0	0	0
Lane Group Flow (vph)	0	387	36	0	764	195	32	31	64	0	0	0
Turn Type			Free			Perm	Split		Perm			
Protected Phases		6			2		4	4				
Permitted Phases			Free			2			4			
Actuated Green, G (s)		75.5	100.0		76.0	76.0	13.7	13.7	13.7			
Effective Green, g (s)		75.5	100.0		76.0	76.0	13.7	13.7	13.7			
Actuated g/C Ratio		0.76	1.00		0.76	0.76	0.14	0.14	0.14			
Clearance Time (s)		6.2			5.7	5.7	4.6	4.6	4.6			
Vehicle Extension (s)		2.0			2.0	2.0	2.0	2.0	2.0			
Lane Grp Cap (vph)		3839	1583		3865	1203	230	231	382			
v/s Ratio Prot		0.08			c0.15		0.02	0.02				
v/s Ratio Perm			0.02			0.12			c0.02			
v/c Ratio		0.10	0.02		0.20	0.16	0.14	0.13	0.17			
Uniform Delay, d1		3.2	0.0		3.4	3.3	38.0	37.9	38.1			
Progression Factor		0.89	1.00		1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		0.1	0.0		0.1	0.3	0.1	0.1	0.1			
Delay (s)		2.9	0.0		3.5	3.6	38.1	38.0	38.2			
Level of Service		A	A		A	A	D	D	D			
Approach Delay (s)		2.7			3.5			38.2			0.0	
Approach LOS		A			A			D			A	

Intersection Summary

HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↑↱		↰	↱		↰	↰↑	↱
Volume (vph)	147	573	53	30	559	80	117	22	25	75	25	202
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.98	1.00
Satd. Flow (prot)	3433	5085	1583	1770	4990		1770	1716		1681	1726	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.98	1.00
Satd. Flow (perm)	3433	5085	1583	1770	4990		1770	1716		1681	1726	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.88	0.88	0.88	0.80	0.80	0.80	0.84	0.84	0.84
Adj. Flow (vph)	162	630	58	34	635	91	146	28	31	89	30	240
RTOR Reduction (vph)	0	0	26	0	8	0	0	27	0	0	0	215
Lane Group Flow (vph)	162	630	32	34	718	0	146	32	0	59	60	25
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	10.9	76.8	76.8	5.1	71.0		19.3	19.3		14.4	14.4	14.4
Effective Green, g (s)	10.9	76.8	76.8	5.1	71.0		19.3	19.3		14.4	14.4	14.4
Actuated g/C Ratio	0.08	0.55	0.55	0.04	0.51		0.14	0.14		0.10	0.10	0.10
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	269	2808	874	65	2547		246	238		174	179	164
v/s Ratio Prot	c0.05	c0.12		0.02	c0.14		c0.08	0.02		c0.04	0.03	
v/s Ratio Perm			0.02									0.02
v/c Ratio	0.60	0.22	0.04	0.52	0.28		0.59	0.14		0.34	0.34	0.15
Uniform Delay, d1	62.0	15.9	14.2	65.8	19.5		56.2	52.6		57.9	57.9	56.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.6	0.2	0.1	3.5	0.3		2.5	0.1		0.4	0.4	0.2
Delay (s)	64.6	16.1	14.3	69.3	19.7		58.8	52.7		58.4	58.3	56.9
Level of Service	E	B	B	E	B		E	D		E	E	E
Approach Delay (s)		25.2			22.0			57.0			57.4	
Approach LOS		C			C			E			E	

Intersection Summary

HCM Average Control Delay	32.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	139.1	Sum of lost time (s)	29.2
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	200	463	478	3	1	201
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.93	0.93	0.79	0.79
Hourly flow rate (vph)	227	526	514	3	1	254
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	517				1496	516
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	517				1496	516
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	78				99	55
cM capacity (veh/h)	1049				106	559

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	753	517	256
Volume Left	227	0	1
Volume Right	0	3	254
cSH	1049	1700	548
Volume to Capacity	0.22	0.30	0.47
Queue Length 95th (ft)	21	0	62
Control Delay (s)	4.9	0.0	17.2
Lane LOS	A		C
Approach Delay (s)	4.9	0.0	17.2
Approach LOS			C

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

HCM 2000
Basic Freeway Segments
Capacity Analysis

Jurisdiction
Analysis Year Exisitng Conditions
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Transit Facilities

General Information / *Flow Rate Calculation*

	Freeway/ Direction	From/To	Analysis Time Period	Volume (vph)	PHF	Lanes	HOV Lane?	HOV Lane Volume	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	Grade E_T	Grade E_R	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcphpl)
1	SR 99 NB	Grant Line Road Loop On to Slip On	AM	1,746	0.92	3	No		Level			10%	0%			1.5	1.2	0.952	1.00	664
2	SR 99 NB	Grant Line Road Loop On to Slip On	PM	1,711	0.92	3	No		Level			10%	0%			1.5	1.2	0.952	1.00	651
3	SR 99 SB	Grant Line Road Loop On to Slip On	AM	1,905	0.92	3	No		Level			10%	0%			1.5	1.2	0.952	1.00	725
4	SR 99 SB	Grant Line Road Loop On to Slip On	PM	2,360	0.92	3	No		Level			10%	0%			1.5	1.2	0.952	1.00	898

HCM 2000
Basic Freeway Segments
Capacity Analysis

General Information			*Speed Calculation*										*Speed Calculation*		*Results*	
	Freeway/ Direction	From/To	BFFS (mph)	Lane Width (ft)	f_{LW}	R. Shoulder Width (ft)	f_{LC}	f_N	IC Density (per mi)	f_{ID}	Calculated FFS (mph)	Measured FFS (mph)	S (mph)	Density, D (pcplpm)	Level of Service	
1	SR 99 NB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	70.0	63.0	10.5	A	
2	SR 99 NB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	70.0	63.0	10.3	A	
3	SR 99 SB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	70.0	63.0	11.5	B	
4	SR 99 SB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	70.0	63.0	14.3	B	

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction
Analysis Year Exisitng Conditions
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Transit Facilities

	General Information			*Freeway Data*			*Freeway Volume Adjustment*									Effective
	Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S_{FF} (mph)	V (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	Flow Rate v_p (pcph)
2	SR 99 NB	Slip On-Ramp from WB Grant Line Road	AM	3	65.0	1,746	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	1,993	1,993
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	AM	3	65.0	1,905	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,174	2,174
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	PM	3	65.0	1,763	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,012	2,012
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	PM	3	65.0	2,360	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,693	2,693

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*On-Ramp Data*							*On-Ramp Volume Adjustment*									
	Freeway/				S_{FR}	V_R	Accel Lane (ft)					Truck/							Flow Rate
	Direction	On-ramp	Type	Lanes	(mph)	(vph)	L_{A1}	L_{A2}	L_{Aeff}	PHF	Terrain	Bus %	RV %	E_T	E_R	f_{HV}	f_P		v_p (pcph)
2	SR 99 NB	Slip On-Ramp from WB Grant Line Road	Right	1	45.0	195	450		450	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00		217
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	Right	1	45.0	85	450		450	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00		95
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	Right	1	45.0	222	450		450	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00		247
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	Right	1	45.0	44	450		450	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00		49

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Upstream Ramp Data*											
	Freeway/ Direction	On-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
2	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No											
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No											
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No											
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No											

	General Information		*Adjacent Downstream Ramp Data*												*v_{12} Estimation*						
	Freeway/ Direction	On-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	L_{EQ} 25-2	L_{EQ} 25-3	P_{FM} Equations 1	P_{FM} Equations 2	P_{FM} Equations 3	P_{FM}	v_{12} (pcph)
2	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No														0.590			0.590	1,176
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No														0.590			0.590	1,283
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No														0.590			0.590	1,187
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No														0.590			0.590	1,589

	General Information		*Capacity Checks*													
	Freeway/ Direction	On-ramp	v_{FI} (pcph)	Max v_{FI} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	v_3, v_{av34} (pcphpl)	v_3, v_{av34} > 2,700?	v_3, v_{av34} >1.5*v_{12}/2?	v_{12a} (pcph)	v_{R12a} (pcph)	Max v_{R12a} (pcph)	LOS F?
2	SR 99 NB	Slip On-Ramp from WB Grant Line Road	1,993	7,050	No	2,210	7,050	No	817	No	No	1,176	1,393	4,600	No
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	2,174	7,050	No	2,269	7,050	No	891	No	No	1,283	1,378	4,600	No
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	2,012	7,050	No	2,259	7,050	No	825	No	No	1,187	1,435	4,600	No
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	2,693	7,050	No	2,743	7,050	No	1,104	No	No	1,589	1,638	4,600	No

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information					*Results*		*Speed Estimation*			
	Freeway/ Direction	On-ramp	v_R (pcph)	Max v_R (pcph)	LOS F?	Density, D (pcplpm)	Level of Service	Int. Var. M_S	Inf. Area S_R (mph)	Out Lns. S_O (mph)	All vehs. S (mph)
2	SR 99 NB	Slip On-Ramp from WB Grant Line Road	217	2,100	No	13.4	B	0.296	58.2	63.9	60.2
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	95	2,100	No	13.4	B	0.296	58.2	63.6	60.2
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	247	2,100	No	13.7	B	0.297	58.2	63.8	60.1
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	49	2,100	No	15.4	B	0.301	58.1	62.8	59.9

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction Bakersfield, CA
Analysis Year Existing (2008)
Analyst AL

Agency or Company TRIP
Date 11/23/2009
Project Description Centennial Corridor Study

	General Information			*Freeway Data*			*Freeway Volume Adjustment*										Effective
	Freeway/ Direction	Off-ramp	Analysis Time Period	Lanes	S_{FF} (mph)	V (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)		Flow Rate v_p (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	AM	2	65.0	2,297	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,622		2,622
2	SR 99 SB	Off-Ramp to Grant Line Road	AM	2	65.0	1,717	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	1,960		1,960
3	SR 99 NB	Off-Ramp to Grant Line Road	PM	2	65.0	2,161	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,466		2,466
4	SR 99 SB	Off-Ramp to Grant Line Road	PM	2	65.0	2,153	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,457		2,457

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Off-Ramp Data*							*Off-Ramp Volume Adjustment*								
	Freeway/ Direction	Off-ramp	Type	Lanes	S_{FR} (mph)	V_R (vph)	Decel Lane (ft) L_{D1}	L_{D2}	L_{Deff}	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	Major	2	45.0	566	0	1,500	1,500	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	631
2	SR 99 SB	Off-Ramp to Grant Line Road	Major	2	45.0	212	0	1,500	1,500	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	236
3	SR 99 NB	Off-Ramp to Grant Line Road	Major	2	45.0	482	0	1,500	1,500	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	537
4	SR 99 SB	Off-Ramp to Grant Line Road	Major	2	45.0	247	0	1,500	1,500	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	275

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Upstream Ramp Data*											
	Freeway/ Direction	Off-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	No											
2	SR 99 SB	Off-Ramp to Grant Line Road	No											
3	SR 99 NB	Off-Ramp to Grant Line Road	No											
4	SR 99 SB	Off-Ramp to Grant Line Road	No											

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Downstream Ramp Data*												*v_{12} Estimation*						
	Freeway/ Direction	Off-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	L_{EQ} 25-13	L_{EQ} 25-14	P_{FD} Equations 5	6	7	P_{FD}	v_{12} (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	No																	1.000	2,622
2	SR 99 SB	Off-Ramp to Grant Line Road	No																	1.000	1,960
3	SR 99 NB	Off-Ramp to Grant Line Road	No																	1.000	2,466
4	SR 99 SB	Off-Ramp to Grant Line Road	No																	1.000	2,457

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			*Capacity Checks*												
	Freeway/ Direction	Off-ramp	v_{Fi} (pcph)	Max v_{Fi} (pcph)	LOS F?	v_3, v_{av34} (pcphpl)	v_3, v_{av34} > 2,700?	v_3, v_{av34} >1.5*v_{12}/2?	v_{12a} (pcph)	Max v_{12} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?
1	SR 99 NB	Off-Ramp to Grant Line Road	2,622	4,700	No	0	No	No	2,622	4,400	No	1,991	4,700	No
2	SR 99 SB	Off-Ramp to Grant Line Road	1,960	4,700	No	0	No	No	1,960	4,400	No	1,723	4,700	No
3	SR 99 NB	Off-Ramp to Grant Line Road	2,466	4,700	No	0	No	No	2,466	4,400	No	1,929	4,700	No
4	SR 99 SB	Off-Ramp to Grant Line Road	2,457	4,700	No	0	No	No	2,457	4,400	No	2,182	4,700	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information					*Results*		*Speed Estimation*			
	Freeway/ Direction	Off-ramp	v_R (pcph)	Max v_R (pcph)	LOS F?	Density, D (pcplpm)	Level of Service	Int. Var. D_S	Inf. Area S_R (mph)	Out Lns. S_O (mph)	All vehs. S (mph)
1	SR 99 NB	Off-Ramp to Grant Line Road	631	4,100	No	14.3	B	0.355	56.8	0.0	56.8
2	SR 99 SB	Off-Ramp to Grant Line Road	236	4,100	No	10.7	B	0.319	57.7	0.0	57.7
3	SR 99 NB	Off-Ramp to Grant Line Road	537	4,100	No	13.4	B	0.346	57.0	0.0	57.0
4	SR 99 SB	Off-Ramp to Grant Line Road	275	4,100	No	13.4	B	0.323	57.6	0.0	57.6

Appendix B

Existing Plus Project Conditions

HCM Signalized Intersection Capacity Analysis
1: Grantline Road & SR 99 SB Ramps 4/23/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱				↰	✥	↱
Volume (vph)	0	218	85	0	226	414	0	0	0	191	0	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7		5.7	4.0				6.6	6.6	6.6
Lane Util. Factor		0.91	1.00		0.91	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		5085	1583		5085	1583				1681	1611	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		5085	1583		5085	1583				1681	1611	1504
Peak-hour factor, PHF	0.84	0.84	0.84	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93
Adj. Flow (vph)	0	260	101	0	238	436	0	0	0	205	0	23
RTOR Reduction (vph)	0	0	28	0	0	0	0	0	0	0	1	18
Lane Group Flow (vph)	0	260	73	0	238	436	0	0	0	105	101	3
Turn Type			Perm			Free				Split		Perm
Protected Phases		6			2					8	8	
Permitted Phases			6			Free						8
Actuated Green, G (s)		71.8	71.8		71.8	100.0				15.9	15.9	15.9
Effective Green, g (s)		71.8	71.8		71.8	100.0				15.9	15.9	15.9
Actuated g/C Ratio		0.72	0.72		0.72	1.00				0.16	0.16	0.16
Clearance Time (s)		5.7	5.7		5.7					6.6	6.6	6.6
Vehicle Extension (s)		2.0	2.0		2.0					2.0	2.0	2.0
Lane Grp Cap (vph)		3651	1137		3651	1583				267	256	239
v/s Ratio Prot		0.05			0.05					0.06	c0.06	
v/s Ratio Perm			0.05			c0.28						0.00
v/c Ratio		0.07	0.06		0.07	0.28				0.39	0.40	0.01
Uniform Delay, d1		4.2	4.2		4.2	0.0				37.7	37.7	35.4
Progression Factor		1.00	1.00		0.76	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.0	0.1		0.0	0.4				0.3	0.4	0.0
Delay (s)		4.2	4.3		3.2	0.4				38.1	38.1	35.5
Level of Service		A	A		A	A				D	D	D
Approach Delay (s)		4.2			1.4			0.0			37.8	
Approach LOS		A			A			A			D	

Intersection Summary

HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	21.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱	↰	↰	↱↱			
Volume (vph)	0	394	15	0	561	196	79	0	487	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2	4.0		5.7	5.7	4.6	4.6	4.6			
Lane Util. Factor		0.91	1.00		0.91	1.00	0.95	0.95	0.88			
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		5085	1583		5085	1583	1681	1681	2787			
Flt Permitted		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		5085	1583		5085	1583	1681	1681	2787			
Peak-hour factor, PHF	0.87	0.87	0.87	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92
Adj. Flow (vph)	0	453	17	0	630	220	84	0	518	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	54	0	0	429	0	0	0
Lane Group Flow (vph)	0	453	17	0	630	166	42	42	89	0	0	0
Turn Type			Free			Perm	Split		Perm			
Protected Phases		6			2		4	4				
Permitted Phases			Free			2			4			
Actuated Green, G (s)		74.9	100.0		75.4	75.4	14.3	14.3	14.3			
Effective Green, g (s)		74.9	100.0		75.4	75.4	14.3	14.3	14.3			
Actuated g/C Ratio		0.75	1.00		0.75	0.75	0.14	0.14	0.14			
Clearance Time (s)		6.2			5.7	5.7	4.6	4.6	4.6			
Vehicle Extension (s)		2.0			2.0	2.0	2.0	2.0	2.0			
Lane Grp Cap (vph)		3809	1583		3834	1194	240	240	399			
v/s Ratio Prot		0.09			c0.12		0.02	0.02				
v/s Ratio Perm			0.01			0.10			c0.03			
v/c Ratio		0.12	0.01		0.16	0.14	0.17	0.17	0.22			
Uniform Delay, d1		3.5	0.0		3.5	3.4	37.7	37.7	37.9			
Progression Factor		0.81	1.00		1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		0.1	0.0		0.1	0.2	0.1	0.1	0.1			
Delay (s)		2.9	0.0		3.5	3.6	37.8	37.8	38.0			
Level of Service		A	A		A	A	D	D	D			
Approach Delay (s)		2.8			3.6			38.0			0.0	
Approach LOS		A			A			D			A	

Intersection Summary

HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	33.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↑↱		↰	↑↱		↰	↰↑	↱
Volume (vph)	196	596	89	42	544	170	95	32	10	104	39	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.98	1.00
Satd. Flow (prot)	3433	5085	1583	1770	4904		1770	1795		1681	1730	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.98	1.00
Satd. Flow (perm)	3433	5085	1583	1770	4904		1770	1795		1681	1730	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.93	0.93	0.93	0.73	0.73	0.73	0.85	0.85	0.85
Adj. Flow (vph)	209	634	95	45	585	183	130	44	14	122	46	139
RTOR Reduction (vph)	0	0	44	0	24	0	0	10	0	0	0	123
Lane Group Flow (vph)	209	634	51	45	744	0	130	48	0	83	85	16
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	12.8	74.3	74.3	7.0	68.5		18.4	18.4		15.9	15.9	15.9
Effective Green, g (s)	12.8	74.3	74.3	7.0	68.5		18.4	18.4		15.9	15.9	15.9
Actuated g/C Ratio	0.09	0.53	0.53	0.05	0.49		0.13	0.13		0.11	0.11	0.11
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	316	2716	846	89	2415		234	237		192	198	181
v/s Ratio Prot	c0.06	c0.12		0.03	c0.15		c0.07	0.03		c0.05	0.05	
v/s Ratio Perm			0.03									0.01
v/c Ratio	0.66	0.23	0.06	0.51	0.31		0.56	0.20		0.43	0.43	0.09
Uniform Delay, d1	61.1	17.2	15.6	64.4	21.1		56.5	53.8		57.4	57.4	55.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.0	0.2	0.1	1.6	0.3		1.6	0.2		0.6	0.5	0.1
Delay (s)	65.0	17.4	15.7	66.0	21.5		58.1	54.0		58.0	57.9	55.2
Level of Service	E	B	B	E	C		E	D		E	E	E
Approach Delay (s)		27.9			23.9			56.9			56.7	
Approach LOS		C			C			E			E	

Intersection Summary

HCM Average Control Delay	32.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	139.1	Sum of lost time (s)	29.2
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	194	504	505	6	3	251
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.97	0.97	0.77	0.77
Hourly flow rate (vph)	223	579	521	6	4	326
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	527				1549	524
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	527				1549	524
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	79				96	41
cM capacity (veh/h)	1040				99	553

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	802	527	330
Volume Left	223	0	4
Volume Right	0	6	326
cSH	1040	1700	525
Volume to Capacity	0.21	0.31	0.63
Queue Length 95th (ft)	20	0	108
Control Delay (s)	4.8	0.0	22.8
Lane LOS	A		C
Approach Delay (s)	4.8	0.0	22.8
Approach LOS			C

Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱				↰	✥	↱
Volume (vph)	0	162	44	0	304	416	0	0	0	219	1	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7		5.7	4.0				6.6	6.6	6.6
Lane Util. Factor		0.91	1.00		0.91	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		5085	1583		5085	1583				1681	1611	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		5085	1583		5085	1583				1681	1611	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	176	48	0	334	457	0	0	0	238	1	30
RTOR Reduction (vph)	0	0	14	0	0	0	0	0	0	0	2	22
Lane Group Flow (vph)	0	176	34	0	334	457	0	0	0	121	119	5
Turn Type			Perm			Free				Split		Perm
Protected Phases		6			2					8	8	
Permitted Phases			6			Free						8
Actuated Green, G (s)		71.0	71.0		71.0	100.0				16.7	16.7	16.7
Effective Green, g (s)		71.0	71.0		71.0	100.0				16.7	16.7	16.7
Actuated g/C Ratio		0.71	0.71		0.71	1.00				0.17	0.17	0.17
Clearance Time (s)		5.7	5.7		5.7					6.6	6.6	6.6
Vehicle Extension (s)		2.0	2.0		2.0					2.0	2.0	2.0
Lane Grp Cap (vph)		3610	1124		3610	1583				281	269	251
v/s Ratio Prot		0.03			0.07					0.07	c0.07	
v/s Ratio Perm			0.02			c0.29						0.00
v/c Ratio		0.05	0.03		0.09	0.29				0.43	0.44	0.02
Uniform Delay, d1		4.4	4.3		4.5	0.0				37.4	37.5	34.8
Progression Factor		1.00	1.00		0.74	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.0	0.1		0.1	0.5				0.4	0.4	0.0
Delay (s)		4.4	4.3		3.4	0.5				37.8	37.9	34.8
Level of Service		A	A		A	A				D	D	C
Approach Delay (s)		4.4			1.7			0.0			37.5	
Approach LOS		A			A			A			D	

Intersection Summary

HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱	↰	↰↑	↱↱			
Volume (vph)	0	349	32	0	657	222	56	1	425	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2	4.0		5.7	5.7	4.6	4.6	4.6			
Lane Util. Factor		0.91	1.00		0.91	1.00	0.95	0.95	0.88			
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		5085	1583		5085	1583	1681	1688	2787			
Flt Permitted		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		5085	1583		5085	1583	1681	1688	2787			
Peak-hour factor, PHF	0.90	0.90	0.90	0.86	0.86	0.86	0.91	0.91	0.91	0.92	0.92	0.92
Adj. Flow (vph)	0	388	36	0	764	258	62	1	467	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	62	0	0	403	0	0	0
Lane Group Flow (vph)	0	388	36	0	764	196	32	31	64	0	0	0
Turn Type			Free			Perm	Split		Perm			
Protected Phases		6			2		4	4				
Permitted Phases			Free			2			4			
Actuated Green, G (s)		75.5	100.0		76.0	76.0	13.7	13.7	13.7			
Effective Green, g (s)		75.5	100.0		76.0	76.0	13.7	13.7	13.7			
Actuated g/C Ratio		0.76	1.00		0.76	0.76	0.14	0.14	0.14			
Clearance Time (s)		6.2			5.7	5.7	4.6	4.6	4.6			
Vehicle Extension (s)		2.0			2.0	2.0	2.0	2.0	2.0			
Lane Grp Cap (vph)		3839	1583		3865	1203	230	231	382			
v/s Ratio Prot		0.08			c0.15		0.02	0.02				
v/s Ratio Perm			0.02			0.12			c0.02			
v/c Ratio		0.10	0.02		0.20	0.16	0.14	0.13	0.17			
Uniform Delay, d1		3.2	0.0		3.4	3.3	38.0	37.9	38.1			
Progression Factor		0.89	1.00		1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		0.1	0.0		0.1	0.3	0.1	0.1	0.1			
Delay (s)		2.9	0.0		3.5	3.6	38.1	38.0	38.2			
Level of Service		A	A		A	A	D	D	D			
Approach Delay (s)		2.7			3.5			38.2			0.0	
Approach LOS		A			A			D			A	

Intersection Summary

HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	577	57	33	559	77	122	28	26	73	36	198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.98	1.00
Satd. Flow (prot)	3433	5085	1583	1770	4992		1770	1729		1681	1739	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.98	1.00
Satd. Flow (perm)	3433	5085	1583	1770	4992		1770	1729		1681	1739	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.88	0.88	0.88	0.80	0.80	0.80	0.84	0.84	0.84
Adj. Flow (vph)	154	634	63	38	635	88	152	35	32	87	43	236
RTOR Reduction (vph)	0	0	29	0	7	0	0	27	0	0	0	211
Lane Group Flow (vph)	154	634	34	38	716	0	152	40	0	64	66	25
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	10.6	74.7	74.7	6.5	70.6		19.7	19.7		14.7	14.7	14.7
Effective Green, g (s)	10.6	74.7	74.7	6.5	70.6		19.7	19.7		14.7	14.7	14.7
Actuated g/C Ratio	0.08	0.54	0.54	0.05	0.51		0.14	0.14		0.11	0.11	0.11
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	262	2731	850	83	2534		251	245		178	184	167
v/s Ratio Prot	c0.04	c0.12		0.02	c0.14		c0.09	0.02		c0.04	0.04	
v/s Ratio Perm			0.02									0.02
v/c Ratio	0.59	0.23	0.04	0.46	0.28		0.61	0.16		0.36	0.36	0.15
Uniform Delay, d1	62.1	17.0	15.2	64.6	19.7		56.1	52.4		57.8	57.8	56.5
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.2	0.2	0.1	1.5	0.3		2.8	0.1		0.5	0.4	0.2
Delay (s)	64.3	17.2	15.3	66.0	20.0		58.9	52.6		58.3	58.3	56.7
Level of Service	E	B	B	E	B		E	D		E	E	E
Approach Delay (s)		25.6			22.3			56.9			57.2	
Approach LOS		C			C			E			E	

Intersection Summary

HCM Average Control Delay	32.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	139.1	Sum of lost time (s)	29.2
Intersection Capacity Utilization	45.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	200	463	478	3	1	201
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.93	0.93	0.79	0.79
Hourly flow rate (vph)	227	526	514	3	1	254
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	517				1496	516
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	517				1496	516
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	78				99	55
cM capacity (veh/h)	1049				106	559

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	753	517	256
Volume Left	227	0	1
Volume Right	0	3	254
cSH	1049	1700	548
Volume to Capacity	0.22	0.30	0.47
Queue Length 95th (ft)	21	0	62
Control Delay (s)	4.9	0.0	17.2
Lane LOS	A		C
Approach Delay (s)	4.9	0.0	17.2
Approach LOS			C

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱				↰	✥	↱
Volume (vph)	0	218	85	0	226	414	0	0	0	198	0	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7		5.7	4.0				6.6	6.6	6.6
Lane Util. Factor		0.91	1.00		0.91	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		5085	1583		5085	1583				1681	1611	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		5085	1583		5085	1583				1681	1611	1504
Peak-hour factor, PHF	0.84	0.84	0.84	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93
Adj. Flow (vph)	0	260	101	0	238	436	0	0	0	213	0	23
RTOR Reduction (vph)	0	0	29	0	0	0	0	0	0	0	1	18
Lane Group Flow (vph)	0	260	72	0	238	436	0	0	0	109	105	3
Turn Type			Perm			Free				Split		Perm
Protected Phases		6			2					8	8	
Permitted Phases			6			Free						8
Actuated Green, G (s)		71.7	71.7		71.7	100.0				16.0	16.0	16.0
Effective Green, g (s)		71.7	71.7		71.7	100.0				16.0	16.0	16.0
Actuated g/C Ratio		0.72	0.72		0.72	1.00				0.16	0.16	0.16
Clearance Time (s)		5.7	5.7		5.7					6.6	6.6	6.6
Vehicle Extension (s)		2.0	2.0		2.0					2.0	2.0	2.0
Lane Grp Cap (vph)		3646	1135		3646	1583				269	258	241
v/s Ratio Prot		0.05			0.05					0.06	c0.07	
v/s Ratio Perm			0.05			c0.28						0.00
v/c Ratio		0.07	0.06		0.07	0.28				0.41	0.41	0.01
Uniform Delay, d1		4.2	4.2		4.2	0.0				37.7	37.7	35.4
Progression Factor		1.00	1.00		0.76	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.0	0.1		0.0	0.4				0.4	0.4	0.0
Delay (s)		4.3	4.3		3.2	0.4				38.1	38.1	35.4
Level of Service		A	A		A	A				D	D	D
Approach Delay (s)		4.3			1.4			0.0			37.9	
Approach LOS		A			A			A			D	

Intersection Summary

HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	21.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱	↰	↰↑	↱↱			
Volume (vph)	0	401	15	0	561	198	79	0	488	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2	4.0		5.7	5.7	4.6	4.6	4.6			
Lane Util. Factor		0.91	1.00		0.91	1.00	0.95	0.95	0.88			
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		5085	1583		5085	1583	1681	1681	2787			
Flt Permitted		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		5085	1583		5085	1583	1681	1681	2787			
Peak-hour factor, PHF	0.87	0.87	0.87	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92
Adj. Flow (vph)	0	461	17	0	630	222	84	0	519	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	55	0	0	418	0	0	0
Lane Group Flow (vph)	0	461	17	0	630	167	42	42	101	0	0	0
Turn Type			Free			Perm	Split		Perm			
Protected Phases		6			2		4	4				
Permitted Phases			Free			2			4			
Actuated Green, G (s)		74.8	100.0		75.3	75.3	14.4	14.4	14.4			
Effective Green, g (s)		74.8	100.0		75.3	75.3	14.4	14.4	14.4			
Actuated g/C Ratio		0.75	1.00		0.75	0.75	0.14	0.14	0.14			
Clearance Time (s)		6.2			5.7	5.7	4.6	4.6	4.6			
Vehicle Extension (s)		2.0			2.0	2.0	2.0	2.0	2.0			
Lane Grp Cap (vph)		3804	1583		3829	1192	242	242	401			
v/s Ratio Prot		0.09			c0.12		0.02	0.02				
v/s Ratio Perm			0.01			0.11			c0.04			
v/c Ratio		0.12	0.01		0.16	0.14	0.17	0.17	0.25			
Uniform Delay, d1		3.5	0.0		3.5	3.4	37.6	37.6	38.0			
Progression Factor		0.81	1.00		1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		0.1	0.0		0.1	0.2	0.1	0.1	0.1			
Delay (s)		2.9	0.0		3.6	3.7	37.7	37.7	38.1			
Level of Service		A	A		A	A	D	D	D			
Approach Delay (s)		2.8			3.6			38.1			0.0	
Approach LOS		A			A			D			A	

Intersection Summary

HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.18		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↱		↰	↱		↰	↰	↱
Volume (vph)	196	600	93	45	544	170	97	37	10	104	50	118
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.98	1.00
Satd. Flow (prot)	3433	5085	1583	1770	4904		1770	1803		1681	1738	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.98	1.00
Satd. Flow (perm)	3433	5085	1583	1770	4904		1770	1803		1681	1738	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.93	0.93	0.93	0.73	0.73	0.73	0.85	0.85	0.85
Adj. Flow (vph)	209	638	99	48	585	183	133	51	14	122	59	139
RTOR Reduction (vph)	0	0	47	0	24	0	0	9	0	0	0	123
Lane Group Flow (vph)	209	638	52	48	744	0	133	56	0	89	92	16
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	12.8	73.5	73.5	7.3	68.0		18.6	18.6		16.2	16.2	16.2
Effective Green, g (s)	12.8	73.5	73.5	7.3	68.0		18.6	18.6		16.2	16.2	16.2
Actuated g/C Ratio	0.09	0.53	0.53	0.05	0.49		0.13	0.13		0.12	0.12	0.12
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	316	2687	836	93	2397		237	241		196	202	184
v/s Ratio Prot	c0.06	c0.13		0.03	c0.15		c0.08	0.03		c0.05	0.05	
v/s Ratio Perm			0.03									0.01
v/c Ratio	0.66	0.24	0.06	0.52	0.31		0.56	0.23		0.45	0.46	0.09
Uniform Delay, d1	61.1	17.7	16.0	64.2	21.4		56.4	53.9		57.3	57.3	54.9
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.0	0.2	0.1	2.0	0.3		1.8	0.2		0.6	0.6	0.1
Delay (s)	65.0	17.9	16.1	66.2	21.8		58.2	54.1		57.9	57.9	54.9
Level of Service	E	B	B	E	C		E	D		E	E	D
Approach Delay (s)		28.1			24.4			56.9			56.6	
Approach LOS		C			C			E			E	

Intersection Summary

HCM Average Control Delay	33.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	139.1	Sum of lost time (s)	29.2
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	195	504	506	6	3	253
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.97	0.97	0.77	0.77
Hourly flow rate (vph)	224	579	522	6	4	329
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	528				1552	525
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	528				1552	525
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	78				96	41
cM capacity (veh/h)	1039				98	553

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	803	528	332
Volume Left	224	0	4
Volume Right	0	6	329
cSH	1039	1700	524
Volume to Capacity	0.22	0.31	0.63
Queue Length 95th (ft)	20	0	110
Control Delay (s)	4.8	0.0	23.0
Lane LOS	A		C
Approach Delay (s)	4.8	0.0	23.0
Approach LOS			C

Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	90.1%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱				↰	✥	↱
Volume (vph)	0	162	44	0	304	416	0	0	0	226	1	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7		5.7	4.0				6.6	6.6	6.6
Lane Util. Factor		0.91	1.00		0.91	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		5085	1583		5085	1583				1681	1611	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		5085	1583		5085	1583				1681	1611	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	176	48	0	334	457	0	0	0	246	1	30
RTOR Reduction (vph)	0	0	14	0	0	0	0	0	0	0	2	22
Lane Group Flow (vph)	0	176	34	0	334	457	0	0	0	125	123	5
Turn Type			Perm			Free				Split		Perm
Protected Phases		6			2					8	8	
Permitted Phases			6			Free						8
Actuated Green, G (s)		70.9	70.9		70.9	100.0				16.8	16.8	16.8
Effective Green, g (s)		70.9	70.9		70.9	100.0				16.8	16.8	16.8
Actuated g/C Ratio		0.71	0.71		0.71	1.00				0.17	0.17	0.17
Clearance Time (s)		5.7	5.7		5.7					6.6	6.6	6.6
Vehicle Extension (s)		2.0	2.0		2.0					2.0	2.0	2.0
Lane Grp Cap (vph)		3605	1122		3605	1583				282	271	253
v/s Ratio Prot		0.03			0.07					0.07	c0.08	
v/s Ratio Perm			0.02			c0.29						0.00
v/c Ratio		0.05	0.03		0.09	0.29				0.44	0.46	0.02
Uniform Delay, d1		4.4	4.3		4.5	0.0				37.4	37.5	34.7
Progression Factor		1.00	1.00		0.74	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.0	0.1		0.1	0.5				0.4	0.4	0.0
Delay (s)		4.4	4.4		3.4	0.5				37.8	37.9	34.7
Level of Service		A	A		A	A				D	D	C
Approach Delay (s)		4.4			1.7			0.0			37.6	
Approach LOS		A			A			A			D	

Intersection Summary

HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	22.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱	↰	↰	↱↱			
Volume (vph)	0	356	32	0	657	225	56	1	426	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2	4.0		5.7	5.7	4.6	4.6	4.6			
Lane Util. Factor		0.91	1.00		0.91	1.00	0.95	0.95	0.88			
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		5085	1583		5085	1583	1681	1688	2787			
Flt Permitted		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		5085	1583		5085	1583	1681	1688	2787			
Peak-hour factor, PHF	0.90	0.90	0.90	0.86	0.86	0.86	0.91	0.91	0.91	0.92	0.92	0.92
Adj. Flow (vph)	0	396	36	0	764	262	62	1	468	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	63	0	0	404	0	0	0
Lane Group Flow (vph)	0	396	36	0	764	199	32	31	64	0	0	0
Turn Type			Free			Perm	Split		Perm			
Protected Phases		6			2		4	4				
Permitted Phases			Free			2			4			
Actuated Green, G (s)		75.5	100.0		76.0	76.0	13.7	13.7	13.7			
Effective Green, g (s)		75.5	100.0		76.0	76.0	13.7	13.7	13.7			
Actuated g/C Ratio		0.76	1.00		0.76	0.76	0.14	0.14	0.14			
Clearance Time (s)		6.2			5.7	5.7	4.6	4.6	4.6			
Vehicle Extension (s)		2.0			2.0	2.0	2.0	2.0	2.0			
Lane Grp Cap (vph)		3839	1583		3865	1203	230	231	382			
v/s Ratio Prot		0.08			c0.15		0.02	0.02				
v/s Ratio Perm			0.02			0.13			c0.02			
v/c Ratio		0.10	0.02		0.20	0.17	0.14	0.13	0.17			
Uniform Delay, d1		3.3	0.0		3.4	3.3	38.0	37.9	38.1			
Progression Factor		0.89	1.00		1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		0.1	0.0		0.1	0.3	0.1	0.1	0.1			
Delay (s)		2.9	0.0		3.5	3.6	38.1	38.0	38.2			
Level of Service		A	A		A	A	D	D	D			
Approach Delay (s)		2.7			3.5			38.2			0.0	
Approach LOS		A			A			D			A	

Intersection Summary

HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	30.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	581	61	30	559	77	125	34	26	73	48	198
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.99	1.00
Satd. Flow (prot)	3433	5085	1583	1770	4992		1770	1742		1681	1750	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.99	1.00
Satd. Flow (perm)	3433	5085	1583	1770	4992		1770	1742		1681	1750	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.88	0.88	0.88	0.80	0.80	0.80	0.84	0.84	0.84
Adj. Flow (vph)	154	638	67	34	635	88	156	42	32	87	57	236
RTOR Reduction (vph)	0	0	31	0	7	0	0	23	0	0	0	210
Lane Group Flow (vph)	154	638	36	34	716	0	156	51	0	70	74	26
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	10.6	75.4	75.4	5.1	69.9		19.9	19.9		15.2	15.2	15.2
Effective Green, g (s)	10.6	75.4	75.4	5.1	69.9		19.9	19.9		15.2	15.2	15.2
Actuated g/C Ratio	0.08	0.54	0.54	0.04	0.50		0.14	0.14		0.11	0.11	0.11
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	262	2756	858	65	2509		253	249		184	191	173
v/s Ratio Prot	c0.04	c0.13		0.02	c0.14		c0.09	0.03		0.04	c0.04	
v/s Ratio Perm			0.02									0.02
v/c Ratio	0.59	0.23	0.04	0.52	0.29		0.62	0.20		0.38	0.39	0.15
Uniform Delay, d1	62.1	16.7	14.9	65.8	20.1		56.0	52.6		57.6	57.6	56.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.2	0.2	0.1	3.5	0.3		3.1	0.1		0.5	0.5	0.1
Delay (s)	64.3	16.9	15.0	69.3	20.4		59.1	52.8		58.1	58.1	56.2
Level of Service	E	B	B	E	C		E	D		E	E	E
Approach Delay (s)		25.2			22.6			57.1			56.9	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM Average Control Delay	33.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	139.1	Sum of lost time (s)	29.2
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	201	463	479	3	1	204
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.93	0.93	0.79	0.79
Hourly flow rate (vph)	228	526	515	3	1	258
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	518				1500	517
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	518				1500	517
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	78				99	54
cM capacity (veh/h)	1048				105	559

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	755	518	259
Volume Left	228	0	1
Volume Right	0	3	258
cSH	1048	1700	547
Volume to Capacity	0.22	0.30	0.47
Queue Length 95th (ft)	21	0	63
Control Delay (s)	4.9	0.0	17.4
Lane LOS	A		C
Approach Delay (s)	4.9	0.0	17.4
Approach LOS			C

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	83.6%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱				↰	✥	↱
Volume (vph)	0	218	85	0	226	413	0	0	0	192	0	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7		5.7	4.0				6.6	6.6	6.6
Lane Util. Factor		0.91	1.00		0.91	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		5085	1583		5085	1583				1681	1611	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		5085	1583		5085	1583				1681	1611	1504
Peak-hour factor, PHF	0.84	0.84	0.84	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93
Adj. Flow (vph)	0	260	101	0	238	435	0	0	0	206	0	23
RTOR Reduction (vph)	0	0	28	0	0	0	0	0	0	0	1	18
Lane Group Flow (vph)	0	260	73	0	238	435	0	0	0	105	102	3
Turn Type			Perm			Free				Split		Perm
Protected Phases		6			2					8	8	
Permitted Phases			6			Free						8
Actuated Green, G (s)		71.8	71.8		71.8	100.0				15.9	15.9	15.9
Effective Green, g (s)		71.8	71.8		71.8	100.0				15.9	15.9	15.9
Actuated g/C Ratio		0.72	0.72		0.72	1.00				0.16	0.16	0.16
Clearance Time (s)		5.7	5.7		5.7					6.6	6.6	6.6
Vehicle Extension (s)		2.0	2.0		2.0					2.0	2.0	2.0
Lane Grp Cap (vph)		3651	1137		3651	1583				267	256	239
v/s Ratio Prot		0.05			0.05					0.06	c0.06	
v/s Ratio Perm			0.05			c0.27						0.00
v/c Ratio		0.07	0.06		0.07	0.27				0.39	0.40	0.01
Uniform Delay, d1		4.2	4.2		4.2	0.0				37.7	37.8	35.4
Progression Factor		1.00	1.00		0.76	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.0	0.1		0.0	0.4				0.3	0.4	0.0
Delay (s)		4.2	4.3		3.2	0.4				38.1	38.1	35.5
Level of Service		A	A		A	A				D	D	D
Approach Delay (s)		4.2			1.4			0.0			37.9	
Approach LOS		A			A			A			D	

Intersection Summary

HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	21.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱	↰	↰↑	↱↱			
Volume (vph)	0	395	15	0	560	196	79	0	487	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2	4.0		5.7	5.7	4.6	4.6	4.6			
Lane Util. Factor		0.91	1.00		0.91	1.00	0.95	0.95	0.88			
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		5085	1583		5085	1583	1681	1681	2787			
Flt Permitted		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		5085	1583		5085	1583	1681	1681	2787			
Peak-hour factor, PHF	0.87	0.87	0.87	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92
Adj. Flow (vph)	0	454	17	0	629	220	84	0	518	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	54	0	0	428	0	0	0
Lane Group Flow (vph)	0	454	17	0	629	166	42	42	90	0	0	0
Turn Type			Free			Perm	Split		Perm			
Protected Phases		6			2		4	4				
Permitted Phases			Free			2			4			
Actuated Green, G (s)		74.9	100.0		75.4	75.4	14.3	14.3	14.3			
Effective Green, g (s)		74.9	100.0		75.4	75.4	14.3	14.3	14.3			
Actuated g/C Ratio		0.75	1.00		0.75	0.75	0.14	0.14	0.14			
Clearance Time (s)		6.2			5.7	5.7	4.6	4.6	4.6			
Vehicle Extension (s)		2.0			2.0	2.0	2.0	2.0	2.0			
Lane Grp Cap (vph)		3809	1583		3834	1194	240	240	399			
v/s Ratio Prot		0.09			c0.12		0.02	0.02				
v/s Ratio Perm			0.01			0.10			c0.03			
v/c Ratio		0.12	0.01		0.16	0.14	0.17	0.17	0.23			
Uniform Delay, d1		3.5	0.0		3.5	3.4	37.7	37.7	38.0			
Progression Factor		0.81	1.00		1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		0.1	0.0		0.1	0.2	0.1	0.1	0.1			
Delay (s)		2.9	0.0		3.5	3.6	37.8	37.8	38.1			
Level of Service		A	A		A	A	D	D	D			
Approach Delay (s)		2.8			3.6			38.0			0.0	
Approach LOS		A			A			D			A	

Intersection Summary

HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.17		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	33.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	204	593	85	39	544	173	90	27	9	105	28	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	5085	1583	1770	4901		1770	1794		1681	1720	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	5085	1583	1770	4901		1770	1794		1681	1720	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.93	0.93	0.93	0.73	0.73	0.73	0.85	0.85	0.85
Adj. Flow (vph)	217	631	90	42	585	186	123	37	12	124	33	144
RTOR Reduction (vph)	0	0	41	0	24	0	0	10	0	0	0	128
Lane Group Flow (vph)	217	631	49	42	747	0	123	39	0	78	79	16
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	13.1	75.3	75.3	6.8	69.0		17.9	17.9		15.6	15.6	15.6
Effective Green, g (s)	13.1	75.3	75.3	6.8	69.0		17.9	17.9		15.6	15.6	15.6
Actuated g/C Ratio	0.09	0.54	0.54	0.05	0.50		0.13	0.13		0.11	0.11	0.11
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	323	2753	857	87	2431		228	231		189	193	178
v/s Ratio Prot	c0.06	c0.12		0.02	c0.15		c0.07	0.02		c0.05	0.05	
v/s Ratio Perm			0.03									0.01
v/c Ratio	0.67	0.23	0.06	0.48	0.31		0.54	0.17		0.41	0.41	0.09
Uniform Delay, d1	60.9	16.7	15.1	64.4	20.8		56.7	54.0		57.5	57.5	55.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.3	0.2	0.1	1.5	0.3		1.2	0.1		0.5	0.5	0.1
Delay (s)	65.2	16.9	15.2	66.0	21.2		58.0	54.1		58.0	58.0	55.5
Level of Service	E	B	B	E	C		E	D		E	E	E
Approach Delay (s)		27.9			23.5			56.9			56.8	
Approach LOS		C			C			E			E	

Intersection Summary

HCM Average Control Delay	32.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	139.1	Sum of lost time (s)	29.2
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	194	503	505	6	3	251
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.97	0.97	0.77	0.77
Hourly flow rate (vph)	223	578	521	6	4	326
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	527				1548	524
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	527				1548	524
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	79				96	41
cM capacity (veh/h)	1040				99	553

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	801	527	330
Volume Left	223	0	4
Volume Right	0	6	326
cSH	1040	1700	525
Volume to Capacity	0.21	0.31	0.63
Queue Length 95th (ft)	20	0	108
Control Delay (s)	4.8	0.0	22.8
Lane LOS	A		C
Approach Delay (s)	4.8	0.0	22.8
Approach LOS			C

Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱				↰	✣	↱
Volume (vph)	0	162	44	0	304	416	0	0	0	219	1	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7		5.7	4.0				6.6	6.6	6.6
Lane Util. Factor		0.91	1.00		0.91	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		5085	1583		5085	1583				1681	1611	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		5085	1583		5085	1583				1681	1611	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	176	48	0	334	457	0	0	0	238	1	30
RTOR Reduction (vph)	0	0	14	0	0	0	0	0	0	0	2	22
Lane Group Flow (vph)	0	176	34	0	334	457	0	0	0	121	119	5
Turn Type			Perm			Free				Split		Perm
Protected Phases		6			2					8	8	
Permitted Phases			6			Free						8
Actuated Green, G (s)		71.0	71.0		71.0	100.0				16.7	16.7	16.7
Effective Green, g (s)		71.0	71.0		71.0	100.0				16.7	16.7	16.7
Actuated g/C Ratio		0.71	0.71		0.71	1.00				0.17	0.17	0.17
Clearance Time (s)		5.7	5.7		5.7					6.6	6.6	6.6
Vehicle Extension (s)		2.0	2.0		2.0					2.0	2.0	2.0
Lane Grp Cap (vph)		3610	1124		3610	1583				281	269	251
v/s Ratio Prot		0.03			0.07					0.07	c0.07	
v/s Ratio Perm			0.02			c0.29						0.00
v/c Ratio		0.05	0.03		0.09	0.29				0.43	0.44	0.02
Uniform Delay, d1		4.4	4.3		4.5	0.0				37.4	37.5	34.8
Progression Factor		1.00	1.00		0.74	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.0	0.1		0.1	0.5				0.4	0.4	0.0
Delay (s)		4.4	4.3		3.4	0.5				37.8	37.9	34.8
Level of Service		A	A		A	A				D	D	C
Approach Delay (s)		4.4			1.7			0.0			37.5	
Approach LOS		A			A			A			D	

Intersection Summary

HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	349	32	0	657	222	56	1	425	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2	4.0		5.7	5.7	4.6	4.6	4.6			
Lane Util. Factor		0.91	1.00		0.91	1.00	0.95	0.95	0.88			
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		5085	1583		5085	1583	1681	1688	2787			
Flt Permitted		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		5085	1583		5085	1583	1681	1688	2787			
Peak-hour factor, PHF	0.90	0.90	0.90	0.86	0.86	0.86	0.91	0.91	0.91	0.92	0.92	0.92
Adj. Flow (vph)	0	388	36	0	764	258	62	1	467	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	62	0	0	403	0	0	0
Lane Group Flow (vph)	0	388	36	0	764	196	32	31	64	0	0	0
Turn Type			Free			Perm	Split		Perm			
Protected Phases		6			2		4	4				
Permitted Phases			Free			2			4			
Actuated Green, G (s)		75.5	100.0		76.0	76.0	13.7	13.7	13.7			
Effective Green, g (s)		75.5	100.0		76.0	76.0	13.7	13.7	13.7			
Actuated g/C Ratio		0.76	1.00		0.76	0.76	0.14	0.14	0.14			
Clearance Time (s)		6.2			5.7	5.7	4.6	4.6	4.6			
Vehicle Extension (s)		2.0			2.0	2.0	2.0	2.0	2.0			
Lane Grp Cap (vph)		3839	1583		3865	1203	230	231	382			
v/s Ratio Prot		0.08			c0.15		0.02	0.02				
v/s Ratio Perm			0.02			0.12			c0.02			
v/c Ratio		0.10	0.02		0.20	0.16	0.14	0.13	0.17			
Uniform Delay, d1		3.2	0.0		3.4	3.3	38.0	37.9	38.1			
Progression Factor		0.89	1.00		1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		0.1	0.0		0.1	0.3	0.1	0.1	0.1			
Delay (s)		2.9	0.0		3.5	3.6	38.1	38.0	38.2			
Level of Service		A	A		A	A	D	D	D			
Approach Delay (s)		2.7			3.5			38.2			0.0	
Approach LOS		A			A			D			A	

Intersection Summary

HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	30.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↱		↰	↱		↰	↰	↱
Volume (vph)	148	573	53	30	559	80	117	22	25	75	25	203
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.98	1.00
Satd. Flow (prot)	3433	5085	1583	1770	4990		1770	1716		1681	1726	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.98	1.00
Satd. Flow (perm)	3433	5085	1583	1770	4990		1770	1716		1681	1726	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.88	0.88	0.88	0.80	0.80	0.80	0.84	0.84	0.84
Adj. Flow (vph)	163	630	58	34	635	91	146	28	31	89	30	242
RTOR Reduction (vph)	0	0	26	0	8	0	0	27	0	0	0	217
Lane Group Flow (vph)	163	630	32	34	718	0	146	32	0	59	60	25
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	11.0	76.8	76.8	5.1	70.9		19.3	19.3		14.4	14.4	14.4
Effective Green, g (s)	11.0	76.8	76.8	5.1	70.9		19.3	19.3		14.4	14.4	14.4
Actuated g/C Ratio	0.08	0.55	0.55	0.04	0.51		0.14	0.14		0.10	0.10	0.10
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	271	2808	874	65	2543		246	238		174	179	164
v/s Ratio Prot	c0.05	c0.12		0.02	c0.14		c0.08	0.02		c0.04	0.03	
v/s Ratio Perm			0.02									0.02
v/c Ratio	0.60	0.22	0.04	0.52	0.28		0.59	0.14		0.34	0.34	0.15
Uniform Delay, d1	61.9	15.9	14.2	65.8	19.5		56.2	52.6		57.9	57.9	56.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.6	0.2	0.1	3.5	0.3		2.5	0.1		0.4	0.4	0.2
Delay (s)	64.5	16.1	14.3	69.3	19.8		58.8	52.7		58.4	58.3	57.0
Level of Service	E	B	B	E	B		E	D		E	E	E
Approach Delay (s)		25.3			22.0			57.0			57.4	
Approach LOS		C			C			E			E	

Intersection Summary

HCM Average Control Delay	32.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	139.1	Sum of lost time (s)	29.2
Intersection Capacity Utilization	45.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	200	463	478	3	1	201
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.93	0.93	0.79	0.79
Hourly flow rate (vph)	227	526	514	3	1	254
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	517				1496	516
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	517				1496	516
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	78				99	55
cM capacity (veh/h)	1049				106	559

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	753	517	256
Volume Left	227	0	1
Volume Right	0	3	254
cSH	1049	1700	548
Volume to Capacity	0.22	0.30	0.47
Queue Length 95th (ft)	21	0	62
Control Delay (s)	4.9	0.0	17.2
Lane LOS	A		C
Approach Delay (s)	4.9	0.0	17.2
Approach LOS			C

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	218	85	0	226	414	0	0	0	198	0	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7		5.7	4.0				6.6	6.6	6.6
Lane Util. Factor		0.91	1.00		0.91	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		5085	1583		5085	1583				1681	1611	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		5085	1583		5085	1583				1681	1611	1504
Peak-hour factor, PHF	0.84	0.84	0.84	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93
Adj. Flow (vph)	0	260	101	0	238	436	0	0	0	213	0	23
RTOR Reduction (vph)	0	0	29	0	0	0	0	0	0	0	1	18
Lane Group Flow (vph)	0	260	72	0	238	436	0	0	0	109	105	3
Turn Type			Perm			Free				Split		Perm
Protected Phases		6			2					8	8	
Permitted Phases			6			Free						8
Actuated Green, G (s)		71.7	71.7		71.7	100.0				16.0	16.0	16.0
Effective Green, g (s)		71.7	71.7		71.7	100.0				16.0	16.0	16.0
Actuated g/C Ratio		0.72	0.72		0.72	1.00				0.16	0.16	0.16
Clearance Time (s)		5.7	5.7		5.7					6.6	6.6	6.6
Vehicle Extension (s)		2.0	2.0		2.0					2.0	2.0	2.0
Lane Grp Cap (vph)		3646	1135		3646	1583				269	258	241
v/s Ratio Prot		0.05			0.05					0.06	c0.07	
v/s Ratio Perm			0.05			c0.28						0.00
v/c Ratio		0.07	0.06		0.07	0.28				0.41	0.41	0.01
Uniform Delay, d1		4.2	4.2		4.2	0.0				37.7	37.7	35.4
Progression Factor		1.00	1.00		0.76	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.0	0.1		0.0	0.4				0.4	0.4	0.0
Delay (s)		4.3	4.3		3.2	0.4				38.1	38.1	35.4
Level of Service		A	A		A	A				D	D	D
Approach Delay (s)		4.3			1.4			0.0			37.9	
Approach LOS		A			A			A			D	

Intersection Summary

HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	21.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	401	15	0	561	198	79	0	488	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2	4.0		5.7	5.7	4.6	4.6	4.6			
Lane Util. Factor		0.91	1.00		0.91	1.00	0.95	0.95	0.88			
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		5085	1583		5085	1583	1681	1681	2787			
Flt Permitted		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		5085	1583		5085	1583	1681	1681	2787			
Peak-hour factor, PHF	0.87	0.87	0.87	0.89	0.89	0.89	0.94	0.94	0.94	0.92	0.92	0.92
Adj. Flow (vph)	0	461	17	0	630	222	84	0	519	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	55	0	0	418	0	0	0
Lane Group Flow (vph)	0	461	17	0	630	167	42	42	101	0	0	0
Turn Type			Free			Perm	Split		Perm			
Protected Phases		6			2		4	4				
Permitted Phases			Free			2			4			
Actuated Green, G (s)		74.8	100.0		75.3	75.3	14.4	14.4	14.4			
Effective Green, g (s)		74.8	100.0		75.3	75.3	14.4	14.4	14.4			
Actuated g/C Ratio		0.75	1.00		0.75	0.75	0.14	0.14	0.14			
Clearance Time (s)		6.2			5.7	5.7	4.6	4.6	4.6			
Vehicle Extension (s)		2.0			2.0	2.0	2.0	2.0	2.0			
Lane Grp Cap (vph)		3804	1583		3829	1192	242	242	401			
v/s Ratio Prot		0.09			c0.12		0.02	0.02				
v/s Ratio Perm			0.01			0.11			c0.04			
v/c Ratio		0.12	0.01		0.16	0.14	0.17	0.17	0.25			
Uniform Delay, d1		3.5	0.0		3.5	3.4	37.6	37.6	38.0			
Progression Factor		0.81	1.00		1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		0.1	0.0		0.1	0.2	0.1	0.1	0.1			
Delay (s)		2.9	0.0		3.6	3.7	37.7	37.7	38.1			
Level of Service		A	A		A	A	D	D	D			
Approach Delay (s)		2.8			3.6			38.1			0.0	
Approach LOS		A			A			D			A	

Intersection Summary

HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.18		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑	↱	↰	↑↑↑↱		↰	↱		↰	↰↑	↱
Volume (vph)	211	593	85	39	544	176	90	27	9	107	28	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.96		1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	5085	1583	1770	4899		1770	1794		1681	1719	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	5085	1583	1770	4899		1770	1794		1681	1719	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.93	0.93	0.93	0.73	0.73	0.73	0.85	0.85	0.85
Adj. Flow (vph)	224	631	90	42	585	189	123	37	12	126	33	147
RTOR Reduction (vph)	0	0	41	0	25	0	0	10	0	0	0	131
Lane Group Flow (vph)	224	631	49	42	749	0	123	39	0	78	81	16
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	13.4	75.3	75.3	6.8	68.7		17.9	17.9		15.6	15.6	15.6
Effective Green, g (s)	13.4	75.3	75.3	6.8	68.7		17.9	17.9		15.6	15.6	15.6
Actuated g/C Ratio	0.10	0.54	0.54	0.05	0.49		0.13	0.13		0.11	0.11	0.11
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	331	2753	857	87	2420		228	231		189	193	178
v/s Ratio Prot	c0.07	c0.12		0.02	c0.15		c0.07	0.02		0.05	c0.05	
v/s Ratio Perm			0.03									0.01
v/c Ratio	0.68	0.23	0.06	0.48	0.31		0.54	0.17		0.41	0.42	0.09
Uniform Delay, d1	60.8	16.7	15.1	64.4	21.0		56.7	54.0		57.5	57.5	55.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	4.3	0.2	0.1	1.5	0.3		1.2	0.1		0.5	0.5	0.1
Delay (s)	65.0	16.9	15.2	66.0	21.4		58.0	54.1		58.0	58.1	55.5
Level of Service	E	B	B	E	C		E	D		E	E	E
Approach Delay (s)		28.1			23.7			56.9			56.8	
Approach LOS		C			C			E			E	

Intersection Summary

HCM Average Control Delay	32.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	139.1	Sum of lost time (s)	29.2
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	195	504	506	6	3	253
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.97	0.97	0.77	0.77
Hourly flow rate (vph)	224	579	522	6	4	329
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	528				1552	525
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	528				1552	525
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	78				96	41
cM capacity (veh/h)	1039				98	553

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	803	528	332
Volume Left	224	0	4
Volume Right	0	6	329
cSH	1039	1700	524
Volume to Capacity	0.22	0.31	0.63
Queue Length 95th (ft)	20	0	110
Control Delay (s)	4.8	0.0	23.0
Lane LOS	A		C
Approach Delay (s)	4.8	0.0	23.0
Approach LOS			C

Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	90.1%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑	↱		↑↑↑	↱				↰	✥	↱
Volume (vph)	0	162	44	0	304	417	0	0	0	225	1	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.7	5.7		5.7	4.0				6.6	6.6	6.6
Lane Util. Factor		0.91	1.00		0.91	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	1.00	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (prot)		5085	1583		5085	1583				1681	1611	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	0.95	1.00
Satd. Flow (perm)		5085	1583		5085	1583				1681	1611	1504
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	176	48	0	334	458	0	0	0	245	1	30
RTOR Reduction (vph)	0	0	14	0	0	0	0	0	0	0	2	22
Lane Group Flow (vph)	0	176	34	0	334	458	0	0	0	125	122	5
Turn Type			Perm			Free				Split		Perm
Protected Phases		6			2					8	8	
Permitted Phases			6			Free						8
Actuated Green, G (s)		70.9	70.9		70.9	100.0				16.8	16.8	16.8
Effective Green, g (s)		70.9	70.9		70.9	100.0				16.8	16.8	16.8
Actuated g/C Ratio		0.71	0.71		0.71	1.00				0.17	0.17	0.17
Clearance Time (s)		5.7	5.7		5.7					6.6	6.6	6.6
Vehicle Extension (s)		2.0	2.0		2.0					2.0	2.0	2.0
Lane Grp Cap (vph)		3605	1122		3605	1583				282	271	253
v/s Ratio Prot		0.03			0.07					0.07	c0.08	
v/s Ratio Perm			0.02			c0.29						0.00
v/c Ratio		0.05	0.03		0.09	0.29				0.44	0.45	0.02
Uniform Delay, d1		4.4	4.3		4.5	0.0				37.4	37.5	34.7
Progression Factor		1.00	1.00		0.74	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.0	0.1		0.1	0.5				0.4	0.4	0.0
Delay (s)		4.4	4.4		3.4	0.5				37.8	37.9	34.7
Level of Service		A	A		A	A				D	D	C
Approach Delay (s)		4.4			1.7			0.0			37.5	
Approach LOS		A			A			A			D	

Intersection Summary

HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.6
Intersection Capacity Utilization	22.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	355	32	0	658	225	56	1	426	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.2	4.0		5.7	5.7	4.6	4.6	4.6			
Lane Util. Factor		0.91	1.00		0.91	1.00	0.95	0.95	0.88			
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		5085	1583		5085	1583	1681	1688	2787			
Flt Permitted		1.00	1.00		1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		5085	1583		5085	1583	1681	1688	2787			
Peak-hour factor, PHF	0.90	0.90	0.90	0.86	0.86	0.86	0.91	0.91	0.91	0.92	0.92	0.92
Adj. Flow (vph)	0	394	36	0	765	262	62	1	468	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	63	0	0	404	0	0	0
Lane Group Flow (vph)	0	394	36	0	765	199	32	31	64	0	0	0
Turn Type			Free			Perm	Split		Perm			
Protected Phases		6			2		4	4				
Permitted Phases			Free			2			4			
Actuated Green, G (s)		75.5	100.0		76.0	76.0	13.7	13.7	13.7			
Effective Green, g (s)		75.5	100.0		76.0	76.0	13.7	13.7	13.7			
Actuated g/C Ratio		0.76	1.00		0.76	0.76	0.14	0.14	0.14			
Clearance Time (s)		6.2			5.7	5.7	4.6	4.6	4.6			
Vehicle Extension (s)		2.0			2.0	2.0	2.0	2.0	2.0			
Lane Grp Cap (vph)		3839	1583		3865	1203	230	231	382			
v/s Ratio Prot		0.08			c0.15		0.02	0.02				
v/s Ratio Perm			0.02			0.13			c0.02			
v/c Ratio		0.10	0.02		0.20	0.17	0.14	0.13	0.17			
Uniform Delay, d1		3.3	0.0		3.4	3.3	38.0	37.9	38.1			
Progression Factor		0.89	1.00		1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		0.1	0.0		0.1	0.3	0.1	0.1	0.1			
Delay (s)		2.9	0.0		3.5	3.6	38.1	38.0	38.2			
Level of Service		A	A		A	A	D	D	D			
Approach Delay (s)		2.7			3.5			38.2			0.0	
Approach LOS		A			A			D			A	

Intersection Summary

HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	10.3
Intersection Capacity Utilization	30.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	155	573	53	30	559	83	117	22	25	77	25	207
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Lane Util. Factor	0.97	0.91	1.00	1.00	0.91		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.92		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.98	1.00
Satd. Flow (prot)	3433	5085	1583	1770	4987		1770	1716		1681	1726	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.98	1.00
Satd. Flow (perm)	3433	5085	1583	1770	4987		1770	1716		1681	1726	1583
Peak-hour factor, PHF	0.91	0.91	0.91	0.88	0.88	0.88	0.80	0.80	0.80	0.84	0.84	0.84
Adj. Flow (vph)	170	630	58	34	635	94	146	28	31	92	30	246
RTOR Reduction (vph)	0	0	26	0	8	0	0	27	0	0	0	220
Lane Group Flow (vph)	170	630	32	34	721	0	146	32	0	61	61	26
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	11.3	76.7	76.7	5.1	70.5		19.3	19.3		14.5	14.5	14.5
Effective Green, g (s)	11.3	76.7	76.7	5.1	70.5		19.3	19.3		14.5	14.5	14.5
Actuated g/C Ratio	0.08	0.55	0.55	0.04	0.51		0.14	0.14		0.10	0.10	0.10
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0	2.0
Lane Grp Cap (vph)	279	2804	873	65	2528		246	238		175	180	165
v/s Ratio Prot	c0.05	c0.12		0.02	c0.14		c0.08	0.02		c0.04	0.04	
v/s Ratio Perm			0.02									0.02
v/c Ratio	0.61	0.22	0.04	0.52	0.29		0.59	0.14		0.35	0.34	0.16
Uniform Delay, d1	61.8	16.0	14.3	65.8	19.8		56.2	52.6		57.9	57.8	56.7
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	2.6	0.2	0.1	3.5	0.3		2.5	0.1		0.4	0.4	0.2
Delay (s)	64.3	16.2	14.4	69.3	20.1		58.8	52.7		58.3	58.3	56.9
Level of Service	E	B	B	E	C		E	D		E	E	E
Approach Delay (s)		25.6			22.3			57.0			57.4	
Approach LOS		C			C			E			E	

Intersection Summary

HCM Average Control Delay	32.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	139.1	Sum of lost time (s)	29.2
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	201	464	479	3	1	203
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.93	0.93	0.79	0.79
Hourly flow rate (vph)	228	527	515	3	1	257
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	518				1501	517
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	518				1501	517
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	78				99	54
cM capacity (veh/h)	1048				105	559

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	756	518	258
Volume Left	228	0	1
Volume Right	0	3	257
cSH	1048	1700	547
Volume to Capacity	0.22	0.30	0.47
Queue Length 95th (ft)	21	0	63
Control Delay (s)	4.9	0.0	17.3
Lane LOS	A		C
Approach Delay (s)	4.9	0.0	17.3
Approach LOS			C

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	83.6%	ICU Level of Service	E
Analysis Period (min)	15		

09 7363 | 24 Hour Camera The Corporation Yard, Elk Grove, CA

Time	E-Trans In	E-Trans Out	Other Vehicles In	Other Vehicles Out	Total
1200AM	0	0	0	0	0
1215AM	0	0	0	0	0
1230AM	0	0	0	0	0
1245AM	0	0	0	0	0
0100AM	0	0	0	0	0
0115AM	0	0	0	0	0
0130AM	0	0	0	0	0
0145AM	0	0	0	0	0
0200AM	0	0	0	0	0
0215AM	0	0	0	0	0
0230AM	0	0	0	0	0
0245AM	0	0	0	0	0
0300AM	0	0	0	0	0
0315AM	0	0	0	0	0
0330AM	0	0	1	0	1
0345AM	0	0	0	1	1
0400AM	0	0	0	0	0
0415AM	0	0	1	0	1
0430AM	0	1	0	0	1
0445AM	0	2	1	0	3
0500AM	0	3	0	0	3
0515AM	0	6	0	1	7
0530AM	0	5	2	2	9
0545AM	0	2	0	0	2
0600AM	0	6	0	0	6
0615AM	0	9	2	1	12
0630AM	0	7	4	0	11
0645AM	0	3	1	2	6
0700AM	1	0	2	3	6
0715AM	3	0	1	3	7
0730AM	3	0	1	6	10
0745AM	2	0	1	2	5
0800AM	4	1	1	1	7
0815AM	4	0	2	2	8
0830AM	2	1	0	3	6
0845AM	3	0	1	0	4
0900AM	2	9	8	1	20
0915AM	2	0	2	2	6
0930AM	1	1	3	6	11
0945AM	2	1	5	4	12
1000AM	2	5	2	2	11
1015AM	2	1	1	3	7
1030AM	1	0	5	1	7
1045AM	1	4	1	1	7
1100AM	0	0	5	7	12
1115AM	3	0	0	2	5
1130AM	0	1	1	1	3
1145AM	2	2	2	1	7
1200PM	2	0	6	2	10
1215PM	3	2	3	1	9
1230PM	3	2	1	0	6
1245PM	2	1	3	1	7
0100PM	2	1	4	1	8
0115PM	1	2	7	5	15
0130PM	1	1	3	0	5
0145PM	1	1	6	4	12
0200PM	1	1	2	5	9
0215PM	0	3	3	4	10
0230PM	1	8	5	2	16
0245PM	2	5	7	3	17
0300PM	0	3	4	1	8
0315PM	0	1	2	2	5
0330PM	0	0	3	3	6
0345PM	1	2	0	1	4
0400PM	0	2	1	0	3
0415PM	1	1	2	0	4
0430PM	1	3	3	0	7
0445PM	1	1	2	2	6
0500PM	5	1	0	0	6
0515PM	4	1	3	2	10
0530PM	2	0	3	5	10
0545PM	2	0	4	0	6
0600PM	7	1	2	1	11
0615PM	5	1	1	1	8
0630PM	2	1	1	1	5
0645PM	3	0	0	1	4
0700PM	4	2	3	1	10
0715PM	1	2	0	0	3
0730PM	0	2	3	0	5
0745PM	3	0	0	0	3
0800PM	0	0	0	1	1
0815PM	0	0	0	0	0
0830PM	1	0	0	0	1
0845PM	1	0	0	0	1
0900PM	1	0	0	0	1
0915PM	2	1	0	0	3
0930PM	0	0	0	1	1
0945PM	0	0	1	1	2
1000PM	0	0	0	0	0
1015PM	2	0	1	0	3
1030PM	1	0	1	1	3
1045PM	0	0	0	2	2
1100PM	0	0	0	0	0
1115PM	0	0	0	0	0
1130PM	0	0	0	0	0
1145PM	0	0	1	1	2
Total:	109	122	147	114	492

Existing Plus Project Trip Generation Tables

TABLE 1
EXISTING PLUS PROJECT WITHOUT EXPANSION TRIP GENERATION – SITE A

Vehicle Types	PCE Ratio[1]	Daily			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
E-Trans Buses	1.5	176	197	373	21	2	23	21	3	24
Private Vehicles	1.0	106	91	197	0	8	8	1	9	10
Total	-	282	288	570	21	10	31	22	12	34

Notes: [1] PCE = Passenger Car Equivalent.
Source: Fehr & Peers, 2010.

TABLE 2
EXISTING PLUS PROJECT WITH EXPANSION TRIP GENERATION – SITE A

Vehicle Types	PCE Ratio[1]	Daily			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
E-Trans Buses	1.5	353	393	746	43	4	47	43	6	49
Private Vehicles	1.0	213	183	396	0	15	15	2	17	19
Total	-	565	576	1142	43	19	62	45	24	69

Notes: [1] PCE = Passenger Car Equivalent.
Source: Fehr & Peers, 2010.

TABLE 3
EXISTING PLUS PROJECT WITHOUT EXPANSION TRIP GENERATION – SITES B & C

Vehicle Types	PCE Ratio[1]	Daily			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
E-Trans Buses	1.5	12	14	26	1	0	1	1	0	1
Private Vehicles	1.0	7	6	13	0	1	1	0	1	1
Total	-	19	20	39	1	1	2	1	1	2

Notes: [1] PCE = Passenger Car Equivalent.
Source: Fehr & Peers, 2010.

TABLE 4
EXISTING PLUS PROJECT WITH EXPANSION TRIP GENERATION – SITES B & C

Vehicle Types	PCE Ratio[1]	Daily			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
E-Trans Buses	1.5	189	210	399	23	2	25	23	3	26
Private Vehicles	1.0	114	98	212	0	8	8	1	9	10
Total	-	302	308	611	23	10	33	24	13	37

Notes: [1] PCE = Passenger Car Equivalent.
Source: Fehr & Peers, 2010.

HCM 2000
Basic Freeway Segments
Capacity Analysis

Jurisdiction
Analysis Year E+P No Expansion
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Transit Facilities

General Information | *Flow Rate Calculation* | *Speed Calculation*

	Freeway/ Direction	From/To	Analysis Time Period	Volume (vph)	PHF	Lanes	HOV Lane?	HOV Lane Volume	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	Grade E_T	Grade E_R	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcphpl)	BFFS (mph)	Lane Width (ft)	f_{LW}	R. Shoulder Width (ft)
1	SR 99 NB	Grant Line Road Loop On to Slip On	AM	1,746	0.92	3	No		Level			10%	0%			1.5	1.2	0.952	1.00	664	65	12	0	6
2	SR 99 NB	Grant Line Road Loop On to Slip On	PM	1,711	0.92	3	No		Level			10%	0%			1.5	1.2	0.952	1.00	651	65	12	0	6
3	SR 99 SB	Grant Line Road Loop On to Slip On	AM	1,905	0.92	3	No		Level			10%	0%			1.5	1.2	0.952	1.00	725	65	12	0	6
4	SR 99 SB	Grant Line Road Loop On to Slip On	PM	2,360	0.92	3	No		Level			10%	0%			1.5	1.2	0.952	1.00	898	65	12	0	6

HCM 2000
Basic Freeway Segments
Capacity Analysis

	General Information						*Speed Calculation*			*Results*	
	Freeway/ Direction	From/To	f_{LC}	f_N	IC Density (per mi)	f_{ID}	Calculated FFS (mph)	Measured FFS (mph)	S (mph)	Density, D (pcplpm)	Level of Service
1	SR 99 NB	Grant Line Road Loop On to Slip On	0	3	0.3	-1	63.0	70.0	63.0	**10.5**	**A**
2	SR 99 NB	Grant Line Road Loop On to Slip On	0	3	0.3	-1	63.0	70.0	63.0	**10.3**	**A**
3	SR 99 SB	Grant Line Road Loop On to Slip On	0	3	0.3	-1	63.0	70.0	63.0	**11.5**	**B**
4	SR 99 SB	Grant Line Road Loop On to Slip On	0	3	0.3	-1	63.0	70.0	63.0	**14.3**	**B**

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction ______ Agency or Company City of Elk Grove
Analysis Year E+P No Expansion Date 4/26/2010
Analyst Fehr & Peers Project Description Elk Grove Transit Facilities

	General Information			*Freeway Data*			*Freeway Volume Adjustment*								Effective
	Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S_{FF} (mph)	V (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	Flow Rate v_p (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	AM	3	65.0	1,746	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	1,993	1,993
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	AM	3	65.0	1,905	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,174	2,174
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	PM	3	65.0	1,711	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	1,953	1,953
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	PM	3	65.0	2,360	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,693	2,693

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*On-Ramp Data*							*On-Ramp Volume Adjustment*								
	Freeway/				S_{FR}	V_R	Accel Lane (ft)					Truck/						Flow Rate
	Direction	On-ramp	Type	Lanes	(mph)	(vph)	L_{A1}	L_{A2}	L_{Aeff}	PHF	Terrain	Bus %	RV %	E_T	E_R	f_{HV}	f_P	v_p (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	Right	1	45.0	196	450		450	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	218
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	Right	1	45.0	85	450		450	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	95
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	Right	1	45.0	222	450		450	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	247
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	Right	1	45.0	44	450		450	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	49

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Upstream Ramp Data*											
	Freeway/ Direction	On-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No											
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No											
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No											
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No											

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Downstream Ramp Data*												*v_{12} Estimation*						
	Freeway/ Direction	On-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	L_{EQ} 25-2	L_{EQ} 25-3	P_{FM} Equations 1	P_{FM} Equations 2	P_{FM} Equations 3	P_{FM}	v_{12} (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No														0.590			0.590	1,176
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No														0.590			0.590	1,283
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No														0.590			0.590	1,152
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No														0.590			0.590	1,589

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			*Capacity Checks*												
	Freeway/ Direction	On-ramp	v_{Fi} (pcph)	Max v_{Fi} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} >1.5*v_{12}/2?	v_{12a} (pcph)	v_{R12a} (pcph)	Max v_{R12a} (pcph)	LOS F?
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	1,993	7,050	No	2,211	7,050	No	817	No	No	1,176	1,394	4,600	No
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	2,174	7,050	No	2,269	7,050	No	891	No	No	1,283	1,378	4,600	No
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	1,953	7,050	No	2,200	7,050	No	800	No	No	1,152	1,400	4,600	No
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	2,693	7,050	No	2,743	7,050	No	1,104	No	No	1,589	1,638	4,600	No

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information						Results		Speed Estimation			
	Freeway/ Direction	On-ramp	v_R (pcph)	Max v_R (pcph)	LOS F?	Density, D (pcplpm)	Level of Service	Int. Var. M_S	Inf. Area S_R (mph)	Out Lns. S_O (mph)	All vehs. S (mph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	218	2,100	No	**13.4**	**B**	0.296	58.2	63.9	60.2
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	95	2,100	No	**13.4**	**B**	0.296	58.2	63.6	60.2
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	247	2,100	No	**13.5**	**B**	0.296	58.2	63.9	60.1
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	49	2,100	No	**15.4**	**B**	0.301	58.1	62.8	59.9

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction ______
Analysis Year E+P No Expansion
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Transit Facilities

General Information				*Freeway Data*			*Freeway Volume Adjustment*									Effective
	Freeway/ Direction	Off-ramp	Analysis Time Period	Lanes	S_{FF} (mph)	V (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	Flow Rate v_p (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	AM	2	65.0	2,297	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,622	2,622
2	SR 99 SB	Off-Ramp to Grant Line Road	AM	2	65.0	1,718	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	1,961	1,961
3	SR 99 NB	Off-Ramp to Grant Line Road	PM	2	65.0	2,161	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,466	2,466
4	SR 99 SB	Off-Ramp to Grant Line Road	PM	2	65.0	2,154	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,458	2,458

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Off-Ramp Data*							*Off-Ramp Volume Adjustment*								
	Freeway/				S_{FR}	V_R	Decel Lane (ft)					Truck/						Flow Rate
	Direction	Off-ramp	Type	Lanes	(mph)	(vph)	L_{D1}	L_{D2}	L_{Deff}	PHF	Terrain	Bus %	RV %	E_T	E_R	f_{HV}	f_P	v_p (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	Major	2	45.0	566	0	1,500	1,500	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	631
2	SR 99 SB	Off-Ramp to Grant Line Road	Major	2	45.0	213	0	1,500	1,500	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	237
3	SR 99 NB	Off-Ramp to Grant Line Road	Major	2	45.0	482	0	1,500	1,500	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	537
4	SR 99 SB	Off-Ramp to Grant Line Road	Major	2	45.0	248	0	1,500	1,500	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	276

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Upstream Ramp Data*											
	Freeway/ Direction	Off-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	No											
2	SR 99 SB	Off-Ramp to Grant Line Road	No											
3	SR 99 NB	Off-Ramp to Grant Line Road	No											
4	SR 99 SB	Off-Ramp to Grant Line Road	No											

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Downstream Ramp Data*												*v_{12} Estimation*						
	Freeway/ Direction	Off-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	L_{EQ} 25-13	L_{EQ} 25-14	P_{FD} Equations 5	P_{FD} Equations 6	P_{FD} Equations 7	P_{FD}	v_{12} (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	No																	1.000	2,622
2	SR 99 SB	Off-Ramp to Grant Line Road	No																	1.000	1,961
3	SR 99 NB	Off-Ramp to Grant Line Road	No																	1.000	2,466
4	SR 99 SB	Off-Ramp to Grant Line Road	No																	1.000	2,458

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information Freeway/ Direction	Off-ramp	*Capacity Checks* v_{Fi} (pcph)	Max v_{Fi} (pcph)	LOS F?	v_3, v_{av34} (pcphpl)	v_3, v_{av34} > 2,700?	v_3, v_{av34} >1.5*v_{12}/2?	v_{12a} (pcph)	Max v_{12} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?
1	SR 99 NB	Off-Ramp to Grant Line Road	2,622	4,700	No	0	No	No	2,622	4,400	No	1,991	4,700	No
2	SR 99 SB	Off-Ramp to Grant Line Road	1,961	4,700	No	0	No	No	1,961	4,400	No	1,723	4,700	No
3	SR 99 NB	Off-Ramp to Grant Line Road	2,466	4,700	No	0	No	No	2,466	4,400	No	1,929	4,700	No
4	SR 99 SB	Off-Ramp to Grant Line Road	2,458	4,700	No	0	No	No	2,458	4,400	No	2,182	4,700	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information						*Results*		*Speed Estimation*			
	Freeway/ Direction	Off-ramp	v_R (pcph)	Max v_R (pcph)	LOS F?	Density, D (pcplpm)	Level of Service	Int. Var. D_S	Inf. Area S_R (mph)	Out Lns. S_O (mph)	All vehs. S (mph)
1	SR 99 NB	Off-Ramp to Grant Line Road	631	4,100	No	**14.3**	**B**	0.355	56.8	0.0	56.8
2	SR 99 SB	Off-Ramp to Grant Line Road	237	4,100	No	**10.7**	**B**	0.319	57.7	0.0	57.7
3	SR 99 NB	Off-Ramp to Grant Line Road	537	4,100	No	**13.4**	**B**	0.346	57.0	0.0	57.0
4	SR 99 SB	Off-Ramp to Grant Line Road	276	4,100	No	**13.4**	**B**	0.323	57.6	0.0	57.6

HCM 2000
Basic Freeway Segments
Capacity Analysis

Jurisdiction
Analysis Year E+P With Expansion
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Transit Facilities

General Information / *Flow Rate Calculation* / *Speed Calculation*

	Freeway/ Direction	From/To	Analysis Time Period	Volume (vph)	PHF	Lanes	HOV Lane?	HOV Lane Volume	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	Grade E_T	Grade E_R	E_T	E_R	f_{HV}	f_p	Flow Rate v_p (pcphpl)	BFFS (mph)	Lane Width (ft)	f_{LW}	R. Shoulder Width (ft)
1	SR 99 NB	Grant Line Road Loop On to Slip On	AM	1,746	0.92	3	No		Level			10%	0%			1.5	1.2	0.952	1.00	664	65	12	0	6
2	SR 99 NB	Grant Line Road Loop On to Slip On	PM	1,711	0.92	3	No		Level			10%	0%			1.5	1.2	0.952	1.00	651	65	12	0	6
3	SR 99 SB	Grant Line Road Loop On to Slip On	AM	1,906	0.92	3	No		Level			10%	0%			1.5	1.2	0.952	1.00	725	65	12	0	6
4	SR 99 SB	Grant Line Road Loop On to Slip On	PM	2,361	0.92	3	No		Level			10%	0%			1.5	1.2	0.952	1.00	898	65	12	0	6

HCM 2000
Basic Freeway Segments
Capacity Analysis

General Information							Speed Calculation			Results	
	Freeway/ Direction	From/To	f_{LC}	f_N	IC Density (per mi)	f_{ID}	Calculated FFS (mph)	Measured FFS (mph)	S (mph)	Density, D (pcplpm)	Level of Service
1	SR 99 NB	Grant Line Road Loop On to Slip On	0	3	0.3	-1	63.0	70.0	63.0	**10.5**	**A**
2	SR 99 NB	Grant Line Road Loop On to Slip On	0	3	0.3	-1	63.0	70.0	63.0	**10.3**	**A**
3	SR 99 SB	Grant Line Road Loop On to Slip On	0	3	0.3	-1	63.0	70.0	63.0	**11.5**	**B**
4	SR 99 SB	Grant Line Road Loop On to Slip On	0	3	0.3	-1	63.0	70.0	63.0	**14.3**	**B**

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction ______
Analysis Year E+P With Expansion
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Transit Facilities

	General Information			*Freeway Data*			*Freeway Volume Adjustment*									Effective
	Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S_{FF} (mph)	V (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	Flow Rate v_p (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	AM	3	65.0	1,746	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	1,993	1,993
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	AM	3	65.0	1,906	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,175	2,175
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	PM	3	65.0	1,711	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	1,953	1,953
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	PM	3	65.0	2,361	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,695	2,695

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		On-Ramp Data				Accel Lane (ft)			On-Ramp Volume Adjustment								Flow Rate
	Freeway/ Direction	On-ramp	Type	Lanes	S_{FR} (mph)	V_R (vph)	L_{A1}	L_{A2}	L_{Aeff}	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	v_p (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	Right	1	45.0	198	450		450	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	221
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	Right	1	45.0	85	450		450	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	95
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	Right	1	45.0	225	450		450	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	251
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	Right	1	45.0	44	450		450	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	49

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Upstream Ramp Data*											
	Freeway/ Direction	On-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No											
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No											
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No											
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No											

General Information			Adjacent Downstream Ramp Data												v_{12} Estimation						
	Freeway/ Direction	On-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	L_{EQ} 25-2	L_{EQ} 25-3	P_{FM} Equations 1	P_{FM} Equations 2	P_{FM} Equations 3	P_{FM}	v_{12} (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No														0.590			0.590	1,176
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No														0.590			0.590	1,284
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No														0.590			0.590	1,152
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No														0.590			0.590	1,590

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Capacity Checks*												
	Freeway/ Direction	On-ramp	v_{Fi} (pcph)	Max v_{Fi} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	v_3, v_{av34} (pcphpl)	v_3, v_{av34} > 2,700?	v_3, v_{av34} >1.5*v_{12}/2?	v_{12a} (pcph)	v_{R12a} (pcph)	Max v_{R12a} (pcph)	LOS F?
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	1,993	7,050	No	2,213	7,050	No	817	No	No	1,176	1,397	4,600	No
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	2,175	7,050	No	2,270	7,050	No	892	No	No	1,284	1,378	4,600	No
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	1,953	7,050	No	2,203	7,050	No	800	No	No	1,152	1,403	4,600	No
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	2,695	7,050	No	2,744	7,050	No	1,105	No	No	1,590	1,639	4,600	No

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information					*Results*		*Speed Estimation*			
	Freeway/ Direction	On-ramp	v_R (pcph)	Max v_R (pcph)	LOS F?	Density, D (pcplpm)	Level of Service	Int. Var. M_S	Inf. Area S_R (mph)	Out Lns. S_O (mph)	All vehs. S (mph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	221	2,100	No	**13.4**	**B**	0.296	58.2	63.9	60.2
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	95	2,100	No	**13.4**	**B**	0.296	58.2	63.6	60.2
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	251	2,100	No	**13.5**	**B**	0.296	58.2	63.9	60.1
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	49	2,100	No	**15.4**	**B**	0.301	58.1	62.8	59.9

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction ______
Analysis Year E+P With Expansion
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Transit Facilities

General Information | *Freeway Data* | *Freeway Volume Adjustment*

	Freeway/ Direction	Off-ramp	Analysis Time Period	Lanes	S_{FF} (mph)	V (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	Effective Flow Rate v_p (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	AM	2	65.0	2,297	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,622	2,622
2	SR 99 SB	Off-Ramp to Grant Line Road	AM	2	65.0	1,718	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	1,961	1,961
3	SR 99 NB	Off-Ramp to Grant Line Road	PM	2	65.0	2,161	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,466	2,466
4	SR 99 SB	Off-Ramp to Grant Line Road	PM	2	65.0	2,154	0.92	Level	10.0%	0.0%	1.5	1.20	0.952	1.00	2,458	2,458

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Off-Ramp Data*							*Off-Ramp Volume Adjustment*								
	Freeway/ Direction	Off-ramp	Type	Lanes	S_{FR} (mph)	V_R (vph)	Decel Lane (ft) L_{D1}	L_{D2}	L_{Deff}	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	Major	2	45.0	567	0	1,500	1,500	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	632
2	SR 99 SB	Off-Ramp to Grant Line Road	Major	2	45.0	219	0	1,500	1,500	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	244
3	SR 99 NB	Off-Ramp to Grant Line Road	Major	2	45.0	483	0	1,500	1,500	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	538
4	SR 99 SB	Off-Ramp to Grant Line Road	Major	2	45.0	254	0	1,500	1,500	0.92	Level	5.0%	0.0%	1.5	1.2	0.976	1.00	283

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Upstream Ramp Data*											
	Freeway/ Direction	Off-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_p	Flow Rate v_p (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	No											
2	SR 99 SB	Off-Ramp to Grant Line Road	No											
3	SR 99 NB	Off-Ramp to Grant Line Road	No											
4	SR 99 SB	Off-Ramp to Grant Line Road	No											

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Downstream Ramp Data*												*v_{12} Estimation*						
	Freeway/ Direction	Off-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	L_{EQ} 25-13	L_{EQ} 25-14	P_{FD} Equations 5	P_{FD} Equations 6	P_{FD} Equations 7	P_{FD}	v_{12} (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	No																	1.000	2,622
2	SR 99 SB	Off-Ramp to Grant Line Road	No																	1.000	1,961
3	SR 99 NB	Off-Ramp to Grant Line Road	No																	1.000	2,466
4	SR 99 SB	Off-Ramp to Grant Line Road	No																	1.000	2,458

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Capacity Checks*											
	Freeway/ Direction	Off-ramp	v_{Fi} (pcph)	Max v_{Fi} (pcph)	LOS F?	v_3, v_{av34} (pcphpl)	v_3, v_{av34} > 2,700?	v_3, v_{av34} >1.5*v_{12}/2?	v_{12a} (pcph)	Max v_{12} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?
1	SR 99 NB	Off-Ramp to Grant Line Road	2,622	4,700	No	0	No	No	2,622	4,400	No	1,990	4,700	No
2	SR 99 SB	Off-Ramp to Grant Line Road	1,961	4,700	No	0	No	No	1,961	4,400	No	1,717	4,700	No
3	SR 99 NB	Off-Ramp to Grant Line Road	2,466	4,700	No	0	No	No	2,466	4,400	No	1,928	4,700	No
4	SR 99 SB	Off-Ramp to Grant Line Road	2,458	4,700	No	0	No	No	2,458	4,400	No	2,175	4,700	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information						Results		Speed Estimation			
	Freeway/ Direction	Off-ramp	v_R (pcph)	Max v_R (pcph)	LOS F?	Density, D (pcplpm)	Level of Service	Int. Var. D_S	Inf. Area S_R (mph)	Out Lns. S_O (mph)	All vehs. S (mph)
1	SR 99 NB	Off-Ramp to Grant Line Road	632	4,100	No	**14.3**	**B**	0.355	56.8	0.0	56.8
2	SR 99 SB	Off-Ramp to Grant Line Road	244	4,100	No	**10.7**	**B**	0.320	57.6	0.0	57.6
3	SR 99 NB	Off-Ramp to Grant Line Road	538	4,100	No	**13.4**	**B**	0.346	57.0	0.0	57.0
4	SR 99 SB	Off-Ramp to Grant Line Road	283	4,100	No	**13.4**	**B**	0.323	57.6	0.0	57.6

Appendix C

Cumulative No Project Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↑	↱		↑↑↑↑	↱				↰	✥	↱
Volume (vph)	0	2220	460	0	3710	1060	0	0	0	80	0	760
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.86	1.00		0.86	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	0.85	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (prot)		6408	1583		6408	1583				1681	1444	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (perm)		6408	1583		6408	1583				1681	1444	1504
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	2337	484	0	3905	1116	0	0	0	84	0	800
RTOR Reduction (vph)	0	0	188	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2337	296	0	3905	1116	0	0	0	76	408	400
Turn Type			Perm			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			2			Free						4
Actuated Green, G (s)		73.4	73.4		73.4	120.0				38.6	38.6	38.6
Effective Green, g (s)		73.4	73.4		73.4	120.0				38.6	38.6	38.6
Actuated g/C Ratio		0.61	0.61		0.61	1.00				0.32	0.32	0.32
Clearance Time (s)		4.0	4.0		4.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		3920	968		3920	1583				541	464	484
v/s Ratio Prot		0.36			c0.61					0.05	c0.28	
v/s Ratio Perm			0.19			0.70						0.27
v/c Ratio		0.60	0.31		1.00	0.70				0.14	0.88	0.83
Uniform Delay, d1		14.2	11.1		23.2	0.0				28.9	38.5	37.6
Progression Factor		0.91	4.02		0.91	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.3	0.3		6.4	0.2				0.1	17.0	11.0
Delay (s)		13.2	45.1		27.5	0.2				29.0	55.5	48.7
Level of Service		B	D		C	A				C	E	D
Approach Delay (s)		18.7			21.4			0.0			50.1	
Approach LOS		B			C			A			D	

Intersection Summary

HCM Average Control Delay	23.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↱			↑↑↑↑	↱	↰	↰↑	↱↱			
Volume (vph)	0	1730	570	0	3910	470	860	0	840	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor		0.86			0.86	1.00	0.95	0.95	0.88			
Frt		0.96			1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		6170			6408	1583	1681	1681	2787			
Flt Permitted		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		6170			6408	1583	1681	1681	2787			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1821	600	0	4116	495	905	0	884	0	0	0
RTOR Reduction (vph)	0	50	0	0	0	182	0	0	27	0	0	0
Lane Group Flow (vph)	0	2372	0	0	4116	314	452	453	857	0	0	0
Turn Type						Perm	Split		Perm			
Protected Phases		2			6		8	8				
Permitted Phases						6			8			
Actuated Green, G (s)		76.0			76.0	76.0	36.0	36.0	36.0			
Effective Green, g (s)		76.0			76.0	76.0	36.0	36.0	36.0			
Actuated g/C Ratio		0.63			0.63	0.63	0.30	0.30	0.30			
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)		3908			4058	1003	504	504	836			
v/s Ratio Prot		0.38			c0.64		0.27	0.27				
v/s Ratio Perm						0.20			c0.31			
v/c Ratio		0.61			1.01	0.31	0.90	0.90	1.02			
Uniform Delay, d1		13.1			22.0	10.1	40.2	40.3	42.0			
Progression Factor		0.17			1.45	11.95	1.00	1.00	1.00			
Incremental Delay, d2		0.6			8.6	0.1	18.3	18.6	37.6			
Delay (s)		2.8			40.5	120.2	58.6	58.8	79.6			
Level of Service		A			D	F	E	E	E			
Approach Delay (s)		2.8			49.1			69.0			0.0	
Approach LOS		A			D			E			A	

Intersection Summary

HCM Average Control Delay	40.4	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	170	2280	120	100	3870	150	90	50	40	290	50	420
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	1.00	0.86		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	6408	1583	1770	6372		1770	1739		1681	1709	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	6408	1583	1770	6372		1770	1739		1681	1709	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	179	2400	126	105	4074	158	95	53	42	305	53	442
RTOR Reduction (vph)	0	0	35	0	2	0	0	31	0	0	0	363
Lane Group Flow (vph)	179	2400	91	105	4230	0	95	64	0	177	181	79
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	3.0	59.1	59.1	3.0	59.1		14.8	14.8		19.6	19.6	19.6
Effective Green, g (s)	5.7	60.8	60.8	5.7	60.8		16.0	16.0		21.5	21.5	21.5
Actuated g/C Ratio	0.05	0.51	0.51	0.05	0.51		0.13	0.13		0.18	0.18	0.18
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lane Grp Cap (vph)	163	3247	802	84	3228		236	232		301	306	284
v/s Ratio Prot	0.05	0.37		c0.06	c0.66		c0.05	0.04		0.11	c0.11	
v/s Ratio Perm			0.06									0.05
v/c Ratio	1.10	0.74	0.11	1.25	1.31		0.40	0.27		0.59	0.59	0.28
Uniform Delay, d1	57.1	23.3	15.5	57.1	29.6		47.6	46.8		45.2	45.2	42.6
Progression Factor	1.07	1.16	1.10	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	85.4	1.0	0.2	179.6	141.9		0.4	0.2		1.9	2.0	0.2
Delay (s)	146.3	28.1	17.3	236.8	171.5		48.0	47.0		47.1	47.3	42.7
Level of Service	F	C	B	F	F		D	D		D	D	D
Approach Delay (s)		35.4			173.1			47.5			44.7	
Approach LOS		D			F			D			D	

Intersection Summary

HCM Average Control Delay	111.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.7%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

	↗	→	←	↖	↘	↙
Movement	**EBL**	**EBT**	**WBT**	**WBR**	**SBL**	**SBR**
Lane Configurations	↰↰	↑↑↑↑	↑↑↑↑	↱	↰	↱↱
Volume (vph)	850	1760	2720	20	10	1400
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	1.00	0.88
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	1770	2787
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	1770	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	895	1853	2863	21	11	1474
RTOR Reduction (vph)	0	0	0	13	0	361
Lane Group Flow (vph)	895	1853	2863	8	11	1113
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	19.0	68.0	45.0	45.0	44.0	44.0
Effective Green, g (s)	19.0	68.0	45.0	45.0	44.0	44.0
Actuated g/C Ratio	0.16	0.57	0.38	0.38	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	544	3631	2403	594	649	1022
v/s Ratio Prot	c0.26	0.29	c0.45		0.01	
v/s Ratio Perm				0.00		c0.40
v/c Ratio	1.65	0.51	1.19	0.01	0.02	1.09
Uniform Delay, d1	50.5	15.9	37.5	23.6	24.2	38.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	298.6	0.1	90.6	0.0	0.0	55.6
Delay (s)	349.1	16.0	128.1	23.6	24.2	93.6
Level of Service	F	B	F	C	C	F
Approach Delay (s)		124.5	127.3		93.1	
Approach LOS		F	F		F	

Intersection Summary

HCM Average Control Delay	119.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	95.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	1190	120	410	1560	2500	90	140	290	1200	130	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	0.97	0.86	0.88	1.00	0.95	1.00	0.94	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	1253	126	432	1642	2632	95	147	305	1263	137	63
RTOR Reduction (vph)	0	0	73	0	0	0	0	0	92	0	0	44
Lane Group Flow (vph)	42	1253	53	432	1642	2632	95	147	213	1263	137	19
Turn Type	Prot		Perm	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			Free			8			4
Actuated Green, G (s)	4.0	50.8	50.8	11.0	57.8	120.0	6.0	20.2	20.2	22.0	36.2	36.2
Effective Green, g (s)	4.0	50.8	50.8	11.0	57.8	120.0	6.0	20.2	20.2	22.0	36.2	36.2
Actuated g/C Ratio	0.03	0.42	0.42	0.09	0.48	1.00	0.05	0.17	0.17	0.18	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	114	2713	670	315	3087	2787	89	596	266	915	1068	478
v/s Ratio Prot	0.01	0.20		c0.13	0.26		0.05	0.04		c0.25	0.04	
v/s Ratio Perm			0.03			c0.94			0.13			0.01
v/c Ratio	0.37	0.46	0.08	1.37	0.53	0.94	1.07	0.25	0.80	1.38	0.13	0.04
Uniform Delay, d1	56.8	24.8	20.6	54.5	21.7	0.0	57.0	43.3	48.0	49.0	30.4	29.6
Progression Factor	1.00	1.00	1.00	1.12	0.53	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.6	0.2	173.5	0.2	3.1	114.9	0.2	15.4	178.0	0.1	0.0
Delay (s)	58.8	25.4	20.9	234.7	11.7	3.1	171.9	43.5	63.3	227.0	30.5	29.6
Level of Service	E	C	C	F	B	A	F	D	E	F	C	C
Approach Delay (s)		26.0			27.3			76.9			200.1	
Approach LOS		C			C			E			F	

Intersection Summary

HCM Average Control Delay	61.5	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	490	980	1290	200	340	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	3433	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	3433	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	516	1032	1358	211	358	432
RTOR Reduction (vph)	0	0	0	159	0	239
Lane Group Flow (vph)	516	1032	1358	52	358	193
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8	6	6
Actuated Green, G (s)	15.7	41.7	22.0	22.0	40.0	40.0
Effective Green, g (s)	15.7	41.7	22.0	22.0	40.0	40.0
Actuated g/C Ratio	0.18	0.46	0.25	0.25	0.45	0.45
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	601	2979	1572	388	1531	706
v/s Ratio Prot	c0.15	0.16	c0.21		0.10	
v/s Ratio Perm				0.03		c0.12
v/c Ratio	0.86	0.35	0.86	0.13	0.23	0.27
Uniform Delay, d1	35.9	15.3	32.4	26.4	15.4	15.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.7	0.1	5.2	0.2	0.4	1.0
Delay (s)	47.6	15.4	37.6	26.6	15.7	16.6
Level of Service	D	B	D	C	B	B
Approach Delay (s)		26.1	36.1		16.2	
Approach LOS		C	D		B	

Intersection Summary

HCM Average Control Delay	28.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	89.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↑	↱		↑↑↑↑	↱				↰	✣	↱
Volume (vph)	0	3730	1070	0	2530	900	0	0	0	170	0	830
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.86	1.00		0.86	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	0.86	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (prot)		6408	1583		6408	1583				1681	1448	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (perm)		6408	1583		6408	1583				1681	1448	1504
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	3926	1126	0	2663	947	0	0	0	179	0	874
RTOR Reduction (vph)	0	0	303	0	0	0	0	0	0	0	1	1
Lane Group Flow (vph)	0	3926	823	0	2663	947	0	0	0	161	445	445
Turn Type			Perm			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			2			Free						4
Actuated Green, G (s)		70.7	70.7		70.7	120.0				41.3	41.3	41.3
Effective Green, g (s)		70.7	70.7		70.7	120.0				41.3	41.3	41.3
Actuated g/C Ratio		0.59	0.59		0.59	1.00				0.34	0.34	0.34
Clearance Time (s)		4.0	4.0		4.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		3775	933		3775	1583				579	498	518
v/s Ratio Prot		c0.61			0.42					0.10	c0.31	
v/s Ratio Perm			0.52			0.60						0.30
v/c Ratio		1.04	0.88		0.71	0.60				0.28	0.89	0.86
Uniform Delay, d1		24.6	21.1		17.3	0.0				28.5	37.3	36.7
Progression Factor		0.53	1.52		0.64	1.00				1.00	1.00	1.00
Incremental Delay, d2		19.1	1.3		0.8	1.0				0.3	18.2	13.4
Delay (s)		32.2	33.4		11.8	1.0				28.8	55.5	50.0
Level of Service		C	C		B	A				C	E	D
Approach Delay (s)		32.4			9.0			0.0			49.1	
Approach LOS		C			A			A			D	

Intersection Summary

HCM Average Control Delay	25.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↱			↑↑↑↑	↱	↰	↰	↱↱			
Volume (vph)	0	3260	640	0	2860	135	570	0	960	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor		0.86			0.86	1.00	0.95	0.95	0.88			
Frt		0.98			1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		6250			6408	1583	1681	1681	2787			
Flt Permitted		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		6250			6408	1583	1681	1681	2787			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	3432	674	0	3011	142	600	0	1011	0	0	0
RTOR Reduction (vph)	0	29	0	0	0	56	0	0	1	0	0	0
Lane Group Flow (vph)	0	4077	0	0	3011	86	300	300	1010	0	0	0
Turn Type						Perm	Split		Perm			
Protected Phases		2			6		8	8				
Permitted Phases						6			8			
Actuated Green, G (s)		73.0			73.0	73.0	39.0	39.0	39.0			
Effective Green, g (s)		73.0			73.0	73.0	39.0	39.0	39.0			
Actuated g/C Ratio		0.61			0.61	0.61	0.32	0.32	0.32			
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)		3802			3898	963	546	546	906			
v/s Ratio Prot		c0.65			0.47		0.18	0.18				
v/s Ratio Perm						0.05			c0.36			
v/c Ratio		1.07			0.77	0.09	0.55	0.55	1.12			
Uniform Delay, d1		23.5			17.4	9.7	33.3	33.3	40.5			
Progression Factor		0.26			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		33.1			1.5	0.2	1.1	1.1	66.8			
Delay (s)		39.2			18.9	9.9	34.4	34.4	107.3			
Level of Service		D			B	A	C	C	F			
Approach Delay (s)		39.2			18.5			80.1			0.0	
Approach LOS		D			B			F			A	

Intersection Summary

HCM Average Control Delay	39.3	HCM Level of Service	D
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	98.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	490	3660	70	45	2600	30	155	40	30	275	45	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	1.00	0.86		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	6408	1583	1770	6397		1770	1742		1681	1708	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	6408	1583	1770	6397		1770	1742		1681	1708	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	516	3853	74	47	2737	32	163	42	32	289	47	253
RTOR Reduction (vph)	0	0	13	0	1	0	0	27	0	0	0	209
Lane Group Flow (vph)	516	3853	61	47	2768	0	163	47	0	168	168	44
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	4.9	57.3	57.3	2.4	54.8		18.3	18.3		19.0	19.0	19.0
Effective Green, g (s)	7.6	59.0	59.0	5.1	56.5		19.5	19.5		20.9	20.9	20.9
Actuated g/C Ratio	0.06	0.49	0.49	0.04	0.47		0.16	0.16		0.17	0.17	0.17
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lane Grp Cap (vph)	217	3138	775	75	2999		286	282		292	296	275
v/s Ratio Prot	c0.15	c0.60		0.03	0.43		c0.09	0.03		c0.10	0.10	
v/s Ratio Perm			0.04									0.03
v/c Ratio	2.38	1.23	0.08	0.63	0.92		0.57	0.17		0.58	0.57	0.16
Uniform Delay, d1	56.5	30.8	16.3	56.8	30.0		46.6	43.5		45.7	45.7	42.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	634.0	105.5	0.2	11.2	6.1		1.6	0.1		1.7	1.5	0.1
Delay (s)	690.5	136.3	16.5	67.9	36.1		48.2	43.6		47.4	47.1	42.4
Level of Service	F	F	B	E	D		D	D		D	D	D
Approach Delay (s)		198.7			36.6			46.8			45.2	
Approach LOS		F			D			D			D	

Intersection Summary

HCM Average Control Delay	126.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	1350	2615	1710	10	10	965
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	1.00	0.88
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	1770	2787
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	1770	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1421	2753	1800	11	11	1016
RTOR Reduction (vph)	0	0	0	7	0	535
Lane Group Flow (vph)	1421	2753	1800	4	11	481
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	24.8	64.0	35.2	35.2	22.1	22.1
Effective Green, g (s)	24.8	64.0	35.2	35.2	22.1	22.1
Actuated g/C Ratio	0.26	0.68	0.37	0.37	0.23	0.23
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	905	4358	2397	592	416	655
v/s Ratio Prot	c0.41	0.43	c0.28		0.01	
v/s Ratio Perm				0.00		c0.17
v/c Ratio	1.57	0.63	0.75	0.01	0.03	0.73
Uniform Delay, d1	34.6	8.4	25.6	18.5	27.7	33.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	261.9	0.3	1.4	0.0	0.0	4.3
Delay (s)	296.6	8.7	27.0	18.5	27.7	37.6
Level of Service	F	A	C	B	C	D
Approach Delay (s)		106.7	26.9		37.5	
Approach LOS		F	C		D	

Intersection Summary

HCM Average Control Delay	76.0	HCM Level of Service	E
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	94.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	2300	230	370	1190	1800	170	190	500	2000	150	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	0.97	0.86	0.88	1.00	0.95	1.00	0.94	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	2421	242	389	1253	1895	179	200	526	2105	158	105
RTOR Reduction (vph)	0	0	128	0	0	0	0	0	62	0	0	71
Lane Group Flow (vph)	95	2421	114	389	1253	1895	179	200	464	2105	158	34
Turn Type	Prot		Perm	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			Free			8			4
Actuated Green, G (s)	6.9	46.6	46.6	5.0	44.7	120.0	13.0	38.4	38.4	14.0	39.4	39.4
Effective Green, g (s)	6.9	46.6	46.6	5.0	44.7	120.0	13.0	38.4	38.4	14.0	39.4	39.4
Actuated g/C Ratio	0.06	0.39	0.39	0.04	0.37	1.00	0.11	0.32	0.32	0.12	0.33	0.33
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	197	2488	615	143	2387	2787	192	1132	507	582	1162	520
v/s Ratio Prot	0.03	c0.38		c0.11	0.20		0.10	0.06		c0.42	0.04	
v/s Ratio Perm			0.07			c0.68			c0.29			0.02
v/c Ratio	0.48	0.97	0.19	2.72	0.52	0.68	0.93	0.18	0.92	3.62	0.14	0.07
Uniform Delay, d1	54.8	36.1	24.2	57.5	29.4	0.0	53.1	29.4	39.2	53.0	28.3	27.7
Progression Factor	1.00	1.00	1.00	0.98	1.30	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	12.7	0.7	787.2	0.6	0.9	45.8	0.1	21.1	1181.8	0.1	0.1
Delay (s)	56.7	48.8	24.9	843.4	38.7	0.9	98.9	29.5	60.4	1234.8	28.4	27.7
Level of Service	E	D	C	F	D	A	F	C	E	F	C	C
Approach Delay (s)		47.0			106.9			61.2			1100.8	
Approach LOS		D			F			E			F	

Intersection Summary

HCM Average Control Delay	331.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	112.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	530	1700	900	250	870	610
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	3433	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	3433	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	558	1789	947	263	916	642
RTOR Reduction (vph)	0	0	0	204	0	251
Lane Group Flow (vph)	558	1789	947	59	916	391
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8	6	6
Actuated Green, G (s)	15.9	39.4	19.5	19.5	40.0	40.0
Effective Green, g (s)	15.9	39.4	19.5	19.5	40.0	40.0
Actuated g/C Ratio	0.18	0.45	0.22	0.22	0.46	0.46
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	625	2889	1430	353	1571	724
v/s Ratio Prot	c0.16	c0.28	0.15		c0.27	
v/s Ratio Perm				0.04		0.25
v/c Ratio	0.89	0.62	0.66	0.17	0.58	0.54
Uniform Delay, d1	34.9	18.3	30.9	27.4	17.5	17.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.1	0.4	1.2	0.2	1.6	2.9
Delay (s)	50.0	18.7	32.1	27.6	19.1	20.0
Level of Service	D	B	C	C	B	B
Approach Delay (s)		26.1	31.1		19.5	
Approach LOS		C	C		B	

Intersection Summary

HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	87.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM 2000
Basic Freeway Segments
Capacity Analysis

Jurisdiction
Analysis Year Cumulative Conditions
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Corp Yard

General Information / *Flow Rate Calculation*

	Freeway/ Direction	From/To	Analysis Time Period	Volume (vph)	PHF	Lanes	HOV Lane?	HOV Lane Volume	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcphpl)
1	SR 99 NB	Grant Line Road Loop On to Slip On	AM	2,800	0.92	3	No		Level			10.0%	0.0%	1.5	1.2	0.95	1.00	1,065
2	SR 99 NB	Grant Line Road Loop On to Slip On	PM	2,790	0.92	3	No		Level			10.0%	0.0%	1.5	1.2	0.95	1.00	1,061
3	SR 99 SB	Grant Line Road Loop On to Slip On	AM	2,930	0.92	3	No		Level			10.0%	0.0%	1.5	1.2	0.95	1.00	1,115
4	SR 99 SB	Grant Line Road Loop On to Slip On	PM	3,570	0.92	3	No		Level			10.0%	0.0%	1.5	1.2	0.95	1.00	1,358

HCM 2000
Basic Freeway Segments
Capacity Analysis

	General Information		*Speed Calculation*												*Results*	
	Freeway/ Direction	From/To	BFFS (mph)	Lane Width (ft)	f_{LW}	R. Shoulder Width (ft)	f_{LC}	f_N	IC Density (per mi)	f_{ID}	Calculated FFS (mph)	Measured FFS (mph)	FFS (mph)	S (mph)	Density, D (pcplpm)	Level of Service
1	SR 99 NB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	**70.0**	**63.0**	**63.0**	**16.9**	**B**
2	SR 99 NB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	**70.0**	**63.0**	**63.0**	**16.8**	**B**
3	SR 99 SB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	**70.0**	**63.0**	**63.0**	**17.7**	**B**
4	SR 99 SB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	**70.0**	**63.0**	**63.0**	**21.6**	**C**

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction: 0
Analysis Year: Cumulative Conditions
Analyst: Fehr & Peers

Agency or Company: City of Elk Grove
Date: 4/26/2010
Project Description: Elk Grove Corp Yard

	General Information			*Freeway Data*					*Freeway Volume Adjustment*										
	Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S_{FF} (mph)	V (vph)	HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	AM	3	65.0	2,800	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	3,196
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	AM	3	65.0	2,930	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	3,344
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	PM	3	65.0	2,790	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	3,184
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	PM	3	65.0	3,570	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,074

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*On-Ramp Data*							*On-Ramp Volume Adjustment*											
	Freeway/ Direction	On-ramp	Type	Lanes	S_{FR} (mph)	V_R (vph)	Accel Lane (ft) L_{A1}	L_{A2}	L_{Aeff}	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	Right	1	35.0	470	450		450	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	524
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	Right	1	45.0	460	450		450	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	513
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	Right	1	45.0	135	450		450	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	150
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	Right	1	45.0	1,070	450		450	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	1,192

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Upstream Ramp Data*															
	Freeway Direction	On-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Grade %	Length (mi)	Truck Bus %	RV %	Grade E_T	E_R	E_T	E_R	f_{HV}	f_p	Flow Rate v_u (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No															
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No															
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No															
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No															

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Downstream Ramp Data*																*v_{12} Estimation*						
	Freeway/ Direction	On-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	Grade E_T	Grade E_R	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	L_{EQ} 25-2	L_{EQ} 25-3	P_{FM} Equations 1	P_{FM} Equations 2	P_{FM} Equations 3	P_{FM}	v_{12} (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No																		0.590			0.590	1,886
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No																		0.590			0.590	1,973
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No																		0.590			0.590	1,879
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No																		0.590			0.590	2,404

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks															
	Freeway/ Direction	On-ramp	v_{FI} (pcph)	Max v_{FI} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	v_3, v_{av34} (pcphpl)	v_3, v_{av34} > 2,700?	v_3, v_{av34} >1.5*v_{12}/2?	v_{12a} (pcph)	v_{R12a} (pcph)	Max v_{R12a} (pcph)	LOS F?	v_R (pcph)	Max v_R (pcph)	LOS F?
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	3,196	7,200	No	3,719	7,200	No	1,310	No	No	1,886	2,409	4,600	No	524	2,000	No
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	3,344	7,200	No	3,857	7,200	No	1,371	No	No	1,973	2,486	4,600	No	513	2,100	No
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	3,184	7,200	No	3,335	7,200	No	1,305	No	No	1,879	2,029	4,600	No	150	2,100	No
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	4,074	7,200	No	5,267	7,200	No	1,670	No	No	2,404	3,596	4,600	No	1,192	2,100	No

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			*Results*		*Speed Estimation*			
	Freeway/ Direction	On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M_S	Inf. Area S_R (mph)	Out Lns. S_O (mph)	All vehs. S (mph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	**21.2**	**C**	0.333	57.3	62.1	58.9
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	**21.8**	**C**	0.327	57.5	61.9	59.0
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	**18.4**	**B**	0.310	57.9	62.1	59.5
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	**30.2**	**D**	0.423	55.3	60.8	56.9

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
Analysis Year Cumulative Conditions
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Corp Yard

General Information				*Freeway Data*					*Freeway Volume Adjustment*									
	Freeway/ Direction	Off-ramp	Analysis Time Period	Lanes	S_{FF} (mph)	V (vph)	HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P
1	SR 99 NB	Off-Ramp to Grant Line Road	AM	2	65.0	3,930	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00
2	SR 99 SB	Off-Ramp to Grant Line Road	AM	2	65.0	2,710	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00
3	SR 99 NB	Off-Ramp to Grant Line Road	PM	2	65.0	3,680	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00
4	SR 99 SB	Off-Ramp to Grant Line Road	PM	2	65.0	2,770	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information			Effective	*Off-Ramp Data*								*Off-Ramp Volume Adjustment*										
	Freeway/ Direction	Off-ramp	Flow Rate v_p (pcph)	Flow Rate v_p (pcph)	Type	Lanes	S_{FR} (mph)	V_R (vph)	Decel Lane (ft) L_{D1}	L_{D2}	L_{Deff}	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	4,485	4,485	Major	2	45.0	1,700	0	1,500	1,500	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	1,894
2	SR 99 SB	Off-Ramp to Grant Line Road	3,093	3,093	Major	2	45.0	840	0	1,500	1,500	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	936
3	SR 99 NB	Off-Ramp to Grant Line Road	4,200	4,200	Major	2	45.0	1,530	0	1,500	1,500	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	1,705
4	SR 99 SB	Off-Ramp to Grant Line Road	3,161	3,161	Major	2	45.0	1,000	0	1,500	1,500	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	1,114

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Upstream Ramp Data*															
	Freeway/ Direction	Off-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	Grade E_T	Grade E_R	E_T	E_R	f_{HV}	f_P	Flow Rate v_U (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	No															
2	SR 99 SB	Off-Ramp to Grant Line Road	No															
3	SR 99 NB	Off-Ramp to Grant Line Road	No															
4	SR 99 SB	Off-Ramp to Grant Line Road	No															

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Downstream Ramp Data*																*v_{12} Estimation*						
	Freeway/ Direction	Off-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	Grade E_T	Grade E_R	E_T	E_R	f_{HV}	f_P	Flow Rate v_D (pcph)	L_D 25-13	L_D 25-14	P_{FD} Equations 5	P_{FD} Equations 6	P_{FD} Equations 7	P_{FD}	v_{12} (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	No																						
2	SR 99 SB	Off-Ramp to Grant Line Road	No																						
3	SR 99 NB	Off-Ramp to Grant Line Road	No																						
4	SR 99 SB	Off-Ramp to Grant Line Road	No																						

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Capacity Checks															
	Freeway/ Direction	Off-ramp	v_{Fi} (pcph)	Max v_{Fi} (pcph)	LOS F?	v_3, v_{av34} (pcphpl)	v_3, v_{av34} > 2,700?	v_3, v_{av34} >1.5*v_{12}/2?	v_{12a} (pcph)	Max v_{12} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	v_R (pcph)	Max v_R (pcph)	LOS F?
1	SR 99 NB	Off-Ramp to Grant Line Road	4,485	4,800	No	0	No	No	4,485	4,400	Yes	2,591	4,800	No	1,894	4,100	No
2	SR 99 SB	Off-Ramp to Grant Line Road	3,093	4,800	No	0	No	No	3,093	4,400	No	2,157	4,800	No	936	4,100	No
3	SR 99 NB	Off-Ramp to Grant Line Road	4,200	4,800	No	0	No	No	4,200	4,400	No	2,495	4,800	No	1,705	4,100	No
4	SR 99 SB	Off-Ramp to Grant Line Road	3,161	4,800	No	0	No	No	3,161	4,400	No	2,047	4,800	No	1,114	4,100	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
	Freeway/ Direction	Off-ramp	Density, D (pcplpm)	Level of Service	Int. Var. D_S	Inf. Area S_R (mph)	Out Lns. S_O (mph)	All vehs. S (mph)
1	SR 99 NB	Off-Ramp to Grant Line Road	**24.4**	**C**	0.468	54.2	0.0	54.2
2	SR 99 SB	Off-Ramp to Grant Line Road	**16.9**	**B**	0.382	56.2	0.0	56.2
3	SR 99 NB	Off-Ramp to Grant Line Road	**22.9**	**C**	0.451	54.6	0.0	54.6
4	SR 99 SB	Off-Ramp to Grant Line Road	**17.2**	**B**	0.398	55.8	0.0	55.8

Appendix D

Cumulative Plus Project Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↑	↱		↑↑↑↑	↱				↰	✣	↱
Volume (vph)	0	2221	460	0	3710	1061	0	0	0	81	0	760
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.86	1.00		0.86	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	0.85	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (prot)		6408	1583		6408	1583				1681	1445	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (perm)		6408	1583		6408	1583				1681	1445	1504
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	2338	484	0	3905	1117	0	0	0	85	0	800
RTOR Reduction (vph)	0	0	188	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2338	296	0	3905	1117	0	0	0	76	401	408
Turn Type			Perm			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			2			Free						4
Actuated Green, G (s)		73.5	73.5		73.5	120.0				38.5	38.5	38.5
Effective Green, g (s)		73.5	73.5		73.5	120.0				38.5	38.5	38.5
Actuated g/C Ratio		0.61	0.61		0.61	1.00				0.32	0.32	0.32
Clearance Time (s)		4.0	4.0		4.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		3925	970		3925	1583				539	464	483
v/s Ratio Prot		0.36			c0.61					0.05	c0.28	
v/s Ratio Perm			0.19			0.71						0.27
v/c Ratio		0.60	0.31		0.99	0.71				0.14	0.86	0.84
Uniform Delay, d1		14.2	11.1		23.1	0.0				29.0	38.3	38.0
Progression Factor		0.91	3.92		0.91	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.3	0.3		6.1	0.2				0.1	15.3	12.8
Delay (s)		13.1	43.8		27.2	0.2				29.1	53.6	50.7
Level of Service		B	D		C	A				C	D	D
Approach Delay (s)		18.4			21.2			0.0			50.2	
Approach LOS		B			C			A			D	

Intersection Summary

HCM Average Control Delay	23.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1732	570	0	3911	471	860	0	840	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor		0.86			0.86	1.00	0.95	0.95	0.88			
Frt		0.96			1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		6170			6408	1583	1681	1681	2787			
Flt Permitted		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		6170			6408	1583	1681	1681	2787			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1823	600	0	4117	496	905	0	884	0	0	0
RTOR Reduction (vph)	0	50	0	0	0	182	0	0	27	0	0	0
Lane Group Flow (vph)	0	2374	0	0	4117	314	452	453	857	0	0	0
Turn Type						Perm	Split		Perm			
Protected Phases		2			6		8	8				
Permitted Phases						6			8			
Actuated Green, G (s)		76.0			76.0	76.0	36.0	36.0	36.0			
Effective Green, g (s)		76.0			76.0	76.0	36.0	36.0	36.0			
Actuated g/C Ratio		0.63			0.63	0.63	0.30	0.30	0.30			
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)		3908			4058	1003	504	504	836			
v/s Ratio Prot		0.38			c0.64		0.27	0.27				
v/s Ratio Perm						0.20			c0.31			
v/c Ratio		0.61			1.01	0.31	0.90	0.90	1.03			
Uniform Delay, d1		13.1			22.0	10.1	40.2	40.3	42.0			
Progression Factor		0.18			1.47	12.12	1.00	1.00	1.00			
Incremental Delay, d2		0.6			8.6	0.1	18.3	18.6	37.8			
Delay (s)		3.0			41.0	122.0	58.6	58.8	79.8			
Level of Service		A			D	F	E	E	E			
Approach Delay (s)		3.0			49.7			69.1			0.0	
Approach LOS		A			D			E			A	

Intersection Summary

HCM Average Control Delay	40.8	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	157	2287	128	102	3870	148	98	53	40	290	56	414
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	1.00	0.86		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	6408	1583	1770	6372		1770	1743		1681	1711	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	6408	1583	1770	6372		1770	1743		1681	1711	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	165	2407	135	107	4074	156	103	56	42	305	59	436
RTOR Reduction (vph)	0	0	37	0	2	0	0	29	0	0	0	358
Lane Group Flow (vph)	165	2407	98	107	4228	0	103	69	0	180	184	78
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	3.0	58.6	58.6	3.0	58.6		15.2	15.2		19.7	19.7	19.7
Effective Green, g (s)	5.7	60.3	60.3	5.7	60.3		16.4	16.4		21.6	21.6	21.6
Actuated g/C Ratio	0.05	0.50	0.50	0.05	0.50		0.14	0.14		0.18	0.18	0.18
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lane Grp Cap (vph)	163	3220	795	84	3202		242	238		303	308	285
v/s Ratio Prot	0.05	0.38		c0.06	c0.66		c0.06	0.04		0.11	c0.11	
v/s Ratio Perm			0.06									0.05
v/c Ratio	1.01	0.75	0.12	1.27	1.32		0.43	0.29		0.59	0.60	0.28
Uniform Delay, d1	57.1	23.8	15.8	57.1	29.9		47.5	46.6		45.2	45.2	42.4
Progression Factor	1.06	1.15	1.08	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	59.8	1.1	0.2	188.4	146.4		0.4	0.2		2.1	2.1	0.2
Delay (s)	120.4	28.5	17.4	245.6	176.3		47.9	46.8		47.3	47.3	42.6
Level of Service	F	C	B	F	F		D	D		D	D	D
Approach Delay (s)		33.5			178.0			47.4			44.7	
Approach LOS		C			F			D			D	

Intersection Summary

HCM Average Control Delay	112.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	851	1761	2720	20	10	1400
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	1.00	0.88
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	1770	2787
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	1770	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	896	1854	2863	21	11	1474
RTOR Reduction (vph)	0	0	0	13	0	361
Lane Group Flow (vph)	896	1854	2863	8	11	1113
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	19.0	68.0	45.0	45.0	44.0	44.0
Effective Green, g (s)	19.0	68.0	45.0	45.0	44.0	44.0
Actuated g/C Ratio	0.16	0.57	0.38	0.38	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	544	3631	2403	594	649	1022
v/s Ratio Prot	c0.26	0.29	c0.45		0.01	
v/s Ratio Perm				0.00		c0.40
v/c Ratio	1.65	0.51	1.19	0.01	0.02	1.09
Uniform Delay, d1	50.5	15.9	37.5	23.6	24.2	38.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	299.4	0.1	90.6	0.0	0.0	55.6
Delay (s)	349.9	16.0	128.1	23.6	24.2	93.6
Level of Service	F	B	F	C	C	F
Approach Delay (s)		124.8	127.3		93.1	
Approach LOS		F	F		F	

Intersection Summary

HCM Average Control Delay	119.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	95.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	1191	120	410	1560	2500	90	140	290	1200	130	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	0.97	0.86	0.88	1.00	0.95	1.00	0.94	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	1254	126	432	1642	2632	95	147	305	1263	137	63
RTOR Reduction (vph)	0	0	73	0	0	0	0	0	92	0	0	44
Lane Group Flow (vph)	42	1254	53	432	1642	2632	95	147	213	1263	137	19
Turn Type	Prot		Perm	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			Free			8			4
Actuated Green, G (s)	4.0	50.8	50.8	11.0	57.8	120.0	6.0	20.2	20.2	22.0	36.2	36.2
Effective Green, g (s)	4.0	50.8	50.8	11.0	57.8	120.0	6.0	20.2	20.2	22.0	36.2	36.2
Actuated g/C Ratio	0.03	0.42	0.42	0.09	0.48	1.00	0.05	0.17	0.17	0.18	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	114	2713	670	315	3087	2787	89	596	266	915	1068	478
v/s Ratio Prot	0.01	0.20		c0.13	0.26		0.05	0.04		c0.25	0.04	
v/s Ratio Perm			0.03			c0.94			0.13			0.01
v/c Ratio	0.37	0.46	0.08	1.37	0.53	0.94	1.07	0.25	0.80	1.38	0.13	0.04
Uniform Delay, d1	56.8	24.8	20.6	54.5	21.7	0.0	57.0	43.3	48.0	49.0	30.4	29.6
Progression Factor	1.00	1.00	1.00	1.12	0.52	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.6	0.2	173.7	0.2	3.1	114.9	0.2	15.4	178.0	0.1	0.0
Delay (s)	58.8	25.4	20.9	234.9	11.5	3.1	171.9	43.5	63.3	227.0	30.5	29.6
Level of Service	E	C	C	F	B	A	F	D	E	F	C	C
Approach Delay (s)		26.0			27.3			76.9			200.1	
Approach LOS		C			C			E			F	

Intersection Summary

HCM Average Control Delay	61.5	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	490	981	1290	200	340	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	3433	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	3433	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	516	1033	1358	211	358	432
RTOR Reduction (vph)	0	0	0	159	0	239
Lane Group Flow (vph)	516	1033	1358	52	358	193
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8	6	6
Actuated Green, G (s)	15.7	41.7	22.0	22.0	40.0	40.0
Effective Green, g (s)	15.7	41.7	22.0	22.0	40.0	40.0
Actuated g/C Ratio	0.18	0.46	0.25	0.25	0.45	0.45
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	601	2979	1572	388	1531	706
v/s Ratio Prot	c0.15	0.16	c0.21		0.10	
v/s Ratio Perm				0.03		c0.12
v/c Ratio	0.86	0.35	0.86	0.13	0.23	0.27
Uniform Delay, d1	35.9	15.3	32.4	26.4	15.4	15.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.7	0.1	5.2	0.2	0.4	1.0
Delay (s)	47.6	15.4	37.6	26.6	15.7	16.6
Level of Service	D	B	D	C	B	B
Approach Delay (s)		26.1	36.1		16.2	
Approach LOS		C	D		B	

Intersection Summary

HCM Average Control Delay	28.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	89.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↑	↱		↑↑↑↑	↱				↰	✥	↱
Volume (vph)	0	3732	1070	0	2531	900	0	0	0	170	0	830
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.86	1.00		0.86	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	0.86	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (prot)		6408	1583		6408	1583				1681	1448	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (perm)		6408	1583		6408	1583				1681	1448	1504
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	3928	1126	0	2664	947	0	0	0	179	0	874
RTOR Reduction (vph)	0	0	303	0	0	0	0	0	0	0	1	1
Lane Group Flow (vph)	0	3928	823	0	2664	947	0	0	0	161	445	445
Turn Type			Perm			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			2			Free						4
Actuated Green, G (s)		70.7	70.7		70.7	120.0				41.3	41.3	41.3
Effective Green, g (s)		70.7	70.7		70.7	120.0				41.3	41.3	41.3
Actuated g/C Ratio		0.59	0.59		0.59	1.00				0.34	0.34	0.34
Clearance Time (s)		4.0	4.0		4.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		3775	933		3775	1583				579	498	518
v/s Ratio Prot		c0.61			0.42					0.10	c0.31	
v/s Ratio Perm			0.52			0.60						0.30
v/c Ratio		1.04	0.88		0.71	0.60				0.28	0.89	0.86
Uniform Delay, d1		24.6	21.1		17.3	0.0				28.5	37.3	36.7
Progression Factor		0.53	1.52		0.64	1.00				1.00	1.00	1.00
Incremental Delay, d2		19.3	1.3		0.8	1.0				0.3	18.2	13.4
Delay (s)		32.4	33.4		11.8	1.0				28.8	55.5	50.0
Level of Service		C	C		B	A				C	E	D
Approach Delay (s)		32.6			9.0			0.0			49.1	
Approach LOS		C			A			A			D	

Intersection Summary

HCM Average Control Delay	25.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	3262	640	0	2861	136	570	0	960	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor		0.86			0.86	1.00	0.95	0.95	0.88			
Frt		0.98			1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		6250			6408	1583	1681	1681	2787			
Flt Permitted		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		6250			6408	1583	1681	1681	2787			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	3434	674	0	3012	143	600	0	1011	0	0	0
RTOR Reduction (vph)	0	29	0	0	0	56	0	0	1	0	0	0
Lane Group Flow (vph)	0	4079	0	0	3012	87	300	300	1010	0	0	0
Turn Type						Perm	Split		Perm			
Protected Phases		2			6		8	8				
Permitted Phases						6			8			
Actuated Green, G (s)		73.0			73.0	73.0	39.0	39.0	39.0			
Effective Green, g (s)		73.0			73.0	73.0	39.0	39.0	39.0			
Actuated g/C Ratio		0.61			0.61	0.61	0.32	0.32	0.32			
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)		3802			3898	963	546	546	906			
v/s Ratio Prot		c0.65			0.47		0.18	0.18				
v/s Ratio Perm						0.05			c0.36			
v/c Ratio		1.07			0.77	0.09	0.55	0.55	1.12			
Uniform Delay, d1		23.5			17.4	9.7	33.3	33.3	40.5			
Progression Factor		0.26			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		33.4			1.5	0.2	1.1	1.1	66.8			
Delay (s)		39.4			18.9	9.9	34.4	34.4	107.3			
Level of Service		D			B	A	C	C	F			
Approach Delay (s)		39.4			18.5			80.1			0.0	
Approach LOS		D			B			F			A	

Intersection Summary

HCM Average Control Delay	39.4	HCM Level of Service	D
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	98.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	476	3668	78	47	2600	28	165	44	30	274	51	232
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	1.00	0.86		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	6408	1583	1770	6398		1770	1748		1681	1711	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	6408	1583	1770	6398		1770	1748		1681	1711	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	501	3861	82	49	2737	29	174	46	32	288	54	244
RTOR Reduction (vph)	0	0	14	0	1	0	0	26	0	0	0	201
Lane Group Flow (vph)	501	3861	68	49	2765	0	174	52	0	170	172	43
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	5.0	56.6	56.6	2.4	54.0		18.9	18.9		19.1	19.1	19.1
Effective Green, g (s)	7.7	58.3	58.3	5.1	55.7		20.1	20.1		21.0	21.0	21.0
Actuated g/C Ratio	0.06	0.48	0.48	0.04	0.46		0.17	0.17		0.17	0.17	0.17
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lane Grp Cap (vph)	219	3100	766	75	2957		295	292		293	298	276
v/s Ratio Prot	c0.15	c0.60		0.03	0.43		c0.10	0.03		c0.10	0.10	
v/s Ratio Perm			0.04									0.03
v/c Ratio	2.29	1.25	0.09	0.65	0.94		0.59	0.18		0.58	0.58	0.15
Uniform Delay, d1	56.4	31.1	16.8	56.8	30.7		46.4	43.1		45.7	45.7	42.2
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	593.7	113.3	0.2	14.5	7.1		1.9	0.1		1.9	1.7	0.1
Delay (s)	650.1	144.4	17.0	71.3	37.8		48.3	43.2		47.6	47.4	42.3
Level of Service	F	F	B	E	D		D	D		D	D	D
Approach Delay (s)		199.1			38.3			46.8			45.3	
Approach LOS		F			D			D			D	

Intersection Summary

HCM Average Control Delay	127.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	120.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	1351	2615	1710	10	10	965
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	1.00	0.88
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	1770	2787
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	1770	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1422	2753	1800	11	11	1016
RTOR Reduction (vph)	0	0	0	7	0	535
Lane Group Flow (vph)	1422	2753	1800	4	11	481
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	24.8	64.0	35.2	35.2	22.1	22.1
Effective Green, g (s)	24.8	64.0	35.2	35.2	22.1	22.1
Actuated g/C Ratio	0.26	0.68	0.37	0.37	0.23	0.23
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	905	4358	2397	592	416	655
v/s Ratio Prot	c0.41	0.43	c0.28		0.01	
v/s Ratio Perm				0.00		c0.17
v/c Ratio	1.57	0.63	0.75	0.01	0.03	0.73
Uniform Delay, d1	34.6	8.4	25.6	18.5	27.7	33.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	262.4	0.3	1.4	0.0	0.0	4.3
Delay (s)	297.1	8.7	27.0	18.5	27.7	37.6
Level of Service	F	A	C	B	C	D
Approach Delay (s)		107.0	26.9		37.5	
Approach LOS		F	C		D	

Intersection Summary

HCM Average Control Delay	76.1	HCM Level of Service	E
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	94.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	2301	230	370	1191	1800	170	190	500	2001	150	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	0.97	0.86	0.88	1.00	0.95	1.00	0.94	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	2422	242	389	1254	1895	179	200	526	2106	158	105
RTOR Reduction (vph)	0	0	128	0	0	0	0	0	62	0	0	71
Lane Group Flow (vph)	95	2422	114	389	1254	1895	179	200	464	2106	158	34
Turn Type	Prot		Perm	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			Free			8			4
Actuated Green, G (s)	6.9	46.6	46.6	5.0	44.7	120.0	13.0	38.4	38.4	14.0	39.4	39.4
Effective Green, g (s)	6.9	46.6	46.6	5.0	44.7	120.0	13.0	38.4	38.4	14.0	39.4	39.4
Actuated g/C Ratio	0.06	0.39	0.39	0.04	0.37	1.00	0.11	0.32	0.32	0.12	0.33	0.33
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	197	2488	615	143	2387	2787	192	1132	507	582	1162	520
v/s Ratio Prot	0.03	c0.38		c0.11	0.20		0.10	0.06		c0.42	0.04	
v/s Ratio Perm			0.07			c0.68			c0.29			0.02
v/c Ratio	0.48	0.97	0.19	2.72	0.53	0.68	0.93	0.18	0.92	3.62	0.14	0.07
Uniform Delay, d1	54.8	36.1	24.2	57.5	29.4	0.0	53.1	29.4	39.2	53.0	28.3	27.7
Progression Factor	1.00	1.00	1.00	0.98	1.30	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	12.8	0.7	787.2	0.6	0.9	45.8	0.1	21.1	1182.6	0.1	0.1
Delay (s)	56.7	48.9	24.9	843.4	38.7	0.9	98.9	29.5	60.4	1235.6	28.4	27.7
Level of Service	E	D	C	F	D	A	F	C	E	F	C	C
Approach Delay (s)		47.1			106.9			61.2			1101.6	
Approach LOS		D			F			E			F	

Intersection Summary

HCM Average Control Delay	331.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	112.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	530	1701	901	250	870	610
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	3433	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	3433	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	558	1791	948	263	916	642
RTOR Reduction (vph)	0	0	0	204	0	251
Lane Group Flow (vph)	558	1791	948	59	916	391
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8	6	6
Actuated Green, G (s)	15.9	39.4	19.5	19.5	40.0	40.0
Effective Green, g (s)	15.9	39.4	19.5	19.5	40.0	40.0
Actuated g/C Ratio	0.18	0.45	0.22	0.22	0.46	0.46
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	625	2889	1430	353	1571	724
v/s Ratio Prot	c0.16	c0.28	0.15		c0.27	
v/s Ratio Perm				0.04		0.25
v/c Ratio	0.89	0.62	0.66	0.17	0.58	0.54
Uniform Delay, d1	34.9	18.3	31.0	27.4	17.5	17.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.1	0.4	1.2	0.2	1.6	2.9
Delay (s)	50.0	18.7	32.1	27.6	19.1	20.0
Level of Service	D	B	C	C	B	B
Approach Delay (s)		26.1	31.1		19.5	
Approach LOS		C	C		B	

Intersection Summary			
HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	87.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	2228	460	0	3713	1061	0	0	0	86	0	760
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.86	1.00		0.86	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	0.85	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (prot)		6408	1583		6408	1583				1681	1445	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (perm)		6408	1583		6408	1583				1681	1445	1504
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	2345	484	0	3908	1117	0	0	0	91	0	800
RTOR Reduction (vph)	0	0	189	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2345	295	0	3908	1117	0	0	0	82	401	408
Turn Type			Perm			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			2			Free						4
Actuated Green, G (s)		73.2	73.2		73.2	120.0				38.8	38.8	38.8
Effective Green, g (s)		73.2	73.2		73.2	120.0				38.8	38.8	38.8
Actuated g/C Ratio		0.61	0.61		0.61	1.00				0.32	0.32	0.32
Clearance Time (s)		4.0	4.0		4.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		3909	966		3909	1583				544	467	486
v/s Ratio Prot		0.37			c0.61					0.05	c0.28	
v/s Ratio Perm			0.19			0.71						0.27
v/c Ratio		0.60	0.31		1.00	0.71				0.15	0.86	0.84
Uniform Delay, d1		14.4	11.2		23.4	0.0				28.9	38.0	37.7
Progression Factor		0.90	3.85		0.91	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.3	0.3		7.1	0.2				0.1	14.5	12.1
Delay (s)		13.3	43.5		28.5	0.2				29.0	52.5	49.8
Level of Service		B	D		C	A				C	D	D
Approach Delay (s)		18.4			22.2			0.0			49.1	
Approach LOS		B			C			A			D	

Intersection Summary

HCM Average Control Delay	23.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1744	570	0	3914	473	860	0	841	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor		0.86			0.86	1.00	0.95	0.95	0.88			
Frt		0.96			1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		6171			6408	1583	1681	1681	2787			
Flt Permitted		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		6171			6408	1583	1681	1681	2787			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1836	600	0	4120	498	905	0	885	0	0	0
RTOR Reduction (vph)	0	49	0	0	0	183	0	0	26	0	0	0
Lane Group Flow (vph)	0	2387	0	0	4120	315	452	453	859	0	0	0
Turn Type						Perm	Split		Perm			
Protected Phases		2			6		8	8				
Permitted Phases						6			8			
Actuated Green, G (s)		76.0			76.0	76.0	36.0	36.0	36.0			
Effective Green, g (s)		76.0			76.0	76.0	36.0	36.0	36.0			
Actuated g/C Ratio		0.63			0.63	0.63	0.30	0.30	0.30			
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)		3908			4058	1003	504	504	836			
v/s Ratio Prot		0.39			c0.64		0.27	0.27				
v/s Ratio Perm						0.20			c0.31			
v/c Ratio		0.61			1.02	0.31	0.90	0.90	1.03			
Uniform Delay, d1		13.2			22.0	10.1	40.2	40.3	42.0			
Progression Factor		0.19			1.48	12.22	1.00	1.00	1.00			
Incremental Delay, d2		0.6			8.9	0.1	18.3	18.6	38.4			
Delay (s)		3.1			41.5	123.1	58.6	58.8	80.4			
Level of Service		A			D	F	E	E	F			
Approach Delay (s)		3.1			50.3			69.4			0.0	
Approach LOS		A			D			E			A	

Intersection Summary

HCM Average Control Delay	41.2	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	157	2294	134	104	3870	148	103	55	41	290	61	414
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	1.00	0.86		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	6408	1583	1770	6372		1770	1744		1681	1713	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	6408	1583	1770	6372		1770	1744		1681	1713	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	165	2415	141	109	4074	156	108	58	43	305	64	436
RTOR Reduction (vph)	0	0	39	0	3	0	0	28	0	0	0	357
Lane Group Flow (vph)	165	2415	102	109	4227	0	108	73	0	183	186	79
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	3.0	58.2	58.2	3.0	58.2		15.5	15.5		19.8	19.8	19.8
Effective Green, g (s)	5.7	59.9	59.9	5.7	59.9		16.7	16.7		21.7	21.7	21.7
Actuated g/C Ratio	0.05	0.50	0.50	0.05	0.50		0.14	0.14		0.18	0.18	0.18
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lane Grp Cap (vph)	163	3199	790	84	3181		246	243		304	310	286
v/s Ratio Prot	0.05	0.38		c0.06	c0.66		c0.06	0.04		c0.11	0.11	
v/s Ratio Perm			0.06									0.05
v/c Ratio	1.01	0.75	0.13	1.30	1.33		0.44	0.30		0.60	0.60	0.28
Uniform Delay, d1	57.1	24.2	16.1	57.1	30.1		47.4	46.4		45.2	45.2	42.4
Progression Factor	1.06	1.15	1.09	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	59.6	1.1	0.2	197.3	150.3		0.5	0.3		2.3	2.1	0.2
Delay (s)	120.3	28.9	17.7	254.5	180.3		47.8	46.6		47.5	47.2	42.6
Level of Service	F	C	B	F	F		D	D		D	D	D
Approach Delay (s)		33.9			182.2			47.2			44.8	
Approach LOS		C			F			D			D	

Intersection Summary

HCM Average Control Delay	115.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	851	1761	2721	20	10	1401
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	1.00	0.88
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	1770	2787
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	1770	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	896	1854	2864	21	11	1475
RTOR Reduction (vph)	0	0	0	13	0	361
Lane Group Flow (vph)	896	1854	2864	8	11	1114
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	19.0	68.0	45.0	45.0	44.0	44.0
Effective Green, g (s)	19.0	68.0	45.0	45.0	44.0	44.0
Actuated g/C Ratio	0.16	0.57	0.38	0.38	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	544	3631	2403	594	649	1022
v/s Ratio Prot	c0.26	0.29	c0.45		0.01	
v/s Ratio Perm				0.00		c0.40
v/c Ratio	1.65	0.51	1.19	0.01	0.02	1.09
Uniform Delay, d1	50.5	15.9	37.5	23.6	24.2	38.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	299.4	0.1	90.8	0.0	0.0	55.9
Delay (s)	349.9	16.0	128.3	23.6	24.2	93.9
Level of Service	F	B	F	C	C	F
Approach Delay (s)		124.8	127.5		93.4	
Approach LOS		F	F		F	

Intersection Summary

HCM Average Control Delay	119.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	95.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	1196	120	410	1562	2501	90	140	290	1202	130	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	0.97	0.86	0.88	1.00	0.95	1.00	0.94	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	1259	126	432	1644	2633	95	147	305	1265	137	63
RTOR Reduction (vph)	0	0	73	0	0	0	0	0	91	0	0	44
Lane Group Flow (vph)	42	1259	53	432	1644	2633	95	147	214	1265	137	19
Turn Type	Prot		Perm	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			Free			8			4
Actuated Green, G (s)	4.0	50.7	50.7	11.0	57.7	120.0	6.0	20.3	20.3	22.0	36.3	36.3
Effective Green, g (s)	4.0	50.7	50.7	11.0	57.7	120.0	6.0	20.3	20.3	22.0	36.3	36.3
Actuated g/C Ratio	0.03	0.42	0.42	0.09	0.48	1.00	0.05	0.17	0.17	0.18	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	114	2707	669	315	3081	2787	89	599	268	915	1071	479
v/s Ratio Prot	0.01	0.20		c0.13	0.26		0.05	0.04		c0.25	0.04	
v/s Ratio Perm			0.03			c0.94			0.13			0.01
v/c Ratio	0.37	0.47	0.08	1.37	0.53	0.94	1.07	0.25	0.80	1.38	0.13	0.04
Uniform Delay, d1	56.8	24.9	20.7	54.5	21.8	0.0	57.0	43.2	47.9	49.0	30.4	29.5
Progression Factor	1.00	1.00	1.00	1.12	0.52	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.6	0.2	173.6	0.2	3.1	114.9	0.2	15.1	179.0	0.1	0.0
Delay (s)	58.8	25.5	20.9	234.9	11.6	3.1	171.9	43.4	62.9	228.0	30.4	29.6
Level of Service	E	C	C	F	B	A	F	D	E	F	C	C
Approach Delay (s)		26.1			27.3			76.6			201.0	
Approach LOS		C			C			E			F	

Intersection Summary

HCM Average Control Delay	61.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	490	986	1292	200	340	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	3433	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	3433	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	516	1038	1360	211	358	432
RTOR Reduction (vph)	0	0	0	159	0	239
Lane Group Flow (vph)	516	1038	1360	52	358	193
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8	6	6
Actuated Green, G (s)	15.7	41.7	22.0	22.0	40.0	40.0
Effective Green, g (s)	15.7	41.7	22.0	22.0	40.0	40.0
Actuated g/C Ratio	0.18	0.46	0.25	0.25	0.45	0.45
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	601	2979	1572	388	1531	706
v/s Ratio Prot	c0.15	0.16	c0.21		0.10	
v/s Ratio Perm				0.03		c0.12
v/c Ratio	0.86	0.35	0.87	0.13	0.23	0.27
Uniform Delay, d1	35.9	15.3	32.4	26.4	15.4	15.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.7	0.1	5.2	0.2	0.4	1.0
Delay (s)	47.6	15.4	37.7	26.6	15.7	16.6
Level of Service	D	B	D	C	B	B
Approach Delay (s)		26.1	36.2		16.2	
Approach LOS		C	D		B	

Intersection Summary

HCM Average Control Delay	28.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	89.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↑	↱		↑↑↑↑	↱				↰	✣	↱
Volume (vph)	0	3739	1070	0	2535	900	0	0	0	175	0	830
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.86	1.00		0.86	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	0.86	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (prot)		6408	1583		6408	1583				1681	1448	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (perm)		6408	1583		6408	1583				1681	1448	1504
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	3936	1126	0	2668	947	0	0	0	184	0	874
RTOR Reduction (vph)	0	0	302	0	0	0	0	0	0	0	1	1
Lane Group Flow (vph)	0	3936	824	0	2668	947	0	0	0	166	445	445
Turn Type			Perm			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			2			Free						4
Actuated Green, G (s)		70.7	70.7		70.7	120.0				41.3	41.3	41.3
Effective Green, g (s)		70.7	70.7		70.7	120.0				41.3	41.3	41.3
Actuated g/C Ratio		0.59	0.59		0.59	1.00				0.34	0.34	0.34
Clearance Time (s)		4.0	4.0		4.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		3775	933		3775	1583				579	498	518
v/s Ratio Prot		c0.61			0.42					0.10	c0.31	
v/s Ratio Perm			0.52			0.60						0.30
v/c Ratio		1.04	0.88		0.71	0.60				0.29	0.89	0.86
Uniform Delay, d1		24.6	21.1		17.4	0.0				28.6	37.3	36.7
Progression Factor		0.53	1.51		0.64	1.00				1.00	1.00	1.00
Incremental Delay, d2		20.2	1.3		0.8	1.0				0.3	18.2	13.4
Delay (s)		33.3	33.2		11.8	1.0				28.9	55.5	50.0
Level of Service		C	C		B	A				C	E	D
Approach Delay (s)		33.3			9.0			0.0			49.0	
Approach LOS		C			A			A			D	

Intersection Summary

HCM Average Control Delay	26.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↱			↑↑↑↑	↱	↰	↰	↱↱			
Volume (vph)	0	3274	640	0	2865	138	570	0	961	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor		0.86			0.86	1.00	0.95	0.95	0.88			
Frt		0.98			1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		6251			6408	1583	1681	1681	2787			
Flt Permitted		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		6251			6408	1583	1681	1681	2787			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	3446	674	0	3016	145	600	0	1012	0	0	0
RTOR Reduction (vph)	0	29	0	0	0	57	0	0	1	0	0	0
Lane Group Flow (vph)	0	4091	0	0	3016	88	300	300	1011	0	0	0
Turn Type						Perm	Split		Perm			
Protected Phases		2			6		8	8				
Permitted Phases						6			8			
Actuated Green, G (s)		73.0			73.0	73.0	39.0	39.0	39.0			
Effective Green, g (s)		73.0			73.0	73.0	39.0	39.0	39.0			
Actuated g/C Ratio		0.61			0.61	0.61	0.32	0.32	0.32			
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)		3803			3898	963	546	546	906			
v/s Ratio Prot		c0.65			0.47		0.18	0.18				
v/s Ratio Perm						0.06			c0.36			
v/c Ratio		1.08			0.77	0.09	0.55	0.55	1.12			
Uniform Delay, d1		23.5			17.4	9.7	33.3	33.3	40.5			
Progression Factor		0.26			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		34.6			1.6	0.2	1.1	1.1	67.2			
Delay (s)		40.6			18.9	9.9	34.4	34.4	107.7			
Level of Service		D			B	A	C	C	F			
Approach Delay (s)		40.6			18.5			80.4			0.0	
Approach LOS		D			B			F			A	

Intersection Summary

HCM Average Control Delay	40.0	HCM Level of Service	D
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	98.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	476	3674	85	50	2600	28	171	46	31	274	56	232
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	1.00	0.86		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	6408	1583	1770	6398		1770	1749		1681	1713	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	6408	1583	1770	6398		1770	1749		1681	1713	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	501	3867	89	53	2737	29	180	48	33	288	59	244
RTOR Reduction (vph)	0	0	16	0	1	0	0	26	0	0	0	201
Lane Group Flow (vph)	501	3867	73	53	2765	0	180	55	0	173	174	43
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	5.0	56.1	56.1	2.4	53.5		19.2	19.2		19.3	19.3	19.3
Effective Green, g (s)	7.7	57.8	57.8	5.1	55.2		20.4	20.4		21.2	21.2	21.2
Actuated g/C Ratio	0.06	0.48	0.48	0.04	0.46		0.17	0.17		0.18	0.18	0.18
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lane Grp Cap (vph)	219	3074	759	75	2931		300	296		296	301	279
v/s Ratio Prot	c0.15	c0.60		0.03	0.43		c0.10	0.03		c0.10	0.10	
v/s Ratio Perm			0.05									0.03
v/c Ratio	2.29	1.26	0.10	0.71	0.94		0.60	0.19		0.58	0.58	0.15
Uniform Delay, d1	56.4	31.4	17.1	57.0	31.2		46.3	42.9		45.6	45.5	42.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	593.7	118.9	0.3	21.8	7.8		2.2	0.1		1.9	1.7	0.1
Delay (s)	650.1	150.2	17.4	78.8	39.0		48.4	43.0		47.5	47.2	42.1
Level of Service	F	F	B	E	D		D	D		D	D	D
Approach Delay (s)		203.8			39.8			46.8			45.2	
Approach LOS		F			D			D			D	

Intersection Summary

HCM Average Control Delay	130.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	1350	2616	1711	10	10	967
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	1.00	0.88
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	1770	2787
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	1770	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1421	2754	1801	11	11	1018
RTOR Reduction (vph)	0	0	0	7	0	534
Lane Group Flow (vph)	1421	2754	1801	4	11	484
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	24.8	64.0	35.2	35.2	22.2	22.2
Effective Green, g (s)	24.8	64.0	35.2	35.2	22.2	22.2
Actuated g/C Ratio	0.26	0.68	0.37	0.37	0.24	0.24
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	904	4354	2394	592	417	657
v/s Ratio Prot	c0.41	0.43	c0.28		0.01	
v/s Ratio Perm				0.00		c0.17
v/c Ratio	1.57	0.63	0.75	0.01	0.03	0.74
Uniform Delay, d1	34.7	8.5	25.7	18.5	27.7	33.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	262.7	0.3	1.4	0.0	0.0	4.3
Delay (s)	297.4	8.8	27.1	18.5	27.7	37.6
Level of Service	F	A	C	B	C	D
Approach Delay (s)		107.0	27.0		37.5	
Approach LOS		F	C		D	

Intersection Summary			
HCM Average Control Delay	76.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	94.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	2306	230	370	1194	1801	170	190	500	2003	150	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	0.97	0.86	0.88	1.00	0.95	1.00	0.94	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	2427	242	389	1257	1896	179	200	526	2108	158	105
RTOR Reduction (vph)	0	0	127	0	0	0	0	0	62	0	0	71
Lane Group Flow (vph)	95	2427	115	389	1257	1896	179	200	464	2108	158	34
Turn Type	Prot		Perm	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			Free			8			4
Actuated Green, G (s)	6.9	46.6	46.6	5.0	44.7	120.0	13.0	38.4	38.4	14.0	39.4	39.4
Effective Green, g (s)	6.9	46.6	46.6	5.0	44.7	120.0	13.0	38.4	38.4	14.0	39.4	39.4
Actuated g/C Ratio	0.06	0.39	0.39	0.04	0.37	1.00	0.11	0.32	0.32	0.12	0.33	0.33
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	197	2488	615	143	2387	2787	192	1132	507	582	1162	520
v/s Ratio Prot	0.03	c0.38		c0.11	0.20		0.10	0.06		c0.42	0.04	
v/s Ratio Perm			0.07			c0.68			c0.29			0.02
v/c Ratio	0.48	0.98	0.19	2.72	0.53	0.68	0.93	0.18	0.92	3.62	0.14	0.07
Uniform Delay, d1	54.8	36.1	24.2	57.5	29.4	0.0	53.1	29.4	39.2	53.0	28.3	27.7
Progression Factor	1.00	1.00	1.00	0.98	1.30	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	13.1	0.7	787.1	0.6	0.9	45.8	0.1	21.1	1184.2	0.1	0.1
Delay (s)	56.7	49.3	24.9	843.4	38.7	0.9	98.9	29.5	60.4	1237.2	28.4	27.7
Level of Service	E	D	C	F	D	A	F	C	E	F	C	C
Approach Delay (s)		47.4			106.8			61.2			1103.0	
Approach LOS		D			F			E			F	

Intersection Summary

HCM Average Control Delay	331.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	112.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	530	1706	904	250	870	610
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	3433	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	3433	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	558	1796	952	263	916	642
RTOR Reduction (vph)	0	0	0	204	0	251
Lane Group Flow (vph)	558	1796	952	59	916	391
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8	6	6
Actuated Green, G (s)	15.9	39.5	19.6	19.6	40.0	40.0
Effective Green, g (s)	15.9	39.5	19.6	19.6	40.0	40.0
Actuated g/C Ratio	0.18	0.45	0.22	0.22	0.46	0.46
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	624	2893	1435	355	1569	724
v/s Ratio Prot	c0.16	c0.28	0.15		c0.27	
v/s Ratio Perm				0.04		0.25
v/c Ratio	0.89	0.62	0.66	0.17	0.58	0.54
Uniform Delay, d1	35.0	18.3	30.9	27.4	17.6	17.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.2	0.4	1.2	0.2	1.6	2.9
Delay (s)	50.2	18.7	32.1	27.6	19.2	20.0
Level of Service	D	B	C	C	B	C
Approach Delay (s)		26.2	31.1		19.5	
Approach LOS		C	C		B	

Intersection Summary

HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	87.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↑	↱		↑↑↑↑	↱				↰	↔	↱
Volume (vph)	0	2222	460	0	3711	1060	0	0	0	81	0	760
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.86	1.00		0.86	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	0.85	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (prot)		6408	1583		6408	1583				1681	1445	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (perm)		6408	1583		6408	1583				1681	1445	1504
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	2339	484	0	3906	1116	0	0	0	85	0	800
RTOR Reduction (vph)	0	0	188	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2339	296	0	3906	1116	0	0	0	76	401	408
Turn Type			Perm			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			2			Free						4
Actuated Green, G (s)		73.5	73.5		73.5	120.0				38.5	38.5	38.5
Effective Green, g (s)		73.5	73.5		73.5	120.0				38.5	38.5	38.5
Actuated g/C Ratio		0.61	0.61		0.61	1.00				0.32	0.32	0.32
Clearance Time (s)		4.0	4.0		4.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		3925	970		3925	1583				539	464	483
v/s Ratio Prot		0.37			c0.61					0.05	c0.28	
v/s Ratio Perm			0.19			0.70						0.27
v/c Ratio		0.60	0.31		1.00	0.70				0.14	0.86	0.84
Uniform Delay, d1		14.2	11.1		23.1	0.0				29.0	38.3	38.0
Progression Factor		0.91	3.92		0.91	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.3	0.3		6.1	0.2				0.1	15.3	12.8
Delay (s)		13.2	43.8		27.2	0.2				29.1	53.6	50.7
Level of Service		B	D		C	A				C	D	D
Approach Delay (s)		18.4			21.2			0.0			50.2	
Approach LOS		B			C			A			D	

Intersection Summary

HCM Average Control Delay	23.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1733	570	0	3911	471	860	0	840	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor		0.86			0.86	1.00	0.95	0.95	0.88			
Frt		0.96			1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		6170			6408	1583	1681	1681	2787			
Flt Permitted		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		6170			6408	1583	1681	1681	2787			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1824	600	0	4117	496	905	0	884	0	0	0
RTOR Reduction (vph)	0	50	0	0	0	182	0	0	27	0	0	0
Lane Group Flow (vph)	0	2375	0	0	4117	314	452	453	857	0	0	0
Turn Type						Perm	Split		Perm			
Protected Phases		2			6		8	8				
Permitted Phases						6			8			
Actuated Green, G (s)		76.0			76.0	76.0	36.0	36.0	36.0			
Effective Green, g (s)		76.0			76.0	76.0	36.0	36.0	36.0			
Actuated g/C Ratio		0.63			0.63	0.63	0.30	0.30	0.30			
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)		3908			4058	1003	504	504	836			
v/s Ratio Prot		0.38			c0.64		0.27	0.27				
v/s Ratio Perm						0.20			c0.31			
v/c Ratio		0.61			1.01	0.31	0.90	0.90	1.03			
Uniform Delay, d1		13.1			22.0	10.1	40.2	40.3	42.0			
Progression Factor		0.19			1.45	11.98	1.00	1.00	1.00			
Incremental Delay, d2		0.6			8.6	0.1	18.3	18.6	37.8			
Delay (s)		3.0			40.6	120.7	58.6	58.8	79.8			
Level of Service		A			D	F	E	E	E			
Approach Delay (s)		3.0			49.2			69.1			0.0	
Approach LOS		A			D			E			A	

Intersection Summary

HCM Average Control Delay	40.6	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	173	2280	120	100	3870	150	90	50	40	290	50	422
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	1.00	0.86		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	6408	1583	1770	6372		1770	1739		1681	1709	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	6408	1583	1770	6372		1770	1739		1681	1709	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	182	2400	126	105	4074	158	95	53	42	305	53	444
RTOR Reduction (vph)	0	0	35	0	2	0	0	31	0	0	0	364
Lane Group Flow (vph)	182	2400	91	105	4230	0	95	64	0	177	181	80
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	3.0	59.1	59.1	3.0	59.1		14.8	14.8		19.6	19.6	19.6
Effective Green, g (s)	5.7	60.8	60.8	5.7	60.8		16.0	16.0		21.5	21.5	21.5
Actuated g/C Ratio	0.05	0.51	0.51	0.05	0.51		0.13	0.13		0.18	0.18	0.18
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lane Grp Cap (vph)	163	3247	802	84	3228		236	232		301	306	284
v/s Ratio Prot	0.05	0.37		c0.06	c0.66		c0.05	0.04		0.11	c0.11	
v/s Ratio Perm			0.06									0.05
v/c Ratio	1.12	0.74	0.11	1.25	1.31		0.40	0.27		0.59	0.59	0.28
Uniform Delay, d1	57.1	23.3	15.5	57.1	29.6		47.6	46.8		45.2	45.2	42.6
Progression Factor	1.06	1.16	1.09	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	91.5	1.0	0.2	179.6	141.9		0.4	0.2		1.9	2.0	0.2
Delay (s)	152.4	28.0	17.1	236.8	171.5		48.0	47.0		47.1	47.3	42.8
Level of Service	F	C	B	F	F		D	D		D	D	D
Approach Delay (s)		35.9			173.1			47.5			44.7	
Approach LOS		D			F			D			D	

Intersection Summary

HCM Average Control Delay	111.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	850	1760	2720	20	10	1400
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	1.00	0.88
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	1770	2787
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	1770	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	895	1853	2863	21	11	1474
RTOR Reduction (vph)	0	0	0	13	0	361
Lane Group Flow (vph)	895	1853	2863	8	11	1113
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	19.0	68.0	45.0	45.0	44.0	44.0
Effective Green, g (s)	19.0	68.0	45.0	45.0	44.0	44.0
Actuated g/C Ratio	0.16	0.57	0.38	0.38	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	544	3631	2403	594	649	1022
v/s Ratio Prot	c0.26	0.29	c0.45		0.01	
v/s Ratio Perm				0.00		c0.40
v/c Ratio	1.65	0.51	1.19	0.01	0.02	1.09
Uniform Delay, d1	50.5	15.9	37.5	23.6	24.2	38.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	298.6	0.1	90.6	0.0	0.0	55.6
Delay (s)	349.1	16.0	128.1	23.6	24.2	93.6
Level of Service	F	B	F	C	C	F
Approach Delay (s)		124.5	127.3		93.1	
Approach LOS		F	F		F	

Intersection Summary

HCM Average Control Delay	119.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	95.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	1192	120	410	1561	2500	90	140	290	1200	130	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	0.97	0.86	0.88	1.00	0.95	1.00	0.94	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	1255	126	432	1643	2632	95	147	305	1263	137	63
RTOR Reduction (vph)	0	0	73	0	0	0	0	0	92	0	0	44
Lane Group Flow (vph)	42	1255	53	432	1643	2632	95	147	213	1263	137	19
Turn Type	Prot		Perm	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			Free			8			4
Actuated Green, G (s)	4.0	50.8	50.8	11.0	57.8	120.0	6.0	20.2	20.2	22.0	36.2	36.2
Effective Green, g (s)	4.0	50.8	50.8	11.0	57.8	120.0	6.0	20.2	20.2	22.0	36.2	36.2
Actuated g/C Ratio	0.03	0.42	0.42	0.09	0.48	1.00	0.05	0.17	0.17	0.18	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	114	2713	670	315	3087	2787	89	596	266	915	1068	478
v/s Ratio Prot	0.01	0.20		c0.13	0.26		0.05	0.04		c0.25	0.04	
v/s Ratio Perm			0.03			c0.94			0.13			0.01
v/c Ratio	0.37	0.46	0.08	1.37	0.53	0.94	1.07	0.25	0.80	1.38	0.13	0.04
Uniform Delay, d1	56.8	24.8	20.6	54.5	21.7	0.0	57.0	43.3	48.0	49.0	30.4	29.6
Progression Factor	1.00	1.00	1.00	1.12	0.53	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.6	0.2	173.7	0.2	3.1	114.9	0.2	15.4	178.0	0.1	0.0
Delay (s)	58.8	25.4	20.9	234.7	11.6	3.1	171.9	43.5	63.3	227.0	30.5	29.6
Level of Service	E	C	C	F	B	A	F	D	E	F	C	C
Approach Delay (s)		26.0			27.4			76.9			200.1	
Approach LOS		C			C			E			F	

Intersection Summary

HCM Average Control Delay	61.5	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	490	982	1291	200	340	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	3433	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	3433	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	516	1034	1359	211	358	432
RTOR Reduction (vph)	0	0	0	159	0	239
Lane Group Flow (vph)	516	1034	1359	52	358	193
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8	6	6
Actuated Green, G (s)	15.7	41.7	22.0	22.0	40.0	40.0
Effective Green, g (s)	15.7	41.7	22.0	22.0	40.0	40.0
Actuated g/C Ratio	0.18	0.46	0.25	0.25	0.45	0.45
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	601	2979	1572	388	1531	706
v/s Ratio Prot	c0.15	0.16	c0.21		0.10	
v/s Ratio Perm				0.03		c0.12
v/c Ratio	0.86	0.35	0.86	0.13	0.23	0.27
Uniform Delay, d1	35.9	15.3	32.4	26.4	15.4	15.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.7	0.1	5.2	0.2	0.4	1.0
Delay (s)	47.6	15.4	37.6	26.6	15.7	16.6
Level of Service	D	B	D	C	B	B
Approach Delay (s)		26.1	36.2		16.2	
Approach LOS		C	D		B	

Intersection Summary

HCM Average Control Delay	28.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	89.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↑	↱		↑↑↑↑	↱				↰	✥	↱
Volume (vph)	0	3732	1070	0	2531	900	0	0	0	171	0	830
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.86	1.00		0.86	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	0.86	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (prot)		6408	1583		6408	1583				1681	1448	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (perm)		6408	1583		6408	1583				1681	1448	1504
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	3928	1126	0	2664	947	0	0	0	180	0	874
RTOR Reduction (vph)	0	0	303	0	0	0	0	0	0	0	1	1
Lane Group Flow (vph)	0	3928	823	0	2664	947	0	0	0	162	445	445
Turn Type			Perm			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			2			Free						4
Actuated Green, G (s)		70.7	70.7		70.7	120.0				41.3	41.3	41.3
Effective Green, g (s)		70.7	70.7		70.7	120.0				41.3	41.3	41.3
Actuated g/C Ratio		0.59	0.59		0.59	1.00				0.34	0.34	0.34
Clearance Time (s)		4.0	4.0		4.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		3775	933		3775	1583				579	498	518
v/s Ratio Prot		c0.61			0.42					0.10	c0.31	
v/s Ratio Perm			0.52			0.60						0.30
v/c Ratio		1.04	0.88		0.71	0.60				0.28	0.89	0.86
Uniform Delay, d1		24.6	21.1		17.3	0.0				28.6	37.3	36.7
Progression Factor		0.53	1.52		0.64	1.00				1.00	1.00	1.00
Incremental Delay, d2		19.3	1.3		0.8	1.0				0.3	18.2	13.4
Delay (s)		32.4	33.3		11.8	1.0				28.8	55.5	50.0
Level of Service		C	C		B	A				C	E	D
Approach Delay (s)		32.6			9.0			0.0			49.1	
Approach LOS		C			A			A			D	

Intersection Summary

HCM Average Control Delay	25.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↱			↑↑↑↑	↱	↰	↰	↱↱			
Volume (vph)	0	3263	640	0	2861	136	570	0	960	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor		0.86			0.86	1.00	0.95	0.95	0.88			
Frt		0.98			1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		6250			6408	1583	1681	1681	2787			
Flt Permitted		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		6250			6408	1583	1681	1681	2787			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	3435	674	0	3012	143	600	0	1011	0	0	0
RTOR Reduction (vph)	0	29	0	0	0	56	0	0	1	0	0	0
Lane Group Flow (vph)	0	4080	0	0	3012	87	300	300	1010	0	0	0
Turn Type						Perm	Split		Perm			
Protected Phases		2			6		8	8				
Permitted Phases						6			8			
Actuated Green, G (s)		73.0			73.0	73.0	39.0	39.0	39.0			
Effective Green, g (s)		73.0			73.0	73.0	39.0	39.0	39.0			
Actuated g/C Ratio		0.61			0.61	0.61	0.32	0.32	0.32			
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)		3802			3898	963	546	546	906			
v/s Ratio Prot		c0.65			0.47		0.18	0.18				
v/s Ratio Perm						0.05			c0.36			
v/c Ratio		1.07			0.77	0.09	0.55	0.55	1.12			
Uniform Delay, d1		23.5			17.4	9.7	33.3	33.3	40.5			
Progression Factor		0.26			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		33.5			1.5	0.2	1.1	1.1	66.8			
Delay (s)		39.5			18.9	9.9	34.4	34.4	107.3			
Level of Service		D			B	A	C	C	F			
Approach Delay (s)		39.5			18.5			80.1			0.0	
Approach LOS		D			B			F			A	

Intersection Summary

HCM Average Control Delay	39.4	HCM Level of Service	D
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	98.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	493	3660	70	45	2600	30	155	40	30	275	45	242
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	1.00	0.86		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	6408	1583	1770	6397		1770	1742		1681	1708	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	6408	1583	1770	6397		1770	1742		1681	1708	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	519	3853	74	47	2737	32	163	42	32	289	47	255
RTOR Reduction (vph)	0	0	13	0	1	0	0	27	0	0	0	211
Lane Group Flow (vph)	519	3853	61	47	2768	0	163	47	0	168	168	44
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	5.0	57.3	57.3	2.4	54.7		18.3	18.3		19.0	19.0	19.0
Effective Green, g (s)	7.7	59.0	59.0	5.1	56.4		19.5	19.5		20.9	20.9	20.9
Actuated g/C Ratio	0.06	0.49	0.49	0.04	0.47		0.16	0.16		0.17	0.17	0.17
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lane Grp Cap (vph)	219	3138	775	75	2994		286	282		292	296	275
v/s Ratio Prot	c0.15	c0.60		0.03	0.43		c0.09	0.03		c0.10	0.10	
v/s Ratio Perm			0.04									0.03
v/c Ratio	2.37	1.23	0.08	0.63	0.92		0.57	0.17		0.58	0.57	0.16
Uniform Delay, d1	56.4	30.8	16.3	56.8	30.1		46.6	43.5		45.7	45.7	42.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	630.3	105.5	0.2	11.2	6.2		1.6	0.1		1.7	1.5	0.1
Delay (s)	686.7	136.3	16.5	67.9	36.3		48.2	43.6		47.4	47.1	42.4
Level of Service	F	F	B	E	D		D	D		D	D	D
Approach Delay (s)		198.6			36.8			46.8			45.2	
Approach LOS		F			D			D			D	

Intersection Summary			
HCM Average Control Delay	126.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	120.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	1350	2615	1710	10	10	965
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	1.00	0.88
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	1770	2787
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	1770	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1421	2753	1800	11	11	1016
RTOR Reduction (vph)	0	0	0	7	0	535
Lane Group Flow (vph)	1421	2753	1800	4	11	481
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	24.8	64.0	35.2	35.2	22.1	22.1
Effective Green, g (s)	24.8	64.0	35.2	35.2	22.1	22.1
Actuated g/C Ratio	0.26	0.68	0.37	0.37	0.23	0.23
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	905	4358	2397	592	416	655
v/s Ratio Prot	c0.41	0.43	c0.28		0.01	
v/s Ratio Perm				0.00		c0.17
v/c Ratio	1.57	0.63	0.75	0.01	0.03	0.73
Uniform Delay, d1	34.6	8.4	25.6	18.5	27.7	33.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	261.9	0.3	1.4	0.0	0.0	4.3
Delay (s)	296.6	8.7	27.0	18.5	27.7	37.6
Level of Service	F	A	C	B	C	D
Approach Delay (s)		106.7	26.9		37.5	
Approach LOS		F	C		D	

Intersection Summary			
HCM Average Control Delay	76.0	HCM Level of Service	E
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	94.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑↑↑	↱	↰↰	↑↑↑↑	↱↱	↰	↑↑	↱	↰↰↰	↑↑	↱
Volume (vph)	90	2302	230	370	1191	1800	170	190	500	2000	150	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	0.97	0.86	0.88	1.00	0.95	1.00	0.94	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	2423	242	389	1254	1895	179	200	526	2105	158	105
RTOR Reduction (vph)	0	0	128	0	0	0	0	0	62	0	0	71
Lane Group Flow (vph)	95	2423	114	389	1254	1895	179	200	464	2105	158	34
Turn Type	Prot		Perm	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			Free			8			4
Actuated Green, G (s)	6.9	46.6	46.6	5.0	44.7	120.0	13.0	38.4	38.4	14.0	39.4	39.4
Effective Green, g (s)	6.9	46.6	46.6	5.0	44.7	120.0	13.0	38.4	38.4	14.0	39.4	39.4
Actuated g/C Ratio	0.06	0.39	0.39	0.04	0.37	1.00	0.11	0.32	0.32	0.12	0.33	0.33
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	197	2488	615	143	2387	2787	192	1132	507	582	1162	520
v/s Ratio Prot	0.03	c0.38		c0.11	0.20		0.10	0.06		c0.42	0.04	
v/s Ratio Perm			0.07			c0.68			c0.29			0.02
v/c Ratio	0.48	0.97	0.19	2.72	0.53	0.68	0.93	0.18	0.92	3.62	0.14	0.07
Uniform Delay, d1	54.8	36.1	24.2	57.5	29.4	0.0	53.1	29.4	39.2	53.0	28.3	27.7
Progression Factor	1.00	1.00	1.00	0.98	1.30	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	12.9	0.7	787.2	0.6	0.9	45.8	0.1	21.1	1181.8	0.1	0.1
Delay (s)	56.7	49.0	24.9	843.4	38.7	0.9	98.9	29.5	60.4	1234.8	28.4	27.7
Level of Service	E	D	C	F	D	A	F	C	E	F	C	C
Approach Delay (s)		47.1			106.9			61.2			1100.8	
Approach LOS		D			F			E			F	

Intersection Summary

HCM Average Control Delay	331.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	112.4%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	530	1702	901	250	870	610
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	3433	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	3433	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	558	1792	948	263	916	642
RTOR Reduction (vph)	0	0	0	204	0	251
Lane Group Flow (vph)	558	1792	948	59	916	391
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8	6	6
Actuated Green, G (s)	15.9	39.4	19.5	19.5	40.0	40.0
Effective Green, g (s)	15.9	39.4	19.5	19.5	40.0	40.0
Actuated g/C Ratio	0.18	0.45	0.22	0.22	0.46	0.46
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	625	2889	1430	353	1571	724
v/s Ratio Prot	c0.16	c0.28	0.15		c0.27	
v/s Ratio Perm				0.04		0.25
v/c Ratio	0.89	0.62	0.66	0.17	0.58	0.54
Uniform Delay, d1	34.9	18.3	31.0	27.4	17.5	17.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.1	0.4	1.2	0.2	1.6	2.9
Delay (s)	50.0	18.7	32.1	27.6	19.1	20.0
Level of Service	D	B	C	C	B	B
Approach Delay (s)		26.1	31.1		19.5	
Approach LOS		C	C		B	

Intersection Summary

HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	87.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↑	↱		↑↑↑↑	↱				↰	✣	↱
Volume (vph)	0	2228	460	0	3714	1061	0	0	0	86	0	760
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.86	1.00		0.86	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	0.85	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (prot)		6408	1583		6408	1583				1681	1445	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (perm)		6408	1583		6408	1583				1681	1445	1504
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	2345	484	0	3909	1117	0	0	0	91	0	800
RTOR Reduction (vph)	0	0	188	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	2345	296	0	3909	1117	0	0	0	82	401	408
Turn Type			Perm			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			2			Free						4
Actuated Green, G (s)		73.5	73.5		73.5	120.0				38.5	38.5	38.5
Effective Green, g (s)		73.5	73.5		73.5	120.0				38.5	38.5	38.5
Actuated g/C Ratio		0.61	0.61		0.61	1.00				0.32	0.32	0.32
Clearance Time (s)		4.0	4.0		4.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		3925	970		3925	1583				539	464	483
v/s Ratio Prot		0.37			c0.61					0.05	c0.28	
v/s Ratio Perm			0.19			0.71						0.27
v/c Ratio		0.60	0.31		1.00	0.71				0.15	0.86	0.84
Uniform Delay, d1		14.2	11.1		23.1	0.0				29.1	38.3	38.0
Progression Factor		0.91	3.92		0.91	1.00				1.00	1.00	1.00
Incremental Delay, d2		0.3	0.3		6.3	0.2				0.1	15.3	12.8
Delay (s)		13.2	43.8		27.3	0.2				29.2	53.6	50.7
Level of Service		B	D		C	A				C	D	D
Approach Delay (s)		18.4			21.3			0.0			50.0	
Approach LOS		B			C			A			D	

Intersection Summary			
HCM Average Control Delay	23.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1744	570	0	3915	473	860	0	841	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor		0.86			0.86	1.00	0.95	0.95	0.88			
Frt		0.96			1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		6171			6408	1583	1681	1681	2787			
Flt Permitted		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		6171			6408	1583	1681	1681	2787			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1836	600	0	4121	498	905	0	885	0	0	0
RTOR Reduction (vph)	0	49	0	0	0	183	0	0	26	0	0	0
Lane Group Flow (vph)	0	2387	0	0	4121	315	452	453	859	0	0	0
Turn Type						Perm	Split		Perm			
Protected Phases		2			6		8	8				
Permitted Phases						6			8			
Actuated Green, G (s)		76.0			76.0	76.0	36.0	36.0	36.0			
Effective Green, g (s)		76.0			76.0	76.0	36.0	36.0	36.0			
Actuated g/C Ratio		0.63			0.63	0.63	0.30	0.30	0.30			
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)		3908			4058	1003	504	504	836			
v/s Ratio Prot		0.39			c0.64		0.27	0.27				
v/s Ratio Perm						0.20			c0.31			
v/c Ratio		0.61			1.02	0.31	0.90	0.90	1.03			
Uniform Delay, d1		13.2			22.0	10.1	40.2	40.3	42.0			
Progression Factor		0.19			1.45	11.97	1.00	1.00	1.00			
Incremental Delay, d2		0.6			9.0	0.1	18.3	18.6	38.4			
Delay (s)		3.1			41.0	120.7	58.6	58.8	80.4			
Level of Service		A			D	F	E	E	F			
Approach Delay (s)		3.1			49.6			69.4			0.0	
Approach LOS		A			D			E			A	

Intersection Summary

HCM Average Control Delay	40.8	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	185	2280	120	100	3870	152	90	50	40	291	50	428
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	1.00	0.86		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.93		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	6408	1583	1770	6372		1770	1739		1681	1709	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	6408	1583	1770	6372		1770	1739		1681	1709	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	195	2400	126	105	4074	160	95	53	42	306	53	451
RTOR Reduction (vph)	0	0	35	0	2	0	0	31	0	0	0	370
Lane Group Flow (vph)	195	2400	91	105	4232	0	95	64	0	177	182	81
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	3.0	59.1	59.1	3.0	59.1		14.8	14.8		19.6	19.6	19.6
Effective Green, g (s)	5.7	60.8	60.8	5.7	60.8		16.0	16.0		21.5	21.5	21.5
Actuated g/C Ratio	0.05	0.51	0.51	0.05	0.51		0.13	0.13		0.18	0.18	0.18
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lane Grp Cap (vph)	163	3247	802	84	3228		236	232		301	306	284
v/s Ratio Prot	0.06	0.37		c0.06	c0.66		c0.05	0.04		0.11	c0.11	
v/s Ratio Perm			0.06									0.05
v/c Ratio	1.20	0.74	0.11	1.25	1.31		0.40	0.27		0.59	0.59	0.28
Uniform Delay, d1	57.1	23.3	15.5	57.1	29.6		47.6	46.8		45.2	45.2	42.6
Progression Factor	1.06	1.15	1.09	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	120.1	1.0	0.2	179.6	142.2		0.4	0.2		1.9	2.1	0.2
Delay (s)	180.9	28.0	17.2	236.8	171.8		48.0	47.0		47.1	47.3	42.8
Level of Service	F	C	B	F	F		D	D		D	D	D
Approach Delay (s)		38.4			173.4			47.5			44.7	
Approach LOS		D			F			D			D	

Intersection Summary

HCM Average Control Delay	111.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	100.2%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	851	1760	2721	20	10	1401
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	1.00	0.88
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	1770	2787
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	1770	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	896	1853	2864	21	11	1475
RTOR Reduction (vph)	0	0	0	13	0	361
Lane Group Flow (vph)	896	1853	2864	8	11	1114
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	19.0	68.0	45.0	45.0	44.0	44.0
Effective Green, g (s)	19.0	68.0	45.0	45.0	44.0	44.0
Actuated g/C Ratio	0.16	0.57	0.38	0.38	0.37	0.37
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	544	3631	2403	594	649	1022
v/s Ratio Prot	c0.26	0.29	c0.45		0.01	
v/s Ratio Perm				0.00		c0.40
v/c Ratio	1.65	0.51	1.19	0.01	0.02	1.09
Uniform Delay, d1	50.5	15.9	37.5	23.6	24.2	38.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	299.4	0.1	90.8	0.0	0.0	55.9
Delay (s)	349.9	16.0	128.3	23.6	24.2	93.9
Level of Service	F	B	F	C	C	F
Approach Delay (s)		124.8	127.5		93.4	
Approach LOS		F	F		F	

Intersection Summary			
HCM Average Control Delay	119.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	95.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	1196	120	410	1563	2501	90	140	290	1202	130	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	0.97	0.86	0.88	1.00	0.95	1.00	0.94	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	42	1259	126	432	1645	2633	95	147	305	1265	137	63
RTOR Reduction (vph)	0	0	73	0	0	0	0	0	91	0	0	44
Lane Group Flow (vph)	42	1259	53	432	1645	2633	95	147	214	1265	137	19
Turn Type	Prot		Perm	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			Free			8			4
Actuated Green, G (s)	4.0	50.7	50.7	11.0	57.7	120.0	6.0	20.3	20.3	22.0	36.3	36.3
Effective Green, g (s)	4.0	50.7	50.7	11.0	57.7	120.0	6.0	20.3	20.3	22.0	36.3	36.3
Actuated g/C Ratio	0.03	0.42	0.42	0.09	0.48	1.00	0.05	0.17	0.17	0.18	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	114	2707	669	315	3081	2787	89	599	268	915	1071	479
v/s Ratio Prot	0.01	0.20		c0.13	0.26		0.05	0.04		c0.25	0.04	
v/s Ratio Perm			0.03			c0.94			0.13			0.01
v/c Ratio	0.37	0.47	0.08	1.37	0.53	0.94	1.07	0.25	0.80	1.38	0.13	0.04
Uniform Delay, d1	56.8	24.9	20.7	54.5	21.8	0.0	57.0	43.2	47.9	49.0	30.4	29.5
Progression Factor	1.00	1.00	1.00	1.12	0.53	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.6	0.2	173.7	0.2	3.2	114.9	0.2	15.1	179.0	0.1	0.0
Delay (s)	58.8	25.5	20.9	234.6	11.7	3.2	171.9	43.4	62.9	228.0	30.4	29.6
Level of Service	E	C	C	F	B	A	F	D	E	F	C	C
Approach Delay (s)		26.1			27.4			76.6			201.0	
Approach LOS		C			C			E			F	

Intersection Summary

HCM Average Control Delay	61.7	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	4.0
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	490	986	1293	200	340	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	3433	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	3433	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	516	1038	1361	211	358	432
RTOR Reduction (vph)	0	0	0	159	0	239
Lane Group Flow (vph)	516	1038	1361	52	358	193
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8	6	6
Actuated Green, G (s)	15.7	41.7	22.0	22.0	40.0	40.0
Effective Green, g (s)	15.7	41.7	22.0	22.0	40.0	40.0
Actuated g/C Ratio	0.18	0.46	0.25	0.25	0.45	0.45
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	601	2979	1572	388	1531	706
v/s Ratio Prot	c0.15	0.16	c0.21		0.10	
v/s Ratio Perm				0.03		c0.12
v/c Ratio	0.86	0.35	0.87	0.13	0.23	0.27
Uniform Delay, d1	35.9	15.3	32.4	26.4	15.4	15.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.7	0.1	5.3	0.2	0.4	1.0
Delay (s)	47.6	15.4	37.7	26.6	15.7	16.6
Level of Service	D	B	D	C	B	B
Approach Delay (s)		26.1	36.2		16.2	
Approach LOS		C	D		B	

Intersection Summary

HCM Average Control Delay	28.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	89.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑↑↑	↱		↑↑↑↑	↱				↰	↔	↱
Volume (vph)	0	3738	1070	0	2535	901	0	0	0	176	0	830
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0				4.0	4.0	4.0
Lane Util. Factor		0.86	1.00		0.86	1.00				0.95	0.91	0.95
Frt		1.00	0.85		1.00	0.85				1.00	0.86	0.85
Flt Protected		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (prot)		6408	1583		6408	1583				1681	1449	1504
Flt Permitted		1.00	1.00		1.00	1.00				0.95	1.00	1.00
Satd. Flow (perm)		6408	1583		6408	1583				1681	1449	1504
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	3935	1126	0	2668	948	0	0	0	185	0	874
RTOR Reduction (vph)	0	0	303	0	0	0	0	0	0	0	1	1
Lane Group Flow (vph)	0	3935	823	0	2668	948	0	0	0	166	446	445
Turn Type			Perm			Free				Split		Perm
Protected Phases		2			6					4	4	
Permitted Phases			2			Free						4
Actuated Green, G (s)		70.6	70.6		70.6	120.0				41.4	41.4	41.4
Effective Green, g (s)		70.6	70.6		70.6	120.0				41.4	41.4	41.4
Actuated g/C Ratio		0.59	0.59		0.59	1.00				0.34	0.34	0.34
Clearance Time (s)		4.0	4.0		4.0					4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		3770	931		3770	1583				580	500	519
v/s Ratio Prot		c0.61			0.42					0.10	c0.31	
v/s Ratio Perm			0.52			0.60						0.30
v/c Ratio		1.04	0.88		0.71	0.60				0.29	0.89	0.86
Uniform Delay, d1		24.7	21.2		17.4	0.0				28.6	37.2	36.6
Progression Factor		0.53	1.51		0.64	1.00				1.00	1.00	1.00
Incremental Delay, d2		20.7	1.3		0.8	1.0				0.3	18.0	13.2
Delay (s)		33.8	33.3		11.9	1.0				28.8	55.2	49.8
Level of Service		C	C		B	A				C	E	D
Approach Delay (s)		33.7			9.0			0.0			48.8	
Approach LOS		C			A			A			D	

Intersection Summary

HCM Average Control Delay	26.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	3274	640	0	2866	138	570	0	961	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor		0.86			0.86	1.00	0.95	0.95	0.88			
Frt		0.98			1.00	0.85	1.00	1.00	0.85			
Flt Protected		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (prot)		6251			6408	1583	1681	1681	2787			
Flt Permitted		1.00			1.00	1.00	0.95	0.95	1.00			
Satd. Flow (perm)		6251			6408	1583	1681	1681	2787			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	3446	674	0	3017	145	600	0	1012	0	0	0
RTOR Reduction (vph)	0	29	0	0	0	57	0	0	1	0	0	0
Lane Group Flow (vph)	0	4091	0	0	3017	88	300	300	1011	0	0	0
Turn Type						Perm	Split		Perm			
Protected Phases		2			6		8	8				
Permitted Phases						6			8			
Actuated Green, G (s)		73.0			73.0	73.0	39.0	39.0	39.0			
Effective Green, g (s)		73.0			73.0	73.0	39.0	39.0	39.0			
Actuated g/C Ratio		0.61			0.61	0.61	0.32	0.32	0.32			
Clearance Time (s)		4.0			4.0	4.0	4.0	4.0	4.0			
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0			
Lane Grp Cap (vph)		3803			3898	963	546	546	906			
v/s Ratio Prot		c0.65			0.47		0.18	0.18				
v/s Ratio Perm						0.06			c0.36			
v/c Ratio		1.08			0.77	0.09	0.55	0.55	1.12			
Uniform Delay, d1		23.5			17.4	9.7	33.3	33.3	40.5			
Progression Factor		0.26			1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2		34.6			1.6	0.2	1.1	1.1	67.2			
Delay (s)		40.6			19.0	9.9	34.4	34.4	107.7			
Level of Service		D			B	A	C	C	F			
Approach Delay (s)		40.6			18.5			80.4			0.0	
Approach LOS		D			B			F			A	

Intersection Summary

HCM Average Control Delay	40.0	HCM Level of Service	D
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	98.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	505	3660	70	45	2600	32	155	40	30	276	45	249
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	1.00	0.86		1.00	1.00		0.95	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.94		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (prot)	3433	6408	1583	1770	6396		1770	1742		1681	1708	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	0.97	1.00
Satd. Flow (perm)	3433	6408	1583	1770	6396		1770	1742		1681	1708	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	532	3853	74	47	2737	34	163	42	32	291	47	262
RTOR Reduction (vph)	0	0	13	0	1	0	0	27	0	0	0	216
Lane Group Flow (vph)	532	3853	61	47	2770	0	163	47	0	169	169	46
Turn Type	Prot		Perm	Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases			6									3
Actuated Green, G (s)	5.0	57.2	57.2	2.4	54.6		18.3	18.3		19.1	19.1	19.1
Effective Green, g (s)	7.7	58.9	58.9	5.1	56.3		19.5	19.5		21.0	21.0	21.0
Actuated g/C Ratio	0.06	0.49	0.49	0.04	0.47		0.16	0.16		0.17	0.17	0.17
Clearance Time (s)	6.7	5.7	5.7	6.7	5.7		5.2	5.2		5.9	5.9	5.9
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lane Grp Cap (vph)	219	3132	774	75	2988		286	282		293	298	276
v/s Ratio Prot	c0.15	c0.60		0.03	0.43		c0.09	0.03		c0.10	0.10	
v/s Ratio Perm			0.04									0.03
v/c Ratio	2.43	1.23	0.08	0.63	0.93		0.57	0.17		0.58	0.57	0.17
Uniform Delay, d1	56.4	30.8	16.4	56.8	30.2		46.6	43.5		45.7	45.6	42.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	656.8	106.6	0.2	11.2	6.4		1.6	0.1		1.7	1.5	0.1
Delay (s)	713.2	137.4	16.6	67.9	36.6		48.2	43.6		47.4	47.1	42.4
Level of Service	F	F	B	E	D		D	D		D	D	D
Approach Delay (s)		204.1			37.1			46.8			45.1	
Approach LOS		F			D			D			D	

Intersection Summary

HCM Average Control Delay	129.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	120.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	81.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	1351	2615	1711	10	10	966
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	1.00	0.88
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	1770	2787
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	1770	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1422	2753	1801	11	11	1017
RTOR Reduction (vph)	0	0	0	7	0	534
Lane Group Flow (vph)	1422	2753	1801	4	11	483
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8		6
Actuated Green, G (s)	24.8	64.0	35.2	35.2	22.2	22.2
Effective Green, g (s)	24.8	64.0	35.2	35.2	22.2	22.2
Actuated g/C Ratio	0.26	0.68	0.37	0.37	0.24	0.24
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	904	4354	2394	592	417	657
v/s Ratio Prot	c0.41	0.43	c0.28		0.01	
v/s Ratio Perm				0.00		c0.17
v/c Ratio	1.57	0.63	0.75	0.01	0.03	0.73
Uniform Delay, d1	34.7	8.5	25.7	18.5	27.7	33.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	263.2	0.3	1.4	0.0	0.0	4.3
Delay (s)	297.9	8.8	27.1	18.5	27.7	37.5
Level of Service	F	A	C	B	C	D
Approach Delay (s)		107.3	27.0		37.4	
Approach LOS		F	C		D	

Intersection Summary

HCM Average Control Delay	76.3	HCM Level of Service	E
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	94.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	2306	230	370	1194	1801	170	190	500	2002	150	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	1.00	0.97	0.86	0.88	1.00	0.95	1.00	0.94	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	6408	1583	3433	6408	2787	1770	3539	1583	4990	3539	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	2427	242	389	1257	1896	179	200	526	2107	158	105
RTOR Reduction (vph)	0	0	127	0	0	0	0	0	62	0	0	71
Lane Group Flow (vph)	95	2427	115	389	1257	1896	179	200	464	2107	158	34
Turn Type	Prot		Perm	Prot		Free	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			Free			8			4
Actuated Green, G (s)	6.9	46.6	46.6	5.0	44.7	120.0	13.0	38.4	38.4	14.0	39.4	39.4
Effective Green, g (s)	6.9	46.6	46.6	5.0	44.7	120.0	13.0	38.4	38.4	14.0	39.4	39.4
Actuated g/C Ratio	0.06	0.39	0.39	0.04	0.37	1.00	0.11	0.32	0.32	0.12	0.33	0.33
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	197	2488	615	143	2387	2787	192	1132	507	582	1162	520
v/s Ratio Prot	0.03	c0.38		c0.11	0.20		0.10	0.06		c0.42	0.04	
v/s Ratio Perm			0.07			c0.68			c0.29			0.02
v/c Ratio	0.48	0.98	0.19	2.72	0.53	0.68	0.93	0.18	0.92	3.62	0.14	0.07
Uniform Delay, d1	54.8	36.1	24.2	57.5	29.4	0.0	53.1	29.4	39.2	53.0	28.3	27.7
Progression Factor	1.00	1.00	1.00	0.98	1.30	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	13.1	0.7	787.1	0.6	0.9	45.8	0.1	21.1	1183.4	0.1	0.1
Delay (s)	56.7	49.3	24.9	843.4	38.8	0.9	98.9	29.5	60.4	1236.4	28.4	27.7
Level of Service	E	D	C	F	D	A	F	C	E	F	C	C
Approach Delay (s)		47.4			106.9			61.2			1102.3	
Approach LOS		D			F			E			F	

Intersection Summary

HCM Average Control Delay	331.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	112.5%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	530	1706	904	250	870	610
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.86	0.86	1.00	0.97	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	6408	6408	1583	3433	1583
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	6408	6408	1583	3433	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	558	1796	952	263	916	642
RTOR Reduction (vph)	0	0	0	204	0	251
Lane Group Flow (vph)	558	1796	952	59	916	391
Turn Type	Prot			Perm		Perm
Protected Phases	7	4	8		6	
Permitted Phases				8	6	6
Actuated Green, G (s)	15.9	39.5	19.6	19.6	40.0	40.0
Effective Green, g (s)	15.9	39.5	19.6	19.6	40.0	40.0
Actuated g/C Ratio	0.18	0.45	0.22	0.22	0.46	0.46
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	624	2893	1435	355	1569	724
v/s Ratio Prot	c0.16	c0.28	0.15		c0.27	
v/s Ratio Perm				0.04		0.25
v/c Ratio	0.89	0.62	0.66	0.17	0.58	0.54
Uniform Delay, d1	35.0	18.3	30.9	27.4	17.6	17.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.2	0.4	1.2	0.2	1.6	2.9
Delay (s)	50.2	18.7	32.1	27.6	19.2	20.0
Level of Service	D	B	C	C	B	C
Approach Delay (s)		26.2	31.1		19.5	
Approach LOS		C	C		B	

Intersection Summary			
HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	87.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Cumulative Plus Project Trip Generation Tables

TABLE 1
CUMULATIVE PLUS PROJECT WITHOUT EXPANSION TRIP GENERATION – SITE A

Vehicle Types	PCE Ratio[1]	Daily			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
E-Trans Buses	1.5	201	225	426	24	2	26	24	4	28
Private Vehicles	1.0	122	104	226	0	9	9	1	10	11
Total	-	323	329	652	24	11	35	25	14	39

Notes: [1] PCE = Passenger Car Equivalent.
Source: Fehr & Peers, 2010.

TABLE 2
CUMULATIVE PLUS PROJECT WITH EXPANSION TRIP GENERATION – SITE A

Vehicle Types	PCE Ratio[1]	Daily			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
E-Trans Buses	1.5	353	393	746	43	4	47	43	6	49
Private Vehicles	1.0	213	183	396	0	15	15	2	17	19
Total	-	565	576	1142	43	19	62	45	24	69

Notes: [1] PCE = Passenger Car Equivalent.
Source: Fehr & Peers, 2010.

TABLE 3
CUMULATIVE PLUS PROJECT WITHOUT EXPANSION TRIP GENERATION – SITES B & C

Vehicle Types	PCE Ratio[1]	Daily			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
E-Trans Buses	1.5	37	42	79	4	0	4	4	1	5
Private Vehicles	1.0	23	19	42	0	2	2	0	2	2
Total	-	60	61	121	4	2	6	4	3	7

Notes: [1] PCE = Passenger Car Equivalent.
Source: Fehr & Peers, 2010.

TABLE 4
CUMULATIVE PLUS PROJECT WITH EXPANSION TRIP GENERATION – SITES B & C

Vehicle Types	PCE Ratio[1]	Daily			AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
E-Trans Buses	1.5	189	210	399	23	2	25	23	3	26
Private Vehicles	1.0	114	98	212	0	8	8	1	9	10
Total	-	302	308	611	23	10	33	24	13	37

Notes: [1] PCE = Passenger Car Equivalent.
Source: Fehr & Peers, 2010.

HCM 2000
Basic Freeway Segments
Capacity Analysis

Jurisdiction Caltrans
Analysis Year C+P Without Expansion
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Corp Yard

General Information | *Flow Rate Calculation*

	Freeway/ Direction	From/To	Analysis Time Period	Volume (vph)	PHF	Lanes	HOV Lane?	HOV Lane Volume	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcphpl)
1	SR 99 NB	Grant Line Road Loop On to Slip On	AM	2,800	0.92	3	No		Level			10.0%	0.0%	1.5	1.2	0.95	1.00	1,065
2	SR 99 NB	Grant Line Road Loop On to Slip On	PM	2,790	0.92	3	No		Level			10.0%	0.0%	1.5	1.2	0.95	1.00	1,061
3	SR 99 SB	Grant Line Road Loop On to Slip On	AM	2,930	0.92	3	No		Level			10.0%	0.0%	1.5	1.2	0.95	1.00	1,115
4	SR 99 SB	Grant Line Road Loop On to Slip On	PM	3,570	0.92	3	No		Level			10.0%	0.0%	1.5	1.2	0.95	1.00	1,358

HCM 2000
Basic Freeway Segments
Capacity Analysis

	General Information		*Speed Calculation*												*Results*	
	Freeway/ Direction	From/To	BFFS (mph)	Lane Width (ft)	f_{LW}	R. Shoulder Width (ft)	f_{LC}	f_N	IC Density (per mi)	f_{ID}	Calculated FFS (mph)	Measured FFS (mph)	FFS (mph)	S (mph)	Density, D (pcplpm)	Level of Service
1	SR 99 NB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	70.0	63.0	63.0	**16.9**	**B**
2	SR 99 NB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	70.0	63.0	63.0	**16.8**	**B**
3	SR 99 SB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	70.0	63.0	63.0	**17.7**	**B**
4	SR 99 SB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	70.0	63.0	63.0	**21.6**	**C**

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction Caltrans
Analysis Year C+P Without Expansion
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Corp Yard

General Information / *Freeway Data* / *Freeway Volume Adjustment*

	Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S_{FF} (mph)	V (vph)	HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	AM	3	65.0	2,800	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	3,196
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	AM	3	65.0	2,930	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	3,344
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	PM	3	65.0	2,790	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	3,184
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	PM	3	65.0	3,570	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,074

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*On-Ramp Data*							*On-Ramp Volume Adjustment*										
	Freeway/ Direction	On-ramp	Type	Lanes	S_{FR} (mph)	V_R (vph)	Accel Lane (ft) L_{A1}	L_{A2}	L_{Aeff}	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	Right	1	35.0	471	450		450	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	525
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	Right	1	45.0	460	450		450	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	513
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	Right	1	45.0	136	450		450	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	152
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	Right	1	45.0	1,070	450		450	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	1,192

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Upstream Ramp Data*															
	Freeway Direction	On-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Grade %	Length (mi)	Truck Bus %	RV %	Grade E_T	E_R	E	E_R	f_{HV}	f_p	Flow Rate v_2 (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No															
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No															
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No															
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No															

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information — *Adjacent Downstream Ramp Data* — *v_{12} Estimation*

	Freeway/ Direction	On-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	Grade E_T	Grade E_R	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)	L_{EQ} 25-2	L_{EQ} 25-3	P_{FM} Equations 1	P_{FM} Equations 2	P_{FM} Equations 3	P_{FM}	v_{12} (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No																		0.590			0.590	1,886
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No																		0.590			0.590	1,973
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No																		0.590			0.590	1,879
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No																		0.590			0.590	2,404

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Capacity Checks*																
	Freeway/ Direction	On-ramp	v_{FI} (pcph)	Max v_{FI} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	V_3, V_{av34} (pcphpl)	V_3, V_{av34} > 2,700?	V_3, V_{av34} >1.5*v_{12}/2?	v_{12a} (pcph)	v_{R12a} (pcph)	Max v_{R12a} (pcph)	LOS F?	v_R (pcph)	Max v_R (pcph)	LOS F?
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	3,196	7,200	No	3,720	7,200	No	1,310	No	No	1,886	2,411	4,600	No	525	2,000	No
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	3,344	7,200	No	3,857	7,200	No	1,371	No	No	1,973	2,486	4,600	No	513	2,100	No
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	3,184	7,200	No	3,336	7,200	No	1,305	No	No	1,879	2,031	4,600	No	152	2,100	No
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	4,074	7,200	No	5,267	7,200	No	1,670	No	No	2,404	3,596	4,600	No	1,192	2,100	No

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Results*		*Speed Estimation*			
	Freeway/ Direction	On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M_S	Inf. Area S_R (mph)	Out Lns. S_O (mph)	All vehs. S (mph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	**21.2**	**C**	0.333	57.3	62.1	58.9
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	**21.8**	**C**	0.327	57.5	61.9	59.0
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	**18.4**	**B**	0.310	57.9	62.1	59.5
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	**30.2**	**D**	0.423	55.3	60.8	56.9

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction: Caltrans
Analysis Year: C+P Without Expansion
Analyst: Fehr & Peers

Agency or Company: City of Elk Grove
Date: 4/26/2010
Project Description: Elk Grove Corp Yard

	General Information			*Freeway Data*					*Freeway Volume Adjustment*									
	Freeway/ Direction	Off-ramp	Analysis Time Period	Lanes	S_{FF} (mph)	V (vph)	HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P
1	SR 99 NB	Off-Ramp to Grant Line Road	AM	2	65.0	3,930	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00
2	SR 99 SB	Off-Ramp to Grant Line Road	AM	2	65.0	2,710	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00
3	SR 99 NB	Off-Ramp to Grant Line Road	PM	2	65.0	3,680	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00
4	SR 99 SB	Off-Ramp to Grant Line Road	PM	2	65.0	2,770	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information			Effective	*Off-Ramp Data*							*Off-Ramp Volume Adjustment*										
	Freeway/ Direction	Off-ramp	Flow Rate v_p (pcph)	Flow Rate v_p (pcph)	Type	Lanes	S_{FR} (mph)	V_R (vph)	Decel Lane (ft) L_{D1}	L_{D2}	L_{Deff}	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	4,485	4,485	Major	2	45.0	1,700	0	1,500	1,500	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	1,894
2	SR 99 SB	Off-Ramp to Grant Line Road	3,093	3,093	Major	2	45.0	841	0	1,500	1,500	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	937
3	SR 99 NB	Off-Ramp to Grant Line Road	4,200	4,200	Major	2	45.0	1,530	0	1,500	1,500	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	1,705
4	SR 99 SB	Off-Ramp to Grant Line Road	3,161	3,161	Major	2	45.0	1,001	0	1,500	1,500	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	1,115

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			*Adjacent Upstream Ramp Data*																
	Freeway/ Direction	Off-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	Grade E_T	Grade E_R	E_T	E_R	f_{HV}	f_P	Flow Rate v_u (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	No															
2	SR 99 SB	Off-Ramp to Grant Line Road	No															
3	SR 99 NB	Off-Ramp to Grant Line Road	No															
4	SR 99 SB	Off-Ramp to Grant Line Road	No															

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Downstream Ramp Data*																*v_{12} Estimation*						
	Freeway/ Direction	Off-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	Grade E_T	Grade E_R	E_T	E_R	f_{HV}	f_P	Flow Rate v_D (pcph)	L_{LO} 25-13	L_{LO} 25-14	P_{FD} Equations 5	P_{FD} Equations 6	P_{FD} Equations 7	P_{FD}	v_{12} (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	No																						
2	SR 99 SB	Off-Ramp to Grant Line Road	No																						
3	SR 99 NB	Off-Ramp to Grant Line Road	No																						
4	SR 99 SB	Off-Ramp to Grant Line Road	No																						

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information / *Capacity Checks*

	Freeway/ Direction	Off-ramp	v_{Fi} (pcph)	Max v_{Fi} (pcph)	LOS F?	v_3, v_{av34} (pcphpl)	v_3, v_{av34} > 2,700?	v_3, v_{av34} >1.5*v_{12}/2?	v_{12a} (pcph)	Max v_{12} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	v_R (pcph)	Max v_R (pcph)	LOS F?
1	SR 99 NB	Off-Ramp to Grant Line Road	4,485	4,800	No	0	No	No	4,485	4,400	Yes	2,591	4,800	No	1,894	4,100	No
2	SR 99 SB	Off-Ramp to Grant Line Road	3,093	4,800	No	0	No	No	3,093	4,400	No	2,156	4,800	No	937	4,100	No
3	SR 99 NB	Off-Ramp to Grant Line Road	4,200	4,800	No	0	No	No	4,200	4,400	No	2,495	4,800	No	1,705	4,100	No
4	SR 99 SB	Off-Ramp to Grant Line Road	3,161	4,800	No	0	No	No	3,161	4,400	No	2,046	4,800	No	1,115	4,100	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			*Results*		*Speed Estimation*			
	Freeway/ Direction	Off-ramp	Density, D (pcplpm)	Level of Service	Int. Var. D_S	Inf. Area S_R (mph)	Out Lns. S_O (mph)	All vehs. S (mph)
1	SR 99 NB	Off-Ramp to Grant Line Road	**24.4**	**C**	0.468	54.2	0.0	54.2
2	SR 99 SB	Off-Ramp to Grant Line Road	**16.9**	**B**	0.382	56.2	0.0	56.2
3	SR 99 NB	Off-Ramp to Grant Line Road	**22.9**	**C**	0.451	54.6	0.0	54.6
4	SR 99 SB	Off-Ramp to Grant Line Road	**17.2**	**B**	0.398	55.8	0.0	55.8

HCM 2000
Basic Freeway Segments
Capacity Analysis

Jurisdiction
Analysis Year C+P With Exp
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Corp Yard

General Information / *Flow Rate Calculation*

	Freeway/ Direction	From/To	Analysis Time Period	Volume (vph)	PHF	Lanes	HOV Lane?	HOV Lane Volume	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcphpl)
1	SR 99 NB	Grant Line Road Loop On to Slip On	AM	2,800	0.92	3	No		Level			10.0%	0.0%	1.5	1.2	0.95	1.00	1,065
2	SR 99 NB	Grant Line Road Loop On to Slip On	PM	2,790	0.92	3	No		Level			10.0%	0.0%	1.5	1.2	0.95	1.00	1,061
3	SR 99 SB	Grant Line Road Loop On to Slip On	AM	2,931	0.92	3	No		Level			10.0%	0.0%	1.5	1.2	0.95	1.00	1,115
4	SR 99 SB	Grant Line Road Loop On to Slip On	PM	3,571	0.92	3	No		Level			10.0%	0.0%	1.5	1.2	0.95	1.00	1,359

HCM 2000
Basic Freeway Segments
Capacity Analysis

	General Information		*Speed Calculation*												*Results*	
	Freeway/ Direction	From/To	BFFS (mph)	Lane Width (ft)	f_{LW}	R. Shoulder Width (ft)	f_{LC}	f_N	IC Density (per mi)	f_{ID}	Calculated FFS (mph)	Measured FFS (mph)	FFS (mph)	S (mph)	Density, D (pcplpm)	Level of Service
1	SR 99 NB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	**70.0**	63.0	63.0	**16.9**	**B**
2	SR 99 NB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	**70.0**	63.0	63.0	**16.8**	**B**
3	SR 99 SB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	**70.0**	63.0	63.0	**17.7**	**B**
4	SR 99 SB	Grant Line Road Loop On to Slip On	65	12	0	6	0	3	0.3	-1	63.0	**70.0**	63.0	63.0	**21.6**	**C**

HCM 2000
Merge Ramp Junctions
Capacity Analysis

Jurisdiction 0
Analysis Year C+P With Exp
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Corp Yard

General Information / *Freeway Data* / *Freeway Volume Adjustment*

	Freeway/ Direction	On-ramp	Analysis Time Period	Lanes	S_{FF} (mph)	V (vph)	HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	AM	3	65.0	2,800	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	3,196
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	AM	3	65.0	2,931	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	3,345
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	PM	3	65.0	2,790	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	3,184
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	PM	3	65.0	3,571	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00	4,076

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*On-Ramp Data*							*On-Ramp Volume Adjustment*											
	Freeway/ Direction	On-ramp	Type	Lanes	S_{FR} (mph)	V_R (vph)	Accel Lane (ft) L_{A1}	L_{A2}	L_{Aeff}	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	Right	1	35.0	473	450		450	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	527
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	Right	1	45.0	460	450		450	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	513
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	Right	1	45.0	138	450		450	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	154
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	Right	1	45.0	1,070	450		450	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	1,192

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Upstream Ramp Data*															
	Freeway Direction	On-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Grade %	Length (mi)	Truck Bus %	RV %	Grade E_T	E_R	E_T	E_R	f_{HV}	f_p	Flow Rate v_u (pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No															
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No															
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No															
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No															

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Downstream Ramp Data*																*v_{12} Estimation*						
	Freeway/				Volume			Grade	Length	Truck/		Grade						Flow Rate	L_{EQ}		P_{FM} Equations				v_{12}
	Direction	On-ramp	Exists?	Distance	(vph)	PHF	Terrain	%	(mi)	Bus %	RV %	E_T	E_R	E_T	E_R	f_{HV}	f_p	v_p (pcph)	25-2	25-3	1	2	3	P_{FM}	(pcph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No																		0.590			0.590	1,886
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No																		0.590			0.590	1,974
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	No																		0.590			0.590	1,879
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	No																		0.590			0.590	2,405

HCM 2000
Merge Ramp Junctions
Capacity Analysis

	General Information		*Capacity Checks*															
	Freeway/ Direction	On-ramp	v_{FI} (pcph)	Max v_{FI} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	v_3, v_{av34} (pcphpl)	v_3, v_{av34} > 2,700?	v_3, v_{av34} >1.5*v_{12}/2?	v_{12a} (pcph)	v_{R12a} (pcph)	Max v_{R12a} (pcph)	LOS F?	v_R (pcph)	Max v_R (pcph)	LOS F?
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	3,196	7,200	No	3,723	7,200	No	1,310	No	No	1,886	2,413	4,600	No	527	2,000	No
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	3,345	7,200	No	3,858	7,200	No	1,371	No	No	1,974	2,486	4,600	No	513	2,100	No
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	3,184	7,200	No	3,338	7,200	No	1,305	No	No	1,879	2,033	4,600	No	154	2,100	No
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	4,076	7,200	No	5,268	7,200	No	1,671	No	No	2,405	3,597	4,600	No	1,192	2,100	No

HCM 2000
Merge Ramp Junctions
Capacity Analysis

General Information			Results		Speed Estimation			
	Freeway/ Direction	On-ramp	Density, D (pcplpm)	Level of Service	Int. Var. M_S	Inf. Area S_R (mph)	Out Lns. S_O (mph)	All vehs. S (mph)
1	SR 99 NB	Slip On-Ramp from WB Grant Line Road	**21.2**	**C**	0.333	57.3	62.1	58.9
2	SR 99 SB	Slip On-Ramp from EB Grant Line Road	**21.8**	**C**	0.327	57.5	61.9	59.0
3	SR 99 NB	Slip On-Ramp from WB Grant Line Road	**18.4**	**B**	0.310	57.9	62.1	59.4
4	SR 99 SB	Slip On-Ramp from EB Grant Line Road	**30.2**	**D**	0.423	55.3	60.8	56.9

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

Jurisdiction 0
Analysis Year C+P With Exp
Analyst Fehr & Peers

Agency or Company City of Elk Grove
Date 4/26/2010
Project Description Elk Grove Corp Yard

General Information / *Freeway Data* / *Freeway Volume Adjustment*

	Freeway/ Direction	Off-ramp	Analysis Time Period	Lanes	S_{FF} (mph)	V (vph)	HOV Lane?	HOV Lane Volume	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P
1	SR 99 NB	Off-Ramp to Grant Line Road	AM	2	65.0	3,930	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00
2	SR 99 SB	Off-Ramp to Grant Line Road	AM	2	65.0	2,710	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00
3	SR 99 NB	Off-Ramp to Grant Line Road	PM	2	65.0	3,680	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00
4	SR 99 SB	Off-Ramp to Grant Line Road	PM	2	65.0	2,770	No		0.92	Level			10.0%	0.0%	1.5	1.2	0.95	1.00

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information			Effective	*Off-Ramp Data*							*Off-Ramp Volume Adjustment*										
	Freeway/ Direction	Off-ramp	Flow Rate v_p (pcph)	Flow Rate v_p (pcph)	Type	Lanes	S_{FR} (mph)	V_R (vph)	Decel Lane (ft) L_{D1}	L_{D2}	L_{Deff}	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	E_T	E_R	f_{HV}	f_P	Flow Rate v_p (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	4,485	4,485	Major	2	45.0	1,700	0	1,500	1,500	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	1,894
2	SR 99 SB	Off-Ramp to Grant Line Road	3,093	3,093	Major	2	45.0	846	0	1,500	1,500	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	943
3	SR 99 NB	Off-Ramp to Grant Line Road	4,200	4,200	Major	2	45.0	1,530	0	1,500	1,500	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	1,705
4	SR 99 SB	Off-Ramp to Grant Line Road	3,161	3,161	Major	2	45.0	1,006	0	1,500	1,500	0.92	Level			5.0%	0.0%	1.5	1.2	0.98	1.00	1,121

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Adjacent Upstream Ramp Data*																
	Freeway/ Direction	Off-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	Grade E_T	Grade E_R	E_T	E_R	f_{HV}	f_P	Flow Rate v_L (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	No															
2	SR 99 SB	Off-Ramp to Grant Line Road	No															
3	SR 99 NB	Off-Ramp to Grant Line Road	No															
4	SR 99 SB	Off-Ramp to Grant Line Road	No															

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

General Information			*Adjacent Downstream Ramp Data*																*v_{12} Estimation*						
	Freeway/ Direction	Off-ramp	Exists?	Distance	Volume (vph)	PHF	Terrain	Grade %	Length (mi)	Truck/ Bus %	RV %	Grade E_T	Grade E_R	E_T	E_R	f_{HV}	f_P	Flow Rate v_D (pcph)	L_{LO} 25-13	L_{LO} 25-14	P_{FD} Equations 5	P_{FD} Equations 6	P_{FD} Equations 7	P_{FD}	v_{12} (pcph)
1	SR 99 NB	Off-Ramp to Grant Line Road	No																						
2	SR 99 SB	Off-Ramp to Grant Line Road	No																						
3	SR 99 NB	Off-Ramp to Grant Line Road	No																						
4	SR 99 SB	Off-Ramp to Grant Line Road	No																						

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Capacity Checks*														
	Freeway/ Direction	Off-ramp	v_{Fi} (pcph)	Max v_{Fi} (pcph)	LOS F?	v_3, v_{av34} (pcphpl)	v_3, v_{av34} > 2,700?	v_3, v_{av34} >1.5*v_{12}/2?	v_{12a} (pcph)	Max v_{12} (pcph)	LOS F?	v_{FO} (pcph)	Max v_{FO} (pcph)	LOS F?	v_R (pcph)	Max v_R (pcph)	LOS F?
1	SR 99 NB	Off-Ramp to Grant Line Road	4,485	4,800	No	0	No	No	4,485	4,400	Yes	2,591	4,800	No	1,894	4,100	No
2	SR 99 SB	Off-Ramp to Grant Line Road	3,093	4,800	No	0	No	No	3,093	4,400	No	2,150	4,800	No	943	4,100	No
3	SR 99 NB	Off-Ramp to Grant Line Road	4,200	4,800	No	0	No	No	4,200	4,400	No	2,495	4,800	No	1,705	4,100	No
4	SR 99 SB	Off-Ramp to Grant Line Road	3,161	4,800	No	0	No	No	3,161	4,400	No	2,041	4,800	No	1,121	4,100	No

HCM 2000
Diverge Ramp Junctions
Capacity Analysis

	General Information		*Results*		*Speed Estimation*			
	Freeway/ Direction	Off-ramp	Density, D (pcplpm)	Level of Service	Int. Var. D_S	Inf. Area S_R (mph)	Out Lns. S_O (mph)	All vehs. S (mph)
1	SR 99 NB	Off-Ramp to Grant Line Road	**24.4**	**C**	0.468	54.2	0.0	54.2
2	SR 99 SB	Off-Ramp to Grant Line Road	**16.9**	**B**	0.383	56.2	0.0	56.2
3	SR 99 NB	Off-Ramp to Grant Line Road	**22.9**	**C**	0.451	54.6	0.0	54.6
4	SR 99 SB	Off-Ramp to Grant Line Road	**17.2**	**B**	0.399	55.8	0.0	55.8

MITIGATION MONITORING AND REPORTING PROGRAM

	MITIGATION MEASURES	TIMING, IMPLEMENTATION AND NOTIFICATION (ACTION BY THE PROJECT APPLICANT):	MONITORING / VERIFICATION (ACTION BY THE CITY): **(DATE & SIGN)**
1.	**MM 3b-1 Construction Emission Control Mitigation** The following SMAQMD's *Basic Construction Emission Control Practices* shall be implemented: • Water all exposed surfaces two times daily. Exposed surfaces include, but are not limited to soil piles, graded areas, unpaved parking areas, staging areas, and access roads. • Cover or maintain at least two feet of free board space on haul trucks transporting soil, sand, or other loose material on the site. Any haul trucks that would be traveling along freeways or major roadways should be covered. • Use wet power vacuum street sweepers to remove any visible trackout mud or dirt onto adjacent public roads at least once a day. Use of dry power sweeping is prohibited. • Limit vehicle speeds on unpaved roads to 15 miles per hour (mph). • All roadways, driveways, sidewalks, parking lots to be paved should be completed as soon as possible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used. • Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to 5 minutes (as required by the state airborne toxics control measure [Title 13, Section 2485 of the California Code of Regulations]). Provide clear signage that posts this requirement for workers at the entrances to the site.	During construction.	City of Elk Grove Planning Department

	Mitigation Measures	Timing, Implementation and Notification (Action by the Project Applicant):	Monitoring / Verification (Action by the City): **(Date & Sign)**
	• Maintain all construction equipment in proper working condition according to manufacturer's specifications. The equipment must be checked by a certified mechanic and determine to be running in proper condition before it is operated.		
2.	**MM 3d-1 Construction Equipment NOx Reduction Mitigation** The following measures shall be implemented to reduce NOX and visible emissions from heavy-duty diesel equipment: • The construction contractor shall provide a plan for approval by the City, in consultation with SMAQMD, demonstrating that the heavy-duty (>50 horsepower), off-road vehicles to be used in the construction project, including owned, leased, and subcontractor vehicles, will achieve a project-wide fleet-average 20-percent NOX reduction and 45-percent particulate reduction compared to the most recent CARB fleet average at the time of construction. Acceptable options for reducing emissions include the use of late-model engines, low-emission diesel products, alternative fuels, particulate matter traps, engine retrofit technology, after-treatment products, and/or such other options as become available. • The construction contractor shall submit to the City and SMAQMD a comprehensive inventory of all off-road construction equipment, equal to or greater than 50 hp, that will be used for an aggregate of 40 or more hours during any portion of the project. The inventory shall be updated and submitted monthly throughout the duration of the project, except that an inventory shall not be required for any 30-day period in which no construction operations occur. At least 48 hours before subject heavy-duty off-road equipment is used, the project representative shall provide the SMAQMD with the anticipated construction timeline including start date, and the name and phone	Prior to and during construction.	City of Elk Grove Planning Department

	MITIGATION MEASURES	TIMING, IMPLEMENTATION AND NOTIFICATION (ACTION BY THE PROJECT APPLICANT):	MONITORING / VERIFICATION (ACTION BY THE CITY): **(DATE & SIGN)**
	number of the project manager and on-site foreman. • The construction contractor shall ensure that emissions from off-road, diesel-powered equipment used on the project site do not exceed 40- percent opacity for more than 3 minutes in any 1 hour, as determined by an on-site inspector trained in visual emissions assessment. Any equipment found to exceed 40-percent opacity (or Ringlemann 2.0) shall be repaired immediately, and the SMAQMD shall be notified of non-compliant equipment within 48 hours of identification. A visual survey of all in operation equipment shall be made at least weekly, and a monthly summary of visual survey results shall be submitted throughout the duration of the construction project, except that the monthly summary shall not be required for any 30-day period in which no construction operations occur. The monthly summary shall include the quantity and type of vehicles surveyed, as well as the dates of each survey. The SMAQMD and/or other officials may conduct periodic site inspections to determine compliance.		
3.	**MM 3d-2 Public Transit Idling Mitigation** The following measures shall be implemented: During project operation, extended idling time of all public transit buses shall be limited to five minutes unless extreme hot or cold temperatures (over 100 degrees F or under 54 degrees F) require extended idling for cooling or heating functions of the buses to operate.	Throughout project operation.	City of Elk Grove Planning Department
4.	**MM 4a-1 Swainson's Hawk Foraging Habitat Mitigation** The City shall implement one of the following options prior to ground-disturbing activities: 1) Preserve 1.0 acre of similar habitat for each acre lost.	Prior to any site disturbance.	City of Elk Grove Development Services

	MITIGATION MEASURES	TIMING, IMPLEMENTATION AND NOTIFICATION (ACTION BY THE PROJECT APPLICANT):	MONITORING / VERIFICATION (ACTION BY THE CITY): **(DATE & SIGN)**
	This land shall be protected through a fee title or conservation easement acceptable to the DFG and the City of Elk Grove as set forth In Chapter 16.130.040(a) of the City of Elk Grove Municipal Code as such may be amended from time to time and to the extent that said Chapter remains in effect, or 2) Submit payment of Swainson's hawk impact mitigation fee per acre of habitat impacted (payment shall be at a 1:1 ratio) to the City of Elk Grove's Swainson's hawk mitigation fund in the amount set forth in Chapter 16.130 of the City of Elk Grove Code as such may be amended from time to time and to the extent that said chapter remains in effect, or 3) Submit proof that mitigation credits for Swainson's hawk foraging habitat have been purchased at a DFG approved mitigation bank.		
5.	**MM 4a-2 Nesting Birds Mitigation** In order to avoid impacts to nesting habitat for raptors, the City shall implement the following measures prior to construction and site grading activities on the Iron Rock Way Site: 1) Retain a qualified biologist to conduct a focused survey for active nests within the single oak tree on the Iron Rock Way Site. The survey shall occur no more than two weeks prior to ground disturbance. 2) If no active nests are found, tree removal may proceed. If active nests are found, DFG shall be notified, and the tree shall not be removed until the nest is no longer active, as determined by a DFG-approved biologist. No construction activities shall take place within a 500-foot (152-meter) radius of the active nest (or another distance determined	Prior to any site disturbance.	City of Elk Grove Development Services

	MITIGATION MEASURES	TIMING, IMPLEMENTATION AND NOTIFICATION (ACTION BY THE PROJECT APPLICANT):	MONITORING / VERIFICATION (ACTION BY THE CITY): **(DATE & SIGN)**
	appropriate during consultation with DFG).		
6.	**MM 4a-3 Giant Garter Snake Mitigation** Prior to any construction activities on the Grant Line Road Site, the City shall consult with the U.S. Fish and Wildlife Service and California Department of Fish and Game to determine the agencies' opinion on the suitability of the habitat on the project site to support giant garter snake, and the likelihood of injury for giant garter snakes that may be moving through the project site during construction. If the agencies determine that the project site does not support giant garter snake habitat, then no additional mitigation is required. If U.S. Fish and Wildlife Service and California Department of Fish and Game determine that implementation of the proposed project could affect giant garter snake, the City shall undertake the following measures prior to project grading within 200 feet of Grant Line Channel. • Construction personnel shall participate in a USFWS-approved worker environmental awareness program. Under this program, workers shall be informed about the potential presence of giant garter snake and habitat associated with the species and that unlawful take of the animal or destruction of its habitat is a violation of the Endangered Species Act. Prior to construction activities, a qualified biologist approved by the USFWS shall instruct all construction personnel about: (1) the life history of the giant garter snake; (2) the importance of Grant Line Channel to the giant garter snake; and (3) the required avoidance/protection measures. Proof of this instruction shall be submitted to the City and the Sacramento U.S. Fish and Wildlife Service Office.	Prior to any site disturbance.	City of Elk Grove Development Services
7.	**MM 4a-4 Giant Garter Snake Habitat Mitigation** The City shall mitigate to standard guidelines identified in the USFWS's *Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effects on the Giant Garter Snake within Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter and Yolo Counties, California* (1997). Loss of upland basking and retreat site habitat resulting	Prior to any site disturbance.	City of Elk Grove Development Services

	MITIGATION MEASURES	TIMING, IMPLEMENTATION AND NOTIFICATION (ACTION BY THE PROJECT APPLICANT):	MONITORING / VERIFICATION (ACTION BY THE CITY): **(DATE & SIGN)**
	from project grading and construction would be considered a "Level 3" impact. Standard mitigation shall consist of: **a)** replacement of affected giant garter snake habitat at a 3:1 ratio; **b)** all replacement habitat must include both upland and aquatic habitat components. Upland and aquatic habitat components must be included in the replacement habitat at a ratio of 2:1 upland acres to aquatic acres; **c)** if restoration of habitat is a component of the replacement habitat, one year of monitoring restored habitat with a photo documentation report due one year from implementation of the restoration with pre- and post-project area photos; and **d)** Five years of monitoring replacement habitat with photo documentation report due each year. Loss of habitat resulting from the project implementation must be replaced at a location deemed appropriate by the USFWS; Evidence of compliance with this mitigation measure shall provided prior to grading activities that will remove giant garter snake habitat.		
8.	**MM 4a-5 Burrowing Owl Mitigation** One week prior to the start of ground disturbing activities within the project area, a qualified biologist shall survey the project site and surrounding areas (up to 160 feet outside the project area) for the presence of burrowing owls. A second pre-construction survey shall occur one-day prior to ground disturbing activities. If ground-disturbing activities are delayed or suspended for more than one week after the preconstruction survey, the site shall be resurveyed. If no burrowing owls are detected during the preconstruction surveys, no further action is necessary and construction may proceed. If burrowing owls are detected during preconstruction surveys, occupied burrows shall	Prior to any site disturbance.	City of Elk Grove Development Services

	Mitigation Measures	Timing, Implementation and Notification (Action by the Project Applicant):	Monitoring / Verification (Action by the City): (Date & Sign)
	not be disturbed during the nesting season (February 1 through August 31) unless a qualified biologist approved by the CDFG verifies through non-invasive methods that either: (1) the birds have not begun egglaying and incubation; or (2) that juveniles from the occupied burrows are foraging independently and are capable of independent survival. If the qualified biologist determines that impacts on occupied burrows could occur, the City shall retain a qualified biologist to complete mitigation established by the CDFG to avoid and minimize impacts to burrowing owls at the project site. The biologist shall complete "passive relocation" of the owls utilizing one-way doors. Owls shall be excluded from burrows in the immediate impact zone and within a 50-meter (approx. 160 feet) buffer zone by installing one-way doors in burrow entrances. One-way doors should be left in place 48 hours to insure owl have left the burrow before excavation. Whenever possible, burrows should be excavated using hand tools and should be refilled to prevent reoccupation.		
9.	**MM 4c-1 Wetland Deliniation Mitigation** To minimize, avoid and mitigate impacts to potential waters of the United States or waters of the state, the City shall conduct a formal wetland delineation to determine the extent of jurisdictional waters on the Grant Line Road Site. The wetland delineation report and map shall be submitted to the Sacramento district office of the USACE for verification.	Prior to any site disturbance on the Grant Line Road Site.	City of Elk Grove Development Services
10.	**MM 4c-2 Wetlands Permitting Mitigation** For those waters of the United States that cannot be avoided during construction, authorization for fill of jurisdictional waters of the United States shall be secured from USACE via the Section 404 permitting process prior to project implementation.	Prior to any site disturbance on the Grant Line Road Site.	City of Elk Grove Development Services
11.	**MM 4c-3 Wetland Replacement/Rehabilitation Mitigation** The acreage of jurisdictional habitat removed shall be replaced or rehabilitated on a "no-net-loss" basis in accordance with USACE regulations and Policy CAQ-9 of the City of Elk Grove General Plan. Habitat restoration, rehabilitation, and/or replacement shall be at a location and by methods agreeable to USACE.	Prior to any site disturbance on the Grant Line Road Site.	City of Elk Grove Development Services
12.	**MM 4c-4 Wetland Certification Mitigation**	Prior to any site disturbance on the Grant	City of Elk Grove

	Mitigation Measures	Timing, Implementation and Notification (Action by the Project Applicant):	Monitoring / Verification (Action by the City): (Date & Sign)
	Section 401 water quality certification from the Central Valley RWQCB shall be obtained.	Line Road Site.	Development Services.
13.	**MM 5b-1 Cultural Resources Mitigation** If cultural resources (i.e., prehistoric sites, historic sites, and isolated artifacts) are discovered during grading or construction activities on the project site, work shall be halted immediately within 50 feet of the discovery, the City Planning Department shall be notified, and a professional archaeologist that meets the Secretary of the Interior's Professional Qualifications Standards in archaeology and/or history shall be retained to determine the significance of the discovery. The City shall consider mitigation recommendations presented by a professional archaeologist that meets the Secretary of the Interior's Professional Qualifications Standards in archaeology and/or history for any unanticipated discoveries. The City and project applicant shall consult and agree upon implementation of a measure or measures that the City deems feasible and appropriate. Such measures may include avoidance, preservation in place, excavation, documentation, curation, data recovery, or other appropriate measures. The project proponent shall be required to implement any mitigation necessary for the protection of cultural resources.	As a condition of project approval and implemented during ground-disturbing activities.	City of Elk Grove Development Services, Planning Department
14.	**MM 5b-2 Paleontological Resources Mitigation** If any paleontological resources (fossils) are discovered during grading or construction activities on the project site, work shall be halted immediately within 50 feet of the discovery, and the City Planning Department shall be immediately notified. At that time, the City will coordinate any necessary investigation of the discovery with a qualified paleontologist. The City shall consider the mitigation recommendations of the qualified paleontologist for any unanticipated discoveries of paleontological resources. The City and project applicant shall consult and agree upon implementation of a measure or measures that the City deems feasible and appropriate. Such measures may include avoidance, preservation in place, excavation, documentation, curation, data recovery, or other appropriate measures. The project proponent shall be required to implement any mitigation necessary for the protection of paleontological resources.	As a condition of project approval and implemented during ground-disturbing activities.	City of Elk Grove Development Services, Planning Department
15.	**MM 5b-3 Human Remains Mitigation**	As a condition of project approval and	City of Elk Grove Development Services,

	MITIGATION MEASURES	TIMING, IMPLEMENTATION AND NOTIFICATION (ACTION BY THE PROJECT APPLICANT):	MONITORING / VERIFICATION (ACTION BY THE CITY): **(DATE & SIGN)**
	If, during the course of implementing actions under the Corp Yard Facilities Master Plan and Transit Yard Facilities Master Plan Project, human remains are discovered, all work shall be halted immediately within 50 feet of the discovery, the City Planning Department shall be notified, and the County Coroner must be notified according to Section 5097.98 of the State PRC and Section 7050.5 of California's Health and Safety Code. If the remains are determined to be Native American, the coroner will notify the Native American Heritage Commission, and the procedures outlined in CEQA Section 15064.5(d) and (e) shall be followed.	implemented during ground-disturbing activities.	Planning Department
16.	**MM 6a-1 Emissions Reduction Mitigation** The following emissions reduction measures shall be implemented: 1. The following measures shall be implemented during construction: • Limit idling of construction equipment and delivery vehicles; • Limit the vehicle trips of construction deliveries by consolidating material loads; • Delivery of materials should take place during non-rush hours, in order to increase vehicle fuel efficiency; • Provide opportunity for construction workers to carpool, and • Gasoline and diesel-run equipment and machinery should be well maintained and in good working condition. 2. Following consultation with SMAQMD, and to the extent agreed upon by the project applicant and SMAQMD, construction vehicles shall use retrofit emission control devices, such as diesel oxidation catalysts and diesel particulate filters verified by the California Air Resources	Prior to issuance of certification of occupancy.	City of Elk Grove Development Services Department and Sacramento Metropolitan Air Quality Management District

	Mitigation Measures	Timing, Implementation and Notification (Action by the Project Applicant):	Monitoring / Verification (Action by the City): **(Date & Sign)**
	Board. 3. No wood-burning fireplaces, woodstoves, or similar wood-burning devices will be used in association with the project. 4. For low-impact areas and surfaces, the lowest-emitting architectural coatings feasible shall be used during construction. Zero-VOC coatings shall be used. For areas of high use that will require frequent cleaning, such as door frames or kitchen room walls, low-VOC coatings shall be used. Design review submittals shall include information concerning the coatings products proposed for use in the project.		
17.	**MM 6a-2 Energy Efficiency Mitigation** The following energy efficiency and renewable energy measures shall be implemented: 1. Include energy-efficient window glazings, wall insulation, and efficient ventilation methods. 2. Energy efficient lighting (e.g., fluorescent lighting, which uses approximately 75% less energy than incandescent lighting to deliver the same amount of light) shall be used. 3. Promote passive solar building design and landscaping conducive to passive solar energy use (i.e., building orientation in a south to southwest direction, encouraging planting of deciduous trees on western sides of structures, landscaping with drought-resistant species, and including groundcovers rather than pavement to reduce heat reflection) where energy modeling indicates that these measures will reduce energy consumption. 4. Landscaping plans shall prohibit the use of liquidambar and eucalyptus trees that produce smog-forming compounds (high emission factors for isoprenes). 5. Establish building guidelines that require the use of low-absorptive coatings on all building surfaces and Energy Star roofing products on all roofs if commercially available	Prior to issuance of certification of occupancy.	City of Elk Grove Development Services Department and Sacramento Metropolitan Air Quality Management District

	Mitigation Measures	Timing, Implementation and Notification (Action by the Project Applicant):	Monitoring / Verification (Action by the City): (Date & Sign)
	at the time building permits are issued and compliant with the California Building Code. 6. Require reuse and recycling of construction and demolition waste. 7. Preserve and create open space and parks. Preserve existing heritage and street trees (or in the event that preservation or relocation cannot be achieved, replace with similar species and size).		
18.	**MM 8a-1 Site Excavation Mitigation** Construction monitors trained in the identification of hazardous materials will be present during the excavation and site development phase of the project. Monitors will observe all excavation, trenching, and grading for the potential presence of hazardous materials and petroleum products. If during site preparation and construction activities previous undiscovered or unknown evidence of hazardous materials contamination is observed or suspected through either obvious or implied measures (e.g., stained or odorous soil, unknown storage tanks, etc.), construction activities shall immediately cease in the area of the find. City of Elk Grove staff shall be immediately consulted and the project contractor shall contract with a qualified consultant registered in DTSC's Registered Environmental Assessor Program to assess the situation. If necessary, risk assessments shall include a DTSC Preliminary Endangerment Assessment or no further action determination, or equivalent. Any required remediation shall include a DTSC Remedial Action Work Plan or equivalent. Based on consultation between the Registered Environmental Assessor and DTSC, remediation of the site shall be conducted consistent with all applicable regulations.	During project construction.	City of Elk Grove Planning Department
19.	**MM 8a-2 Hazardous Construction Materials Mitigation** Prior to start of construction, the construction contractor shall designate staging areas where fueling and oil-changing activities will take place. The staging area(s) shall be reviewed and approved by City's Planning Department and the Storm Water pollution Prevention Plan (SWPPP) Manager prior to the start of construction. No fueling and oil-changing activities shall be permitted outside the designated staging areas. The staging areas, as much as practicable, shall be located on level terrain and away from sensitive land uses such as residences, day care facilities, and schools. Staging areas shall not be located near any stream, channel, or wetlands. The proposed	Prior to start of construction and during project construction	City of Elk Grove, Planning Department

	Mitigation Measures	Timing, Implementation and Notification (Action by the Project Applicant):	Monitoring / Verification (Action by the City): **(Date & Sign)**
	staging areas shall be identified in the SWPPP.		
20.	**MM 9a-1 Stormwater Pollution and Prevention Plan Mitigation** Prior to the issuance of grading permits, the City shall prepare a Stormwater Pollution and Prevention Plan (SWPPP) to be administered through all phases of grading and project construction. The SWPPP shall incorporate best management practices (BMPs) which describe the site, erosion and sediment controls, means of waste disposal, control of post-construction sediment and erosion control measures and maintenance responsibilities, water quality monitoring and reporting during storm events (which will be responsibility of the City), corrective actions for identified water quality problems and non-stormwater management controls. The SWPPP shall address spill prevention and include a countermeasure plan describing measures to ensure proper collection and disposal of all pollutants handled or produced on the site during construction, including sanitary wastes, cement, and petroleum products. The measures included in the SWPPP shall ensure compliance with applicable regional, state and federal water quality standards. These measures shall be consistent with the City's Drainage Manual and Land Grading and Erosion Control Code which may include (1) restricting grading to the dry season; (2) protecting all finished graded slopes from erosion using such techniques as erosion control matting and hydroseeding; (3) protecting downstream storm drainage facilities from sedimentation; (4) use of silt fencing and hay bales to retain sediment on the project site; (5) use of temporary water conveyance and water diversion structures to eliminate runoff; and (6) any other suitable measures. The City shall require all construction contractors to retain a copy of the approved SWPPP on each construction site.	Prior to issuance of grading permits.	City of Elk Grove Development Services, Planning Department
21.	**MM 9a-2 Best Management Practices Mitigation** The project shall implement specific best management practices (BMPs) to ensure that long-term water quality is protected. The BMPs shall be designed, constructed, and maintained to meet a performance standard established by the City and shall conform to the provisions of the City's NPDES permit. BMPs may include, but are not limited to: scheduling or limiting construction activities to certain times of year, prohibitions of practices, maintenance procedures, installation of silt fences, hydroseeding, hydraulic mulch, soil binders, straw mulch, fiber rolls, earthen dikes and drainage swales, velocity dissipation devices, sediment traps, inlet filters, tire washes and other management practices that could be used during construction of the proposed project (see California Stormwater Quality Association's *Stormwater Best*	Prior to issuance of grading permit; BMPs shall be implemented and monitored throughout the life of the project.	City of Elk Grove Development Services, Planning Department

	Mitigation Measures	Timing, Implementation and Notification (Action by the Project Applicant):	Monitoring / Verification (Action by the City): (Date & Sign)
	Management Practices Handbook for Construction). The project applicant shall retain a qualified specialist to monitor the effectiveness of the BMPs selected. Monitoring activities, along with funding for monitoring, shall be established and shall include, but not be limited to, initial setup, annual maintenance, and annual monitoring.		
22.	**MM 9e-1 Water Quality Control Mitigation** If the drainage system improvements identified in the Elk Grove Flood Control and Storm Drainage Master Plan are not implemented prior to the initiation of project construction, then storm water detention facilities shall be constructed on the project sites to capture any increase in storm water runoff associated with site development.	Prior to initiation of project construction.	City of Elk Grove Development Services, Planning Department
23.	**MM 10a-1 Construction Hours Noise Mitigation** Noise-generating construction operations on the Grant Line Road Site shall be limited to the hours between 7 a.m. and 7 p.m.	During project construction.	City of Elk Grove Planning Department.
24.	**MM 10a-2 Construction Staging Noise Mitigation** Construction equipment and equipment staging areas on the Grant Line Road Site shall be located at the furthest distance possible from nearby noise-sensitive residential properties.	During project construction.	City of Elk Grove Planning Department.
25.	**MM 10a-3 Construction Equipment Noise Mitigation** Construction equipment on the Grant Line Road Site shall be properly maintained and equipped with noise-reduction intake and exhaust mufflers and engine shrouds, in accordance with manufacturers' recommendations. The onsite construction Contractor shall ensure that equipment engine shrouds are closed during equipment operation.	During project construction.	City of Elk Grove Planning Department.
26.	**MM 10a-4 Idling Noise Mitigation** When not in use, motorized construction equipment on the Grant Line Road Site shall not be left idling.	During project construction.	City of Elk Grove Planning Department.