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Colusa-Sacramento River
State Recreation Area

Final General Plan and
Program Environmental Impact Report

DRAFT

Transportation Study for the

COLUSA-SACRAMENTO RIVER STATE RECREATION AREA GENERAL PLAN –

November 2014

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1. INTRODUCTION

Incorporated on the southwestern bank of the Sacramento River in 1868, the town of Colusa expanded southward and developed along a system of gridded streets. Initially, the Sacramento River served as the primary transportation artery for the town. However, in 1885, a narrow gauge railroad line, known as the Colusa & Lake Railroad, linked Colusa to the Southern Pacific Railroad. The Southern Pacific Railroad eventually built its own branch line extending to the town, and in 1913, the Northern Electric Railway began service between Colusa and Marysville. The opening of the railroad link eastward to Marysville siphoned away passenger traffic from the Colusa & Lake Railroad, which was dismantled in 1918. Eventually, the Southern Pacific and the Northern Electric Railways also suspended rail service to Colusa, with the last train departing Colusa on the Southern Pacific line in 1985.

The Colusa-Sacramento River State Recreation Area (SRA) lies at the heart of the town's historic and present day transportation systems. The Park stretches along the western bank of the Sacramento River, and abuts the northern edge of the gridded system of streets that crisscross the center of Colusa. Train tracks once ran along Main Street, about three hundred feet south of the Park's current main entrance. And today, two state highways serve as Colusa's primary transportation arteries, State Routes 20 and 45, which intersect two blocks south of the current main entrance of the Park at 10th Street and Market Street.

This study analyzes the potential impacts of the proposed Colusa-Sacramento River SRA General Plan upon the surrounding transportation system. The impact analysis conducted for this study evaluated the roadway, transit, bicycle, and pedestrian components of the overall transportation system under the following scenarios:

- Existing Conditions
- Existing Plus Project Conditions
- Cumulative Conditions
- Cumulative Plus Project Conditions

PROJECT DESCRIPTION

The General Plan represents a long-term (approximately 20 years) vision for the future of the Colusa-Sacramento River SRA. The Preferred Alternative Plan includes numerous enhancements to existing components of the park, in addition to new facilities, all of which are intended to improve the visitor experience within the Colusa-Sacramento River SRA. Components of the Preferred Plan include the following:

- **Development of Camping Facilities:**
    - Group Primitive Campground (Restoration/Recreation Zone): 20-50 Tents
    - Group Primitive Campground (Riparian Recreation Zone): 20-50 Tents
    - Developed Campground/Cabins (Southwest Zone): up to 40 Sites +2 Host Sites
    - Developed Campground (Southeast Zone): 10-20 Camp Sites
    - Boat-in Primitive Campground (Riparian Recreation Zone): 3-8 Tents
- **Improved Boat Launch Facilities**:
    - Human-powered boat launches (Riparian Recreation Zone and Channel Zone)
    - New City of Colusa motorboat ramp (2 lane) located on City property, with access and boat trailer parking located within SRA
- **New Visitor Amenities:**
    - New individual picnic sites (12-20 sites), outdoor event facility, and restrooms located in the Southeast Zone.
- **New Trails and Paths:**
    - New multi-use trails and paths in the Restoration/Recreation Zone and Southeast Zone to provide recreation opportunities for visitors and improve visitor access in these sections of the park.
    - New interpretive and fishing access trails in the Riparian Recreation Zone
    - New on-street bike route on levee from existing boat ramp north
    - New off-street bike path on levee from existing boat ramp south and east
- **New Vehicle Entry and Entrance Station:**
    - New vehicle entry point and entrance station located on 12th Street, two blocks west of the current vehicular entry point.

STUDY INTERSECTIONS

Study intersections were selected based on the expected travel characteristics associated with the project (i.e., project location and amount of project trips), as well as the susceptibility of nearby intersections to increased traffic due to implementation of the project. The following four intersections were studied as part of the transportation analysis:

1. Main Street/13th Street
2. Lurline Avenue/13th Street
3. Market Street/12th Street
4. Market Street/10th Street

DATA COLLECTION

To provide a baseline for the intersection analysis, traffic counts were conducted at the four study intersections. The counts occurred on Thursday, November 21, 2013 during the AM (7:00 AM – 9:00 AM) and PM (4:00 PM – 6:00 PM) peak periods of the surrounding roadway system within Colusa. During the counts, weather conditions were dry and local schools were in full session. Pedestrians and bicyclists were also counted at each of the study intersections.

Each intersection's peak hour within the peak period was used for the analysis. For the majority of study intersections, the counts indicate that the AM peak hour is between 7:30 AM and 8:30 AM and the PM peak hour is between 4:30 PM and 5:30 PM.

STATE AND LOCAL REGULATIONS

City of Colusa

The current City of Colusa General Plan (October 2007) is "a long term policy guide for the physical, economic, and environmental growth of the City. It is comprised of goals, policies, and implementation programs which are based on an assessment of current and future needs and available resources." Policy CIR-1.1 of the City of Colusa General Plan specifies that the City will strive to achieve at least a LOS C throughout the City. This policy provides exemptions for downtown intersections along State Route 20/45 where LOS D is established as the minimum acceptable LOS.

Caltrans

- **Guide for the Preparation of Traffic Impact Studies:** Caltrans' *Guide for the Preparation of Traffic Impact Studies* (December 2002) provides guidance on the evaluation of traffic impacts to State highway facilities. The document outlines when a traffic impact study is needed and what should be included in the scope of the study.

- **Transportation Corridor Concept Report (State Route 20):** *The State Route 20 Transportation Corridor Concept Report* (Caltrans 2009) is a long range planning document that identifies existing route conditions and future needs, including existing and forecasted travel data and a concept level of service standard. The document addresses mobility need over the next 20 years. Segment 3 is the portion of SR 20 that is in the City of Colusa. The corridor's concept standard LOS is D in rural areas and E in urban areas. This corridor segment currently operates at LOS E and the 20-year forecast LOS is F under no build conditions and E under the Concept LOS. The Conceptual plan is to support the expansion of existing parallel arterials or construct new parallel arterials designed to relieve the congestion of SR 20.

- **Transportation Corridor Concept Report (State Route 45):** *The State Route 45 Transportation Corridor Concept Report* (Caltrans 2014) is a long range planning document that identifies existing route conditions and future needs, including existing and forecasted travel data and a concept level of service standard. The document addresses mobility need over the next 20 years. Segment 3 is the portion of SR 45 that is in the City of Colusa. The segment's concept standard LOS is D. This corridor segment currently operates at LOS D and is forecast to operate at LOS D in the 2031 horizon year.

STANDARDS OF SIGNIFICANCE

In accordance with CEQA, the lead agency evaluates the effects of a proposed project to determine if they could result in significant adverse impacts on the environment. The standards of significance in this analysis are based upon the current practices of the City of Colusa, documented within the City of Colusa General Plan (2007). Under CEQA, the City of Colusa and Caltrans are the local responsible agencies.

Policy CIR-1.1 of the City of Colusa General Plan specifies that the City will strive to achieve at least a LOS C throughout the City. This policy provides exemptions for downtown intersections along SR 20/45 where LOS D is established as the minimum acceptable LOS. The Caltrans Transportation Concept Corridor Reports for SR 20 and SR 45 identify a concept of LOS for the segments located within the study area. For the purposes of this analysis, an impact is considered significant if implementation of the project would result in any of the following:

Therefore, all four study intersections are located along SR 20 or SR 45, and LOS D is acceptable at these locations.

For the purposes of this analysis, an impact is considered significant if implementation of the project would result in any of the following:

1. Cause an intersection in along SR 20/45 that currently operates (or is projected to operate) at LOS D or better to degrade to LOS E or worse.
2. Increase the average delay by five percent or more at an intersection in Colusa that currently operates (or is projected to operate) at an unacceptable LOS E or F.
3. Eliminate or adversely affect an existing bikeway, pedestrian facility, or transit facility in a way that would discourage its use.

ANALYSIS METHODOLOGY

All intersections were analyzed using procedures and methodologies contained in the *Highway Capacity Manual* (HCM) (Transportation Research Board, 2010). These methodologies were applied using Synchro[1] (Version 8), a traffic operations analysis software package.

The HCM methodologies determine a level of service (LOS) for each study intersection. Level of service is a qualitative measure of traffic operating conditions whereby a letter grade, from A (the best) to F (the worst), is assigned. These grades represent the perspective of drivers and are an indication of the comfort and convenience associated with driving. In general, LOS A represents free-flow conditions with no congestion, and LOS F represents severe congestion and delay under stop-and-go conditions. Table 1 presents the intersection LOS thresholds.

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[1] Trafficware, 2013

TABLE 1
INTERSECTION LEVEL OF SERVICE CRITERIA

Level of Service	Description	Average Control Delay (seconds per vehicle)	
		Signalized Intersections[1]	Unsignalized Intersections[2]
A	Represents free flow. Individual users are virtually unaffected by others in the traffic stream.	≤ 10	≤ 10
B	Stable flow, but the presence of other users in the traffic stream begins to be noticeable.	> 10 to 20	> 10 to 15
C	Stable flow, but the operation of individual users becomes significantly affected by interactions with others in the traffic stream.	> 20 to 35	> 15 to 25
D	Represents high-density, but stable flow.	> 35 to 55	> 25 to 35
E	Represents operating conditions at or near the capacity level.	> 55 to 80	> 35 to 50
F	Represents forced or breakdown flow.	> 80	> 50

Source: Highway Capacity Manual (Transportation Research Board 2010).

Detailed Intersection Analysis Assumptions and Methodologies

The following assumptions and methodologies were applied during the analysis of study intersections:

- Per HCM procedures, the level of service (LOS) for signalized and all-way stop-controlled intersections was based on the average control delay for all vehicles.
- November 2013 pedestrian counts were incorporated into the analysis.
- The Market Street/10th Street signalized intersection was analyzed using the most up-to-date traffic signal timing plan provided by Caltrans.
- Peak hour factors (PHF) measured in 2013 were assumed for all existing and cumulative scenarios.

2. EXISTING CONDITIONS

This chapter describes the physical and operational characteristics of the transportation system within the study area.

INTERNAL TRANSPORTATION FACILITIES

The Park's main entrance road (see image to right) extends from the northern terminus of 10th Street, and proceeds past the entrance station where vehicles are required to stop and pay a fee for access to the Park. From the entrance station, the roadway continues past a campground and an 85-space parking lot before ending at a boat ramp. From this point, an unpaved trail stretches to the northeast, providing pedestrian access to the Riparian Vegetation Management Zone of the Park.

The southernmost portion of Roberts Road, which runs along the crown of the levee that separates the Southeast and Southwest Management Zones, also provides access to the Habitat Restoration and Riparian Vegetation Management Zone. Roberts Road begins at the northern terminus of 12th Street, and ramps up onto the crown of the levee (see image below). Just north of this point, a short paved driveway branches off of Robert's Road and descends the levee embankment, providing access to the Park's maintenance yard. While the maintenance yard is located on the opposite side of the levee from the previously discussed main entrance road, no direct roadway connection exists

between the two, and use of roadways outside of the Park boundary is required for vehicles to travel between these areas. Robert's Road, which is maintained by Colusa County, continues northward from the maintenance yard along the crown of the levee and connects to an unpaved levee maintenance road that provides vehicular, bicycle, and pedestrian access to the northern portion of the Park. This roadway is currently gated and not accessible to the public. North of this point, Roberts Road continues for approximately a quarter mile before connecting to SR 45.

EXTERNAL TRANSPORTATION FACILITIES

The central portion of Colusa, which abuts the Park's southern boundary, is served by a gridded system of streets. Blocks on this grid are relatively small, 350 feet by 400 feet, which results in a high level of accessibility for motor vehicles, bicyclists, and pedestrians. Gridded street systems help to disperse vehicular traffic by providing multiple paths to the same destination, and also increase the desirability of walking and bicycling.

However, within the vicinity of the park, many blocks lack continuous sidewalks on one or both sides of the roadway. The sidewalk system is incomplete in many areas and features gaps that limit the desirability of pedestrian travel and may pose challenges to access for those with disabilities. The two blocks of 10th Street located north of Market Street, which link the center of Colusa to the Park's main entrance, have no sidewalk on the east side of the roadway. The west side of this segment has a partial sidewalk with a gap on the block immediately north Market Street (see image to right), and no sidewalk north of Main Street. As shown in the image, relatively wide sidewalks are provided at the Market Street/10th Street intersection. This intersection provides ADA-compliant signalized crosswalks on three of the four approaches (all but the eastern approach, which does not have a crosswalk), and includes a raised pedestrian island on Market Street that increases pedestrian safety and comfort. Many of these features, including textured crosswalks, were installed during a recent improvement project constructed in 2010 that included signalization of the intersection.

Two state highways, State Route 20 (SR 20) and State Route 45 (SR 45) converge at the Market Street/10th Street intersection, and serve as the two primary transportation arteries that link the Park and Colusa to the surrounding region. Within the vicinity of the Park, SR 20 runs north/south on 10th Street and east/west on Market Street; SR 45 runs east/west on Market Street (concurrent with SR 20 east of 10th Street) and north/south on 13th Street (north of Market Street).

A nine-foot wide paved bicycle and pedestrian trail runs atop the crown of the levee from the Park's entrance (see image to left) and extends through the adjacent Colusa Levee Scenic Park, operated by the City of Colusa and located immediately north of Downtown Colusa along the Sacramento River. This serves as the only facility dedicated to pedestrian and/or bicycle travel that provides access to the Park.

Colusa County Transit operates bus service on fixed-time routes between Colusa and Williams, Arbuckle, Grimes, Meridian, Maxwell, Princeton, Stonyford, and Yuba City that with stops scheduled on a dial-a-ride basis. These services do not operate on a fixed route within Colusa, and therefore no transit facilities or amenities such as designated bus stops or shelters exist in the vicinity of the Park.

REGIONAL ROADWAY NETWORK

The characteristics of key regional roadway facilities in the vicinity of the Colusa-Sacramento River SRA are described in greater detail below:

- ***State Route 20*** is a generally east-west route that connects Colusa to points west including Williams, Clear Lake, and Willits before terminating at State Route 1 just south of the coastal town of Fort Bragg. To the east of Colusa, SR 20 continues to Yuba City, Marysville, Grass Valley, and Nevada City before terminating at Interstate 80 in the Sierra Nevada Mountains. Within the study area, SR 20 runs north/south on 10th Street (south of Market Street) and east/west on Market Street (east of 10th Street). SR 20 has two travel lanes south of Market Street with a posted speed limit of 35 miles per hour and four travel lanes east of 10th Street with a posted speed limit of 30 miles per hour.

- ***State Route 45*** is a generally north-south route connecting Colusa to Glenn and Hamilton City to the north, before terminating at State Route 32, and to Knights Landing to the south before terminating at State Route 113. Within the study area, SR 45 runs east/west on Market Street (concurrent with SR 20 east of 10th Street) and north/south on 13th Street (north of Market Street). SR 45 has a posted speed limit of 35 miles per hour east of 10th Street, and a posted speed limit of 40 miles per hour west of 10th Street. The portion of the route within the study area features two travel lanes west of 11th Street and four travel lanes east of 11th Street.

INTERSECTION OPERATIONS

Figure 1 displays the existing AM and PM weekday peak hour traffic volumes, as well as the current lane configurations and traffic controls present at each of the four study intersections. Table 2 summarizes the existing peak hour intersection operations at the study intersections (refer to separate Appendix A for detailed calculations). As shown, all study intersections operate on average at LOS A during both peak hours, with the exception of Market Street/10th Street, which operates at an average of LOS B during both peak hours.

Overall, the existing roadway system within the area that provides access to the Colusa-Sacramento River SRA can be characterized as operating efficiently with low levels of delay. Motorists do not experience substantial vehicle queues, and conditions are generally at free-flow during peak hours. Delays experienced by motorists waiting to turn from side streets onto SR 45 are modest, with motorists making left turns from 12th Street onto SR 45 experiencing the highest delay within the study area (16 seconds during the AM and PM peak hours).

TABLE 2
INTERSECTION LEVEL OF SERVICE – EXISTING CONDITIONS

Intersection	Control	AM Peak Hour		PM Peak Hour	
		Delay[1]	LOS	Delay[1]	LOS
1. 13th Street (SR 45) / Main Street	Side-Street Stop	1(11)	A(B)	1(11)	A(B)
2. 13th Street (SR 45) / Lurline Avenue	Side-Street Stop	2(12)	A(B)	2(11)	A(B)
3. Market Street (SR 45) / 12th Street	Side-Street Stop	1(16)	A(C)	1(16)	A(C)
4. Market Street (SR 45/SR 20) / 10th Street (SR 20)	Traffic Signal	13	B	15	B

Note: 1. For signalized intersections, average intersection delay is reported in seconds per vehicle for all approaches. For side-street stop controlled intersections, the delay and LOS for the most-delayed individual movement is shown in parentheses next to the average intersection delay and LOS.
Source: Fehr & Peers, 2014

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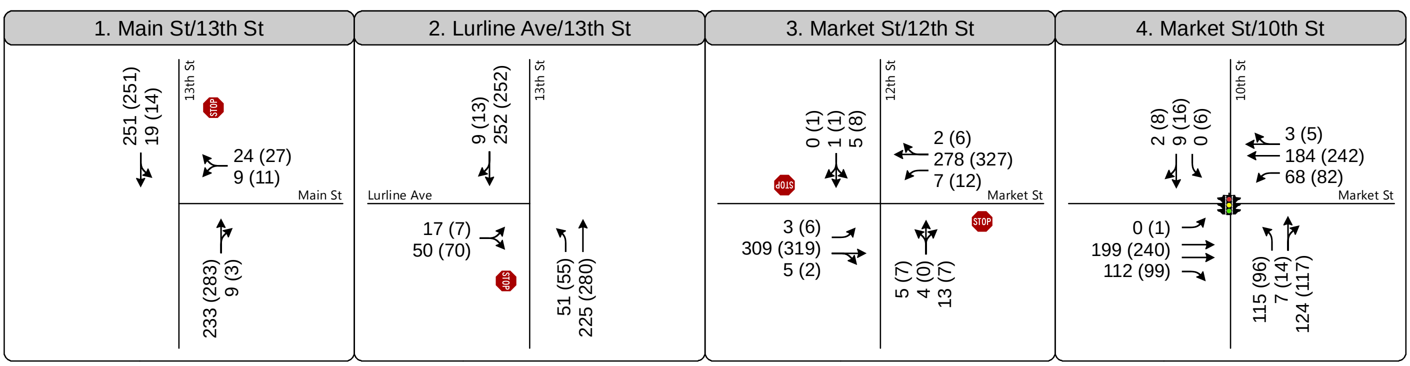

Study Intersection

Turn Lane

Traffic Signal

AM (PM) Peak Hour Traffic Volume

Stop Sign

Figure 1

Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions

3. EXISTING PLUS PROJECT CONDITIONS

This chapter discusses the conditions of the transportation system under Existing Plus Project conditions.

PROJECT DESCRIPTION

As discussed in Section 1, the Colusa-Sacramento River SRA General Plan includes numerous enhancements to existing components of the park as well as proposed new facilities. Specific components of the Preferred Alternative Plan likely to generate additional motor vehicle trips include new visitor amenities, new camping facilities, and improved boat launch facilities.

TRIP GENERATION

This section documents the expected trip generation characteristics of the General Plan. Due to the Colusa-Sacramento River SRA's proximity to downtown Colusa, peak demand on the transportation system surrounding both parks occurs during the weekday AM and PM peak commute periods. For this reason, the transportation analysis focuses upon these two time periods, as the susceptibility of the system to impacts during these periods is greater than during off-peak periods when the system has higher levels of available capacity. Although the number of trips associated with the proposed project will likely be higher on the weekend, the higher levels of available transportation system capacity on weekends reduce the likelihood of impacts, associated with the proposed project during this time period. Therefore the trip generation estimates presented in this section are for the weekday AM and PM peak hours.

Documentation provided by California State Parks provides a range of intensities for planned facilities/improvements. In all cases, the trip generation estimate incorporates the higher end of the range to ensure a conservative analysis of potential project impacts. Build-out of the preferred project alternative would include the following trip-generating components:

- Development of camping facilities:[2]
    - Group Primitive Campground (Riparian Recreation Zone) – 50 Tents

[2] Does not include boat-in camp sites proposed for the Riparian Recreation Zone as it is assumed that these sites would not generate motor vehicle trips.

  - Group Primitive Campground (Restoration/Recreation Zone) – 50 Tents
  - Developed Campground/Cabins (Southwest Zone) – 42 Camp Sites
  - Developed Campground (Southeast Zone) – 20 Camp Sites
- Boat launch facilities:
  - Human-powered boat launches (Riparian Recreation Zone and Channel Zone)
  - New City of Colusa motorboat ramp (2 lane) located on City property, with access and boat trailer parking located within State Park
- Day use (unrelated to boat launch):
  - All other day trips to park, including utilization of picnic areas, trails, etc.

The methods used to calculate the trip generation potential of Park's components differ. The trip generation potential of the proposed camping facilities and day use areas of the Park are based upon rates documented in *Trip Generation* (Institute of Transportation Engineers, 2012). The trip generation estimate for camping facilities assumes an occupancy rate of 75 percent. Given that the Park would have up to 162 total camp sites accessible by motor vehicle, this would result in a total of 122 occupied camp sites.

The trip generation potential of the boat launch facilities is based upon data developed by the Department of Boating and Waterways documented in the grant approval for the proposed boat ramp improvements. This document indicates that the boat launch facilities are projected to handle 9,000 annual boat launches, which equates to an average of 25 boat launches per day.

Table 3 presents the resulting trip generation estimate for the Colusa SRA General Plan's preferred alternative. As shown in Table 3, the project is estimated to generate 51 trips during the AM peak hour and 58 trips during the PM peak hour on a typical weekday.

TABLE 3
PROJECT TRIP GENERATION

Land Use	Quantity	ITE Land Use Code	Trip Rates		Trips					
			AM Peak Hour	PM Peak Hour	AM Peak Hour			PM Peak Hour		
					In	Out	Total	In	Out	Total
Campground	122 occupied camp sites	416	0.21	0.27	9	17	26	21	12	33
Boat Launch	--	--	--	--	4	1	5	2	3	5
Day Use (unrelated to boat launch)	20 picnic sites	413	--	--	16	4	20	10	10	20
Net External Project Trips Made by Vehicle					**29**	**22**	**51**	**33**	**25**	**58**

Note:
1 Trip rates for campground and day use facilities obtained from *Trip Generation* (ITE, 2012).
Source: Fehr & Peers, 2014.

TRIP DISTRIBUTION

The distribution of project trips was estimated using the following sources and analytical techniques:

- Traffic assignment using the City of Colusa Travel Demand Model, initially developed for the *City of Colusa Streets & Roadways Master Plan* (2009).
- Review of existing travel patterns within the study area using traffic counts collected in November 2013.
- Relative travel time/speed comparisons between the project and key travel corridors for various routes.

Table 4 displays the expected distribution of inbound and outbound project trips to/from the Colusa-Sacramento River SRA estimated using the above sources and techniques. Project trips were assigned to the study intersections in accordance with the trip generation and distribution methodologies discussed in this section.

TABLE 4
WEEKDAY TRIP DISTRIBUTION

Gateway	% of Project Trips	
	AM Peak Hour	PM Peak Hour
To/from the north via SR 45	31%	31%
To/from the west via Lurline Avenue	8%	8%
To/from the south via 12th Street	2%	2%
To/from the south via SR 20	24%	24%
To/from the east via SR 45	36%	36%

Source: Fehr & Peers, 2014.

INTERSECTION OPERATIONS

The Existing Plus Project scenario assumes full build-out of the Preferred Plan and layers the additional trips generated by the Colusa-Sacramento River SRA on top of existing 2013 trip levels using the previously discussed trip distribution estimates. Figure 2 displays the Existing Plus Project traffic volumes, and Table 5 summarizes the results of the intersection analysis.

As shown in Table 5, with the addition of the traffic associated with the proposed project, all study intersections would continue to operate at an average of LOS B or better and would experience no degradation in level of service from existing conditions (refer to separate Appendix B for detailed calculations). Therefore, all project specific impacts to the study intersections are considered ***less than significant***.

TABLE 5
INTERSECTION LEVEL OF SERVICE – EXISTING PLUS PROJECT CONDITIONS

Intersection	Control	Existing				Existing Plus Project			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS
1. 13th Street (SR 45) / Main Street	Side-Street Stop	1(11)	A(B)	1(11)	A(B)	1(11)	A(B)	1(11)	A(B)
2. 13th Street (SR 45) / Lurline Avenue	Side-Street Stop	2(12)	A(B)	2(11)	A(B)	2(12)	A(B)	2(11)	A(B)
3. Market Street (SR 45) / 12th Street	Side-Street Stop	1(16)	A(C)	1(16)	A(C)	1(16)	A(C)	1(17)	A(C)
4. Market Street (SR 45/SR 20) / 10th Street (SR 20)	Traffic Signal	13	B	15	B	13	B	16	B

Note: 1. For signalized intersections, average intersection delay is reported in seconds per vehicle for all approaches. For side-street stop controlled intersections, the delay and LOS for the most-delayed individual movement is shown in parentheses next to the average intersection delay and LOS.
Source: Fehr & Peers, 2014

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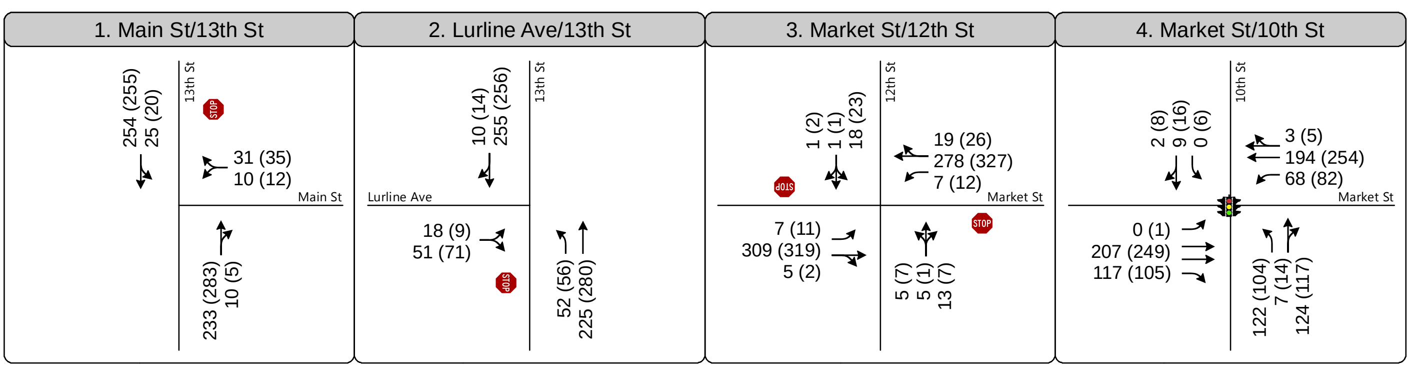

1 Study Intersection — Turn Lane

Traffic Signal — AM (PM) Peak Hour Traffic Volume

Stop Sign

Figure 2

Peak Hour Traffic Volumes and Lane Configurations - Existing Plus Project Conditions

BICYCLE AND PEDESTRIAN FACILITIES

Implementation of the proposed project would not eliminate or adversely affect existing bicycle or pedestrian facilities. The project includes various improvements to bicycle and pedestrian facilities, including the construction of new multi-use trails, construction of an off-street Class I bicycle facility, and implementation of an on-street bicycle route. Conversion of Roberts Road from a public roadway to a park roadway, a component of the project, would also facilitate the implementation of the planned Class I bicycle facility along this roadway which is included in the *City of Colusa Bikeway Master Plan* (2012). Therefore, project-specific impacts to bicycle or pedestrian facilities are considered ***less than significant***.

TRANSIT FACILITIES

Implementation of the proposed project would not eliminate or adversely affect existing transit operations or facilities. Therefore, project-specific impacts to transit facilities are considered ***less than significant***.

4. CUMULATIVE CONDITIONS

This chapter discusses the cumulative conditions of the transportation system with and without implementation of the proposed project. The cumulative conditions analysis considers future planned developments and transportation improvements within the vicinity of the Colusa-Sacramento River SRA.

TRAFFIC FORECASTS

The City of Colusa Travel Demand Model, initially developed for the *City of Colusa Streets & Roadways Master Plan* (2009) was used to forecast cumulative (year 2030) traffic volumes. The cumulative version of this model reflects planned land use growth both within the City of Colusa as well as within the surrounding region. The model also incorporates planned improvements to the surrounding transportation system. While the City of Colusa has approved the *Downtown Colusa Economic Development Plan*, which envisions increased levels of land development within the study area immediately south of the Park boundary, full build-out of the land uses as envisioned in this plan are not included in the model as specific development projects have not yet been approved and are not considered reasonably foreseeable.

Figure 3 displays the Cumulative No Project lane configurations and traffic volumes at each of the study intersections. As shown, all lane configurations and traffic controls at the study intersection are identical to existing conditions as no roadway improvement projects are currently planned within the study area.

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1 Study Intersection — Turn Lane

Traffic Signal — AM (PM) Peak Hour Traffic Volume

STOP Stop Sign

Figure 3

Peak Hour Traffic Volumes and Lane Configurations - Cumulative No Project Conditions

CUMULATIVE NO PROJECT INTERSECTION OPERATIONS

Table 6 summarizes traffic operations at the study intersections under Cumulative No Project conditions (refer to separate Appendix C for detailed calculations). As shown in Table 6, minimal increases in vehicle delay are forecasted to occur by the year 2030. All study intersections are expected to continue to operate at LOS D or better under cumulative conditions during both peak hours.

TABLE 6
INTERSECTION LEVEL OF SERVICE – CUMULATIVE NO PROJECT CONDITIONS

Intersection	Control	AM Peak Hour		PM Peak Hour	
		Delay[1]	LOS	Delay[1]	LOS
1. 13th Street (SR 45) / Main Street	Side-Street Stop	1(11)	A(B)	1(13)	A(B)
2. 13th Street (SR 45) / Lurline Avenue	Side-Street Stop	2(13)	A(B)	2(11)	A(B)
3. Market Street (SR 45) / 12th Street	Side-Street Stop	1(17)	A(C)	1(19)	A(C)
4. Market Street (SR 45/SR 20) / 10th Street (SR 20)	Traffic Signal	16	B	17	B

Note: 1. For signalized intersections, average intersection delay is reported in seconds per vehicle for all approaches. For side-street stop controlled intersections, the delay and LOS for the most-delayed individual movement is shown in parentheses next to the average intersection delay and LOS.
Source: Fehr & Peers, 2014

CUMULATIVE PLUS PROJECT INTERSECTION OPERATIONS

Figure 4 displays the Cumulative Plus Project traffic volumes, and Table 7 summarizes traffic operations at each of study intersections (refer to separate Appendix C for detailed calculations). As shown in Table 7, the addition of traffic associated with the proposed project does not alter the level of service at any study location from Cumulative No Project conditions. Therefore, all cumulative impacts to study intersections are considered ***less than significant.***

TABLE 7
INTERSECTION LEVEL OF SERVICE – CUMULATIVE PLUS PROJECT CONDITIONS

Intersection	Control	Cumulative No Project				Cumulative Plus Project			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS	Delay[1]	LOS
1. 13th Street (SR 45) / Main Street	Side-Street Stop	1(11)	A(B)	1(13)	A(B)	1(12)	A(B)	1(13)	A(B)
2. 13th Street (SR 45) / Lurline Avenue	Side-Street Stop	2(13)	A(B)	2(11)	A(B)	2(13)	A(B)	2(13)	A(B)
3. Market Street (SR 45) / 12th Street	Side-Street Stop	1(17)	A(C)	1(19)	A(C)	2(19)	A(C)	2(25)	A(C)
4. Market Street (SR 45/SR 20) / 10th Street (SR 20)	Traffic Signal	16	B	17	B	16	B	17	B

Note: 1. For signalized intersections, average intersection delay is reported in seconds per vehicle for all approaches. For side-street stop controlled intersections, the delay and LOS for the most-delayed individual movement is shown in parentheses next to the average intersection delay and LOS.
Source: Fehr & Peers, 2014

Evaluation of 12th Street Traffic Volumes

As previously discussed, implementation of the proposed project includes construction of a new vehicle entry point and entrance station located on 12th Street, two blocks west of the current vehicular entry point. This new entry, in combination with future land development projects, would increase traffic volumes on the segment of 12th Street north of Market Street. This roadway is classified as a local street in the *City of Colusa Streets & Roadways Master Plan* (2009), and currently has residential frontage. Based on the Cumulative Plus Project forecasts, this roadway segment is expected to carry approximately 900 daily trips by the year 2030.

While the *City of Colusa General Plan EIR* (2007) does not contain daily roadway segment volume thresholds for local roadways, other local jurisdictions within the region have adopted thresholds for roadway segment performance, including Sacramento County and the City of Sacramento. According to the *Sacramento County Traffic Impact Analysis Guidelines* (2004), two-lane residential collector roadways with frontage may carry up to 4,800 cars per day while maintaining LOS C operations (the LOS threshold used by the City of Colusa). According to the

City of Sacramento's guidelines (*City of Sacramento 2030 General Plan*, 2009), two-lane local streets (i.e., primarily residential roadways) may carry up to 4,000 cars per day while maintaining LOS C operations. Therefore, 12th Street, with an estimated total cumulative volume of 900 daily trips, is expected to continue to operate well under the identified capacities for local roadways under all scenarios.

BICYCLE AND PEDESTRIAN FACILITIES

Implementation of the proposed project would not eliminate or adversely affect existing or planned bicycle and pedestrian facilities. The project includes various improvements to bicycle and pedestrian facilities, including the construction of new multi-use trails, construction of an off-street Class I bicycle facility, and implementation of an on-street bicycle route. Conversion of Roberts Road from a public roadway to a park roadway, a component of the project, would also facilitate the implementation of the planned Class I bicycle facility along this roadway which is included in the *City of Colusa Bikeway Master Plan* (2012). Therefore, cumulative impacts to bicycle or pedestrian facilities are considered ***less than significant***.

TRANSIT FACILITIES

Implementation of the proposed project would not eliminate or adversely affect existing or planned transit operations or facilities. Therefore, cumulative impacts to transit facilities are considered ***less than significant***.

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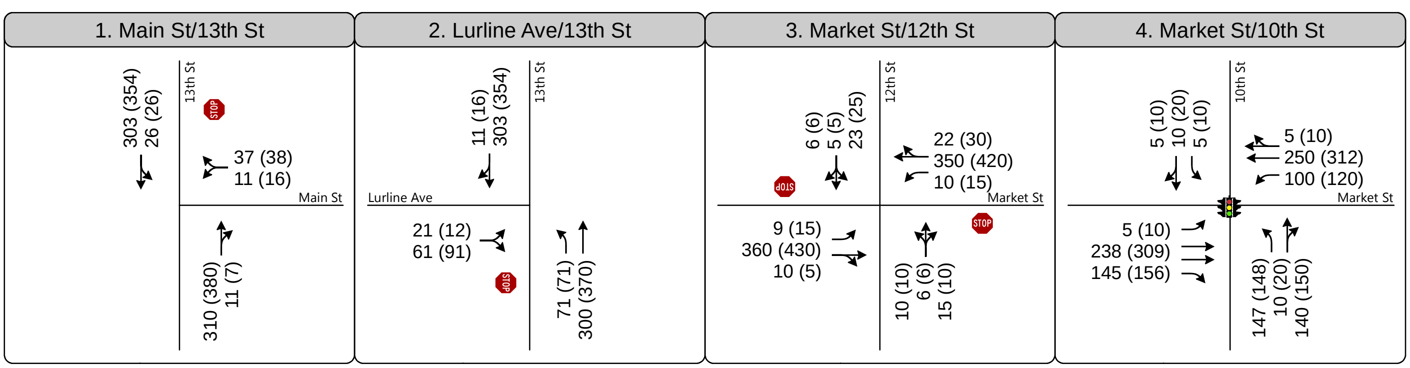

1	Study Intersection		Turn Lane
	Traffic Signal	AM (PM)	Peak Hour Traffic Volume
STOP	Stop Sign		

Figure 4

Peak Hour Traffic Volumes and Lane Configurations - Cumulative Plus Project Conditions

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Appendix A:

Existing Conditions
Intersection Level of Service Calculations

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	9	24	233	9	19	251
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	9	25	240	9	20	259

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	543	245	0	0	249	0
Stage 1	245	-	-	-	-	-
Stage 2	298	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	501	794	-	-	1317	-
Stage 1	796	-	-	-	-	-
Stage 2	753	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	492	794	-	-	1317	-
Mov Cap-2 Maneuver	492	-	-	-	-	-
Stage 1	796	-	-	-	-	-
Stage 2	739	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	0.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	680	1317	-
HCM Lane V/C Ratio	-	-	0.05	0.015	-
HCM Control Delay (s)	-	-	10.6	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	17	50	51	225	252	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	40	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	19	55	56	247	277	10

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	641	282	287	0	-	0
Stage 1	282	-	-	-	-	-
Stage 2	359	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	439	757	1275	-	-	-
Stage 1	766	-	-	-	-	-
Stage 2	707	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	420	757	1275	-	-	-
Mov Cap-2 Maneuver	420	-	-	-	-	-
Stage 1	766	-	-	-	-	-
Stage 2	676	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.5	1.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1275	-	629	-	-
HCM Lane V/C Ratio	0.044	-	0.117	-	-
HCM Control Delay (s)	8	-	11.5	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	-	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	3	309	5	7	278	2	5	4	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	347	6	8	312	2	6	4	15

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	315	0	0	353	0	0	687	687	350
Stage 1	-	-	-	-	-	-	357	357	-
Stage 2	-	-	-	-	-	-	330	330	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1245	-	-	1206	-	-	361	370	693
Stage 1	-	-	-	-	-	-	661	628	-
Stage 2	-	-	-	-	-	-	683	646	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1245	-	-	1206	-	-	358	367	693
Mov Cap-2 Maneuver	-	-	-	-	-	-	358	367	-
Stage 1	-	-	-	-	-	-	659	626	-
Stage 2	-	-	-	-	-	-	677	642	-

Approach	EB	WB	NB
HCM Control Delay, s	0.1	0.2	12.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	504	1245	-	-	1206	-	-	347
HCM Lane V/C Ratio	0.049	0.003	-	-	0.007	-	-	0.019
HCM Control Delay (s)	12.5	7.9	-	-	8	-	-	15.6
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	5	1	0
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	89	89	89
Heavy Vehicles, %	2	2	2
Mvmt Flow	6	1	0

Major/Minor	Minor2		
Conflicting Flow All	695	689	313
Stage 1	329	329	-
Stage 2	366	360	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	357	369	727
Stage 1	684	646	-
Stage 2	653	626	-
Platoon blocked, %			
Mov Cap-1 Maneuver	344	366	727
Mov Cap-2 Maneuver	344	366	-
Stage 1	682	642	-
Stage 2	633	624	-

Approach	SB
HCM Control Delay, s	15.6
HCM LOS	C

Minor Lane/Major Mvmt

Two Way Analysis cannot be performed on Signalized Intersection.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	199	112	68	184	3	115	7	124	0	9	2
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	0	229	129	78	211	3	132	8	143	0	10	2
Adj No. of Lanes	1	2	1	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	4	660	295	321	1603	23	229	30	530	4	211	42
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.00	0.19	0.19	0.18	0.45	0.45	0.13	0.35	0.35	0.00	0.14	0.14
Ln Grp Delay, s/veh	0.0	15.3	15.8	15.2	7.0	7.0	18.4	0.0	10.1	0.0	0.0	16.0
Ln Grp LOS		B	B	B	A	A	B		B			B
Approach Vol, veh/h		358			292			283			12	
Approach Delay, s/veh		15.5			9.2			14.0			16.0	
Approach LOS		B			A			B			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	2.0	3.0	2.0	4.0	2.0	4.0	2.0	4.0
Phs Duration (G+Y+Rc), s	11.3	12.6	9.0	10.0	0.0	23.9	0.0	19.0
Change Period (Y+Rc), s	3.5	4.6	3.5	4.0	3.5	4.6	3.5	4.0
Max Green (Gmax), s	16.5	35.4	16.5	11.0	11.5	35.4	11.5	29.0
Max Allow Headway (MAH), s	1.8	2.5	1.8	3.5	0.0	2.5	0.0	3.5
Max Q Clear (g_c+l1), s	3.6	5.1	5.0	2.2	0.0	3.5	0.0	4.9
Green Ext Time (g_e), s	0.0	0.7	0.0	0.2	0.0	0.7	0.0	0.4
Prob of Phs Call (p_c)	0.97	1.00	0.79	0.86	0.00	1.00	0.00	0.97
Prob of Max Out (p_x)	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1774		1774		1774		1774	
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		1508		3573		85
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		302		51		1511
Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Prot)		(Prot)		(Prot)		(Prot)	
Lanes in Grp	1	0	1	0	1	0	1	0

Grp Vol (v), veh/h	78	0	132	0	0	0	0	0
Grp Sat Flow (s), veh/h/ln	1774	0	1774	0	1774	0	1774	0
Q Serve Time (g_s), s	1.6	0.0	3.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	1.6	0.0	3.0	0.0	0.0	0.0	0.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	321	0	229	0	4	0	4	0
V/C Ratio (X)	0.24	0.00	0.58	0.00	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	682	0	682	0	476	0	476	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	15.1	0.0	17.6	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.8	0.0	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	15.2	0.0	18.4	0.0	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.8	0.0	1.5	0.0	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	0.8	0.0	1.5	0.0	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.14	0.00	0.17	0.00	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	229	0	0	0	104	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	2.4	0.0	0.0	0.0	1.5	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	2.4	0.0	0.0	0.0	1.5	0.0	0.0
Lane Grp Cap (c), veh/h	0	660	0	0	0	794	0	0
V/C Ratio (X)	0.00	0.35	0.00	0.00	0.00	0.13	0.00	0.00
Avail Cap (c_a), veh/h	0	2921	0	0	0	1460	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	15.2	0.0	0.0	0.0	6.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	15.3	0.0	0.0	0.0	7.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.2	0.0	0.0	0.0	0.7	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.2	0.0	0.0	0.0	0.7	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.09	0.00	0.00	0.00	0.02	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		T+R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	129	0	12	0	110	0	151
Grp Sat Flow (s), veh/h/ln	0	1583	0	1810	0	1854	0	1596
Q Serve Time (g_s), s	0.0	3.1	0.0	0.2	0.0	1.5	0.0	2.9
Cycle Q Clear Time (g_c), s	0.0	3.1	0.0	0.2	0.0	1.5	0.0	2.9
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.17	0.00	0.03	0.00	0.95
Lane Grp Cap (c), veh/h	0	295	0	253	0	832	0	560
V/C Ratio (X)	0.00	0.44	0.00	0.05	0.00	0.13	0.00	0.27
Avail Cap (c_a), veh/h	0	1307	0	464	0	1530	0	1079
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	15.5	0.0	16.0	0.0	6.9	0.0	10.0
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	15.8	0.0	16.0	0.0	7.0	0.0	10.1
1st-Term Q (Q1), veh/ln	0.0	1.4	0.0	0.1	0.0	0.8	0.0	1.3
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.4	0.0	0.1	0.0	0.8	0.0	1.3
%ile Storage Ratio (RQ%)	0.00	0.31	0.00	0.01	0.00	0.03	0.00	0.04
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary		
HCM 2010 Ctrl Delay		13.1
HCM 2010 LOS		B

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	11	27	283	3	14	251
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	28	292	3	14	259

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	581	293	0	0	295	0
Stage 1	293	-	-	-	-	-
Stage 2	288	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	476	746	-	-	1266	-
Stage 1	757	-	-	-	-	-
Stage 2	761	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	470	746	-	-	1266	-
Mov Cap-2 Maneuver	470	-	-	-	-	-
Stage 1	757	-	-	-	-	-
Stage 2	751	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	638	1266	-
HCM Lane V/C Ratio	-	-	0.061	0.011	-
HCM Control Delay (s)	-	-	11	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection						
Int Delay, s/veh	1.9					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	7	70	55	280	252	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	40	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	76	60	304	274	14

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	705	281	288	0	-	0
Stage 1	281	-	-	-	-	-
Stage 2	424	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	403	758	1274	-	-	-
Stage 1	767	-	-	-	-	-
Stage 2	660	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	384	758	1274	-	-	-
Mov Cap-2 Maneuver	384	-	-	-	-	-
Stage 1	767	-	-	-	-	-
Stage 2	629	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.9	1.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1274	-	696	-	-
HCM Lane V/C Ratio	0.047	-	0.12	-	-
HCM Control Delay (s)	8	-	10.9	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	-	-

Intersection									
Int Delay, s/veh	0.7								

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	6	319	2	12	327	6	7	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	336	2	13	344	6	7	0	7

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	351	0	0	338	0	0	723	725	337
Stage 1	-	-	-	-	-	-	349	349	-
Stage 2	-	-	-	-	-	-	374	376	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1208	-	-	1221	-	-	342	352	705
Stage 1	-	-	-	-	-	-	667	633	-
Stage 2	-	-	-	-	-	-	647	616	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1208	-	-	1221	-	-	337	347	705
Mov Cap-2 Maneuver	-	-	-	-	-	-	337	347	-
Stage 1	-	-	-	-	-	-	664	630	-
Stage 2	-	-	-	-	-	-	638	609	-

Approach	EB	WB	NB
HCM Control Delay, s	0.1	0.3	13.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	456	1208	-	-	1221	-	-	352
HCM Lane V/C Ratio	0.032	0.005	-	-	0.01	-	-	0.03
HCM Control Delay (s)	13.2	8	-	-	8	-	-	15.5
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	8	1	1
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	95	95	95
Heavy Vehicles, %	2	2	2
Mvmt Flow	8	1	1

Major/Minor	Minor2		
Conflicting Flow All	726	724	347
Stage 1	373	373	-
Stage 2	353	351	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	340	352	696
Stage 1	648	618	-
Stage 2	664	632	-
Platoon blocked, %			
Mov Cap-1 Maneuver	332	347	696
Mov Cap-2 Maneuver	332	347	-
Stage 1	645	611	-
Stage 2	654	629	-

Approach	SB
HCM Control Delay, s	15.5
HCM LOS	C

Minor Lane/Major Mvmt

Two Way Analysis cannot be performed on Signalized Intersection.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	240	99	82	242	5	96	14	117	6	16	8
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	1	258	106	88	260	5	103	15	126	6	17	9
Adj No. of Lanes	1	2	1	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	332	672	301	328	667	13	205	42	356	20	164	87
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.19	0.19	0.19	0.18	0.19	0.19	0.12	0.25	0.25	0.01	0.14	0.14
Ln Grp Delay, s/veh	14.1	15.2	15.2	15.0	15.4	15.4	18.4	0.0	13.4	24.0	0.0	15.9
Ln Grp LOS	B	B	B	B	B	B	B		B	C		B
Approach Vol, veh/h		365			353			244			32	
Approach Delay, s/veh		15.2			15.3			15.5			17.4	
Approach LOS		B			B			B			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	2.0	3.0	2.0	4.0	2.0	4.0	2.0	4.0
Phs Duration (G+Y+Rc), s	11.4	12.7	8.4	10.1	11.5	12.6	4.0	14.5
Change Period (Y+Rc), s	3.5	4.6	3.5	4.0	3.5	4.6	3.5	4.0
Max Green (Gmax), s	16.5	35.4	16.5	11.0	11.5	35.4	11.5	29.0
Max Allow Headway (MAH), s	1.8	2.5	1.8	3.5	1.8	2.5	1.8	3.5
Max Q Clear (g_c+l1), s	3.8	4.7	4.3	2.5	2.0	4.7	2.1	5.1
Green Ext Time (g_e), s	0.0	0.8	0.0	0.2	0.0	0.8	0.0	0.4
Prob of Phs Call (p_c)	0.98	1.00	0.70	0.87	1.00	1.00	0.07	0.96
Prob of Max Out (p_x)	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1774		1774		1774		1774	
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		1148		3552		171
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		608		68		1438
Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Prot)		(Prot)		(Prot)		(Prot)	
Lanes in Grp	1	0	1	0	1	0	1	0

Grp Vol (v), veh/h	88	0	103	0	1	0	6	0
Grp Sat Flow (s), veh/h/ln	1774	0	1774	0	1774	0	1774	0
Q Serve Time (g_s), s	1.8	0.0	2.3	0.0	0.0	0.0	0.1	0.0
Cycle Q Clear Time (g_c), s	1.8	0.0	2.3	0.0	0.0	0.0	0.1	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	328	0	205	0	332	0	20	0
V/C Ratio (X)	0.27	0.00	0.50	0.00	0.00	0.00	0.30	0.00
Avail Cap (c_a), veh/h	687	0	687	0	479	0	479	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d1), s/veh	14.9	0.0	17.7	0.0	14.1	0.0	20.9	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.7	0.0	0.0	0.0	3.1	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	15.0	0.0	18.4	0.0	14.1	0.0	24.0	0.0
1st-Term Q (Q1), veh/ln	0.9	0.0	1.1	0.0	0.0	0.0	0.1	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	0.9	0.0	1.2	0.0	0.0	0.0	0.1	0.0
%ile Storage Ratio (RQ%)	0.16	0.00	0.13	0.00	0.00	0.00	0.02	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	258	0	0	0	129	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	2.7	0.0	0.0	0.0	2.7	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	2.7	0.0	0.0	0.0	2.7	0.0	0.0
Lane Grp Cap (c), veh/h	0	672	0	0	0	332	0	0
V/C Ratio (X)	0.00	0.38	0.00	0.00	0.00	0.39	0.00	0.00
Avail Cap (c_a), veh/h	0	2942	0	0	0	1471	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	15.1	0.0	0.0	0.0	15.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	0.3	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	15.2	0.0	0.0	0.0	15.4	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.3	0.0	0.0	0.0	1.3	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.3	0.0	0.0	0.0	1.4	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.10	0.00	0.00	0.00	0.04	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		T+R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	106	0	26	0	136	0	141
Grp Sat Flow (s), veh/h/ln	0	1583	0	1756	0	1851	0	1609
Q Serve Time (g_s), s	0.0	2.5	0.0	0.5	0.0	2.7	0.0	3.1
Cycle Q Clear Time (g_c), s	0.0	2.5	0.0	0.5	0.0	2.7	0.0	3.1
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.35	0.00	0.04	0.00	0.89
Lane Grp Cap (c), veh/h	0	301	0	251	0	348	0	398
V/C Ratio (X)	0.00	0.35	0.00	0.10	0.00	0.39	0.00	0.35
Avail Cap (c_a), veh/h	0	1316	0	453	0	1538	0	1096
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	15.0	0.0	15.9	0.0	15.2	0.0	13.2
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.1	0.0	0.3	0.0	0.2
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	15.2	0.0	15.9	0.0	15.4	0.0	13.4
1st-Term Q (Q1), veh/ln	0.0	1.1	0.0	0.3	0.0	1.4	0.0	1.4
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.1	0.0	0.3	0.0	1.4	0.0	1.4
%ile Storage Ratio (RQ%)	0.00	0.24	0.00	0.03	0.00	0.05	0.00	0.05
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		15.4						
HCM 2010 LOS		B						

Appendix B:

Existing Plus Project Conditions
Intersection Level of Service Calculations

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	10	31	233	10	25	254
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	32	240	10	26	262

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	558	245	0	0	251	0
Stage 1	245	-	-	-	-	-
Stage 2	313	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	491	794	-	-	1314	-
Stage 1	796	-	-	-	-	-
Stage 2	741	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	480	794	-	-	1314	-
Mov Cap-2 Maneuver	480	-	-	-	-	-
Stage 1	796	-	-	-	-	-
Stage 2	724	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	685	1314	-
HCM Lane V/C Ratio	-	-	0.062	0.02	-
HCM Control Delay (s)	-	-	10.6	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	18	51	52	225	255	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	40	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	20	56	57	247	280	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	648	286	291	0	-	0
Stage 1	286	-	-	-	-	-
Stage 2	362	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	435	753	1271	-	-	-
Stage 1	763	-	-	-	-	-
Stage 2	704	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	415	753	1271	-	-	-
Mov Cap-2 Maneuver	415	-	-	-	-	-
Stage 1	763	-	-	-	-	-
Stage 2	672	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.6	1.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1271	-	621	-	-
HCM Lane V/C Ratio	0.045	-	0.122	-	-
HCM Control Delay (s)	8	-	11.6	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.1	-	0.4	-	-

Intersection									
Int Delay, s/veh	1.1								

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	7	309	5	7	278	19	5	5	13
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	8	347	6	8	312	21	6	6	15

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	334	0	0	353	0	0	706	715	350
Stage 1	-	-	-	-	-	-	366	366	-
Stage 2	-	-	-	-	-	-	340	349	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1225	-	-	1206	-	-	351	356	693
Stage 1	-	-	-	-	-	-	653	623	-
Stage 2	-	-	-	-	-	-	675	633	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1225	-	-	1206	-	-	346	351	693
Mov Cap-2 Maneuver	-	-	-	-	-	-	346	351	-
Stage 1	-	-	-	-	-	-	649	619	-
Stage 2	-	-	-	-	-	-	668	629	-

Approach	EB	WB	NB
HCM Control Delay, s	0.2	0.2	12.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	485	1225	-	-	1206	-	-	341
HCM Lane V/C Ratio	0.053	0.006	-	-	0.007	-	-	0.066
HCM Control Delay (s)	12.8	8	-	-	8	-	-	16.3
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.2

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	18	1	1
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	89	89	89
Heavy Vehicles, %	2	2	2
Mvmt Flow	20	1	1

Major/Minor	Minor2		
Conflicting Flow All	715	708	323
Stage 1	339	339	-
Stage 2	376	369	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	346	360	718
Stage 1	676	640	-
Stage 2	645	621	-
Platoon blocked, %			
Mov Cap-1 Maneuver	331	355	718
Mov Cap-2 Maneuver	331	355	-
Stage 1	672	636	-
Stage 2	622	617	-

Approach	SB
HCM Control Delay, s	16.3
HCM LOS	C

Minor Lane/Major Mvmt

Two Way Analysis cannot be performed on Signalized Intersection.

K52

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	207	117	68	194	3	122	7	124	0	9	2
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	0	238	134	78	223	3	140	8	143	0	10	2
Adj No. of Lanes	1	2	1	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	4	657	294	321	1601	22	234	30	533	4	210	42
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.00	0.19	0.19	0.18	0.45	0.45	0.13	0.35	0.35	0.00	0.14	0.14
Ln Grp Delay, s/veh	0.0	15.4	16.0	15.3	7.0	7.0	18.5	0.0	10.1	0.0	0.0	16.1
Ln Grp LOS		B	B	B	A	A	B		B			B
Approach Vol, veh/h		372			304			291			12	
Approach Delay, s/veh		15.6			9.1			14.1			16.1	
Approach LOS		B			A			B			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	2.0	3.0	2.0	4.0	2.0	4.0	2.0	4.0
Phs Duration (G+Y+Rc), s	11.3	12.6	9.2	10.0	0.0	23.9	0.0	19.2
Change Period (Y+Rc), s	3.5	4.6	3.5	4.0	3.5	4.6	3.5	4.0
Max Green (Gmax), s	16.5	35.4	16.5	11.0	11.5	35.4	11.5	29.0
Max Allow Headway (MAH), s	1.8	2.5	1.8	3.5	0.0	2.5	0.0	3.5
Max Q Clear (g_c+l1), s	3.6	5.2	5.2	2.2	0.0	3.6	0.0	4.9
Green Ext Time (g_e), s	0.0	0.7	0.0	0.2	0.0	0.7	0.0	0.4
Prob of Phs Call (p_c)	0.97	1.00	0.81	0.86	0.00	1.00	0.00	0.97
Prob of Max Out (p_x)	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1774		1774		1774		1774	
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		1508		3576		85
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		302		48		1511
Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Prot)		(Prot)		(Prot)		(Prot)	
Lanes in Grp	1	0	1	0	1	0	1	0

K53

Grp Vol (v), veh/h	78	0	140	0	0	0	0	0
Grp Sat Flow (s), veh/h/ln	1774	0	1774	0	1774	0	1774	0
Q Serve Time (g_s), s	1.6	0.0	3.2	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear Time (g_c), s	1.6	0.0	3.2	0.0	0.0	0.0	0.0	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	321	0	234	0	4	0	4	0
V/C Ratio (X)	0.24	0.00	0.60	0.00	0.00	0.00	0.00	0.00
Avail Cap (c_a), veh/h	679	0	679	0	474	0	474	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
Uniform Delay (d1), s/veh	15.1	0.0	17.6	0.0	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.9	0.0	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	15.3	0.0	18.5	0.0	0.0	0.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.8	0.0	1.6	0.0	0.0	0.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	0.8	0.0	1.6	0.0	0.0	0.0	0.0	0.0
%ile Storage Ratio (RQ%)	0.14	0.00	0.18	0.00	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	238	0	0	0	110	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	2.5	0.0	0.0	0.0	1.6	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	2.5	0.0	0.0	0.0	1.6	0.0	0.0
Lane Grp Cap (c), veh/h	0	657	0	0	0	792	0	0
V/C Ratio (X)	0.00	0.36	0.00	0.00	0.00	0.14	0.00	0.00
Avail Cap (c_a), veh/h	0	2908	0	0	0	1454	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	15.3	0.0	0.0	0.0	7.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	15.4	0.0	0.0	0.0	7.0	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.2	0.0	0.0	0.0	0.8	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.2	0.0	0.0	0.0	0.8	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.09	0.00	0.00	0.00	0.03	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		T+R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	134	0	12	0	116	0	151
Grp Sat Flow (s), veh/h/ln	0	1583	0	1810	0	1854	0	1596
Q Serve Time (g_s), s	0.0	3.2	0.0	0.2	0.0	1.6	0.0	2.9
Cycle Q Clear Time (g_c), s	0.0	3.2	0.0	0.2	0.0	1.6	0.0	2.9
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.17	0.00	0.03	0.00	0.95
Lane Grp Cap (c), veh/h	0	294	0	252	0	830	0	563
V/C Ratio (X)	0.00	0.46	0.00	0.05	0.00	0.14	0.00	0.27
Avail Cap (c_a), veh/h	0	1301	0	462	0	1524	0	1074
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	15.6	0.0	16.1	0.0	7.0	0.0	10.0
Incr Delay (d2), s/veh	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	16.0	0.0	16.1	0.0	7.0	0.0	10.1
1st-Term Q (Q1), veh/ln	0.0	1.4	0.0	0.1	0.0	0.8	0.0	1.3
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.5	0.0	0.1	0.0	0.8	0.0	1.3
%ile Storage Ratio (RQ%)	0.00	0.32	0.00	0.01	0.00	0.03	0.00	0.04
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		13.2						
HCM 2010 LOS		B						

Intersection							
Int Delay, s/veh	1.1						

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	12	35	283	5	20	255
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	36	292	5	21	263

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	598	294	0	0	297	0
Stage 1	294	-	-	-	-	-
Stage 2	304	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	465	745	-	-	1264	-
Stage 1	756	-	-	-	-	-
Stage 2	748	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	456	745	-	-	1264	-
Mov Cap-2 Maneuver	456	-	-	-	-	-
Stage 1	756	-	-	-	-	-
Stage 2	734	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.1	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	641	1264	-
HCM Lane V/C Ratio	-	-	0.076	0.016	-
HCM Control Delay (s)	-	-	11.1	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	9	71	56	280	256	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	40	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	77	61	304	278	15

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	712	286	293	0	-	0
Stage 1	286	-	-	-	-	-
Stage 2	426	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	399	753	1269	-	-	-
Stage 1	763	-	-	-	-	-
Stage 2	659	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	380	753	1269	-	-	-
Mov Cap-2 Maneuver	380	-	-	-	-	-
Stage 1	763	-	-	-	-	-
Stage 2	627	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.1	1.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1269	-	678	-	-
HCM Lane V/C Ratio	0.048	-	0.128	-	-
HCM Control Delay (s)	8	-	11.1	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.4	-	-

Intersection									
Int Delay, s/veh	1.1								

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	11	319	2	12	327	26	7	1	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	336	2	13	344	27	7	1	7

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	372	0	0	338	0	0	745	757	337
Stage 1	-	-	-	-	-	-	360	360	-
Stage 2	-	-	-	-	-	-	385	397	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1186	-	-	1221	-	-	330	337	705
Stage 1	-	-	-	-	-	-	658	626	-
Stage 2	-	-	-	-	-	-	638	603	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1186	-	-	1221	-	-	323	330	705
Mov Cap-2 Maneuver	-	-	-	-	-	-	323	330	-
Stage 1	-	-	-	-	-	-	651	620	-
Stage 2	-	-	-	-	-	-	628	597	-

Approach	EB	WB	NB
HCM Control Delay, s	0.3	0.3	13.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	433	1186	-	-	1221	-	-	334
HCM Lane V/C Ratio	0.036	0.01	-	-	0.01	-	-	0.082
HCM Control Delay (s)	13.6	8.1	-	-	8	-	-	16.7
HCM Lane LOS	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.3

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Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	23	1	2
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	95	95	95
Heavy Vehicles, %	2	2	2
Mvmt Flow	24	1	2

Major/Minor	Minor2		
Conflicting Flow All	747	744	358
Stage 1	383	383	-
Stage 2	364	361	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	329	343	686
Stage 1	640	612	-
Stage 2	655	626	-
Platoon blocked, %			
Mov Cap-1 Maneuver	320	336	686
Mov Cap-2 Maneuver	320	336	-
Stage 1	634	605	-
Stage 2	641	620	-

Approach	SB
HCM Control Delay, s	16.7
HCM LOS	C

Minor Lane/Major Mvmt

Two Way Analysis cannot be performed on Signalized Intersection.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	249	105	82	254	5	104	14	117	6	16	8
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	1	268	113	88	273	5	112	15	126	6	17	9
Adj No. of Lanes	1	2	1	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	330	667	298	327	664	12	213	43	362	20	164	87
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.19	0.19	0.19	0.18	0.19	0.19	0.12	0.25	0.25	0.01	0.14	0.14
Ln Grp Delay, s/veh	14.2	15.4	15.5	15.2	15.6	15.6	18.4	0.0	13.3	24.1	0.0	16.0
Ln Grp LOS	B	B	B	B	B	B	B		B	C		B
Approach Vol, veh/h		382			366			253			32	
Approach Delay, s/veh		15.4			15.5			15.6			17.6	
Approach LOS		B			B			B			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	2.0	3.0	2.0	4.0	2.0	4.0	2.0	4.0
Phs Duration (G+Y+Rc), s	11.4	12.7	8.7	10.1	11.5	12.6	4.0	14.8
Change Period (Y+Rc), s	3.5	4.6	3.5	4.0	3.5	4.6	3.5	4.0
Max Green (Gmax), s	16.5	35.4	16.5	11.0	11.5	35.4	11.5	29.0
Max Allow Headway (MAH), s	1.8	2.5	1.8	3.5	1.8	2.5	1.8	3.5
Max Q Clear (g_c+l1), s	3.8	4.8	4.5	2.6	2.0	4.9	2.1	5.1
Green Ext Time (g_e), s	0.0	0.8	0.0	0.2	0.0	0.8	0.0	0.4
Prob of Phs Call (p_c)	0.99	1.00	0.74	0.87	1.00	1.00	0.07	0.96
Prob of Max Out (p_x)	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1774		1774		1774		1774	
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		1148		3556		171
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		608		65		1438
Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Prot)		(Prot)		(Prot)		(Prot)	
Lanes in Grp	1	0	1	0	1	0	1	0

Grp Vol (v), veh/h	88	0	112	0	1	0	6	0
Grp Sat Flow (s), veh/h/ln	1774	0	1774	0	1774	0	1774	0
Q Serve Time (g_s), s	1.8	0.0	2.5	0.0	0.0	0.0	0.1	0.0
Cycle Q Clear Time (g_c), s	1.8	0.0	2.5	0.0	0.0	0.0	0.1	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	327	0	213	0	330	0	20	0
V/C Ratio (X)	0.27	0.00	0.52	0.00	0.00	0.00	0.30	0.00
Avail Cap (c_a), veh/h	683	0	683	0	476	0	476	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d1), s/veh	15.0	0.0	17.7	0.0	14.2	0.0	21.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	0.7	0.0	0.0	0.0	3.1	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	15.2	0.0	18.4	0.0	14.2	0.0	24.1	0.0
1st-Term Q (Q1), veh/ln	0.9	0.0	1.2	0.0	0.0	0.0	0.1	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	0.9	0.0	1.3	0.0	0.0	0.0	0.1	0.0
%ile Storage Ratio (RQ%)	0.16	0.00	0.14	0.00	0.00	0.00	0.02	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	268	0	0	0	136	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	2.8	0.0	0.0	0.0	2.9	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	2.8	0.0	0.0	0.0	2.9	0.0	0.0
Lane Grp Cap (c), veh/h	0	667	0	0	0	331	0	0
V/C Ratio (X)	0.00	0.40	0.00	0.00	0.00	0.41	0.00	0.00
Avail Cap (c_a), veh/h	0	2925	0	0	0	1463	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	15.3	0.0	0.0	0.0	15.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.0	0.0	0.3	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	15.4	0.0	0.0	0.0	15.6	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.4	0.0	0.0	0.0	1.4	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.4	0.0	0.0	0.0	1.4	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.10	0.00	0.00	0.00	0.05	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		T+R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	113	0	26	0	142	0	141
Grp Sat Flow (s), veh/h/ln	0	1583	0	1756	0	1851	0	1609
Q Serve Time (g_s), s	0.0	2.7	0.0	0.6	0.0	2.9	0.0	3.1
Cycle Q Clear Time (g_c), s	0.0	2.7	0.0	0.6	0.0	2.9	0.0	3.1
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.35	0.00	0.04	0.00	0.89
Lane Grp Cap (c), veh/h	0	298	0	250	0	346	0	405
V/C Ratio (X)	0.00	0.38	0.00	0.10	0.00	0.41	0.00	0.35
Avail Cap (c_a), veh/h	0	1309	0	451	0	1530	0	1089
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	15.2	0.0	16.0	0.0	15.3	0.0	13.1
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.1	0.0	0.3	0.0	0.2
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	15.5	0.0	16.0	0.0	15.6	0.0	13.3
1st-Term Q (Q1), veh/ln	0.0	1.2	0.0	0.3	0.0	1.5	0.0	1.4
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.2	0.0	0.3	0.0	1.5	0.0	1.4
%ile Storage Ratio (RQ%)	0.00	0.26	0.00	0.03	0.00	0.05	0.00	0.05
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		15.6						
HCM 2010 LOS		B						

Appendix C:

Cumulative Conditions
Intersection Level of Service Calculations

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	10	30	310	10	20	300
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	31	320	10	21	309

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	676	325	0	0	330	0
Stage 1	325	-	-	-	-	-
Stage 2	351	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	419	716	-	-	1229	-
Stage 1	732	-	-	-	-	-
Stage 2	713	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	410	716	-	-	1229	-
Mov Cap-2 Maneuver	410	-	-	-	-	-
Stage 1	732	-	-	-	-	-
Stage 2	698	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.4	0	0.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	603	1229	-
HCM Lane V/C Ratio	-	-	0.068	0.017	-
HCM Control Delay (s)	-	-	11.4	8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	20	60	70	300	300	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	40	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	66	77	330	330	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	819	335	341	0	-	0
Stage 1	335	-	-	-	-	-
Stage 2	484	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	345	707	1218	-	-	-
Stage 1	725	-	-	-	-	-
Stage 2	620	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	323	707	1218	-	-	-
Mov Cap-2 Maneuver	323	-	-	-	-	-
Stage 1	725	-	-	-	-	-
Stage 2	581	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.9	1.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1218	-	545	-	-
HCM Lane V/C Ratio	0.063	-	0.161	-	-
HCM Control Delay (s)	8.2	-	12.9	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.6	-	-

Intersection									
Int Delay, s/veh	1.1								

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	5	360	10	10	350	5	10	5	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	404	11	11	393	6	11	6	17

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	399	0	0	416	0	0	845	842	410
Stage 1	-	-	-	-	-	-	421	421	-
Stage 2	-	-	-	-	-	-	424	421	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1160	-	-	1143	-	-	283	301	642
Stage 1	-	-	-	-	-	-	610	589	-
Stage 2	-	-	-	-	-	-	608	589	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1160	-	-	1143	-	-	273	297	642
Mov Cap-2 Maneuver	-	-	-	-	-	-	273	297	-
Stage 1	-	-	-	-	-	-	607	586	-
Stage 2	-	-	-	-	-	-	591	583	-

Approach	EB	WB	NB
HCM Control Delay, s	0.1	0.2	15.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	390	1160	-	-	1143	-	-	322
HCM Lane V/C Ratio	0.086	0.005	-	-	0.01	-	-	0.07
HCM Control Delay (s)	15.1	8.1	-	-	8.2	-	-	17
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.2

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	10	5	5
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	89	89	89
Heavy Vehicles, %	2	2	2
Mvmt Flow	11	6	6

Major/Minor	Minor2		
Conflicting Flow All	852	846	396
Stage 1	419	419	-
Stage 2	433	427	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	280	299	653
Stage 1	612	590	-
Stage 2	601	585	-
Platoon blocked, %			
Mov Cap-1 Maneuver	266	295	653
Mov Cap-2 Maneuver	266	295	-
Stage 1	609	584	-
Stage 2	577	582	-

Approach	SB
HCM Control Delay, s	17
HCM LOS	C

Minor Lane/Major Mvmt

Two Way Analysis cannot be performed on Signalized Intersection.

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Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰	↱		↰	↱	
Volume (veh/h)	5	230	140	100	240	5	140	10	140	5	10	5
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	6	264	161	115	276	6	161	11	161	6	11	6
Adj No. of Lanes	1	2	1	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	322	648	290	320	645	14	243	28	404	20	164	89
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.14	0.27	0.27	0.01	0.14	0.14
Ln Grp Delay, s/veh	14.8	16.0	16.9	16.0	16.3	16.3	19.2	0.0	13.3	24.6	0.0	16.3
Ln Grp LOS	B	B	B	B	B	B	B		B	C		B
Approach Vol, veh/h		431			397			333			23	
Approach Delay, s/veh		16.3			16.2			16.2			18.5	
Approach LOS		B			B			B			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	2.0	3.0	2.0	4.0	2.0	4.0	2.0	4.0
Phs Duration (G+Y+Rc), s	11.4	12.6	9.5	10.4	11.5	12.6	4.0	15.9
Change Period (Y+Rc), s	3.5	4.6	3.5	4.0	3.5	4.6	3.5	4.0
Max Green (Gmax), s	16.5	35.4	16.5	11.0	11.5	35.4	11.5	29.0
Max Allow Headway (MAH), s	1.8	2.5	1.8	3.5	1.8	2.5	1.8	3.5
Max Q Clear (g_c+l1), s	4.5	6.1	5.8	2.4	2.1	5.0	2.1	5.9
Green Ext Time (g_e), s	0.0	0.8	0.1	0.3	0.0	0.8	0.0	0.4
Prob of Phs Call (p_c)	0.99	1.00	0.86	0.91	1.00	1.00	0.07	0.99
Prob of Max Out (p_x)	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1774		1774		1774		1774	
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		1135		3542		102
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		619		77		1496
Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Prot)		(Prot)		(Prot)		(Prot)	
Lanes in Grp	1	0	1	0	1	0	1	0

Grp Vol (v), veh/h	115	0	161	0	6	0	6	0
Grp Sat Flow (s), veh/h/ln	1774	0	1774	0	1774	0	1774	0
Q Serve Time (g_s), s	2.5	0.0	3.8	0.0	0.1	0.0	0.1	0.0
Cycle Q Clear Time (g_c), s	2.5	0.0	3.8	0.0	0.1	0.0	0.1	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	320	0	243	0	322	0	20	0
V/C Ratio (X)	0.36	0.00	0.66	0.00	0.02	0.00	0.30	0.00
Avail Cap (c_a), veh/h	666	0	666	0	464	0	464	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d1), s/veh	15.8	0.0	18.0	0.0	14.8	0.0	21.6	0.0
Incr Delay (d2), s/veh	0.3	0.0	1.2	0.0	0.0	0.0	3.1	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	16.0	0.0	19.2	0.0	14.8	0.0	24.6	0.0
1st-Term Q (Q1), veh/ln	1.2	0.0	1.8	0.0	0.1	0.0	0.1	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	1.2	0.0	1.9	0.0	0.1	0.0	0.1	0.0
%ile Storage Ratio (RQ%)	0.22	0.00	0.21	0.00	0.01	0.00	0.02	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	264	0	0	0	138	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	2.9	0.0	0.0	0.0	3.0	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	2.9	0.0	0.0	0.0	3.0	0.0	0.0
Lane Grp Cap (c), veh/h	0	648	0	0	0	322	0	0
V/C Ratio (X)	0.00	0.41	0.00	0.00	0.00	0.43	0.00	0.00
Avail Cap (c_a), veh/h	0	2850	0	0	0	1425	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	15.9	0.0	0.0	0.0	15.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.0	0.3	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	16.0	0.0	0.0	0.0	16.3	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.4	0.0	0.0	0.0	1.5	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.4	0.0	0.0	0.0	1.5	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.10	0.00	0.00	0.00	0.05	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		T+R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	161	0	17	0	144	0	172
Grp Sat Flow (s), veh/h/ln	0	1583	0	1754	0	1849	0	1599
Q Serve Time (g_s), s	0.0	4.1	0.0	0.4	0.0	3.0	0.0	3.9
Cycle Q Clear Time (g_c), s	0.0	4.1	0.0	0.4	0.0	3.0	0.0	3.9
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.35	0.00	0.04	0.00	0.94
Lane Grp Cap (c), veh/h	0	290	0	253	0	336	0	432
V/C Ratio (X)	0.00	0.56	0.00	0.07	0.00	0.43	0.00	0.40
Avail Cap (c_a), veh/h	0	1275	0	439	0	1489	0	1055
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	16.3	0.0	16.2	0.0	16.0	0.0	13.1
Incr Delay (d2), s/veh	0.0	0.6	0.0	0.0	0.0	0.3	0.0	0.2
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	16.9	0.0	16.3	0.0	16.3	0.0	13.3
1st-Term Q (Q1), veh/ln	0.0	1.7	0.0	0.2	0.0	1.5	0.0	1.7
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.8	0.0	0.2	0.0	1.6	0.0	1.7
%ile Storage Ratio (RQ%)	0.00	0.40	0.00	0.02	0.00	0.05	0.00	0.06
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		16.3						
HCM 2010 LOS		B						

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Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	15	30	380	5	20	350
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	31	392	5	21	361

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	796	394	0	0	397	0
Stage 1	394	-	-	-	-	-
Stage 2	402	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	356	655	-	-	1162	-
Stage 1	681	-	-	-	-	-
Stage 2	676	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	348	655	-	-	1162	-
Mov Cap-2 Maneuver	348	-	-	-	-	-
Stage 1	681	-	-	-	-	-
Stage 2	660	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.8	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	506	1162	-
HCM Lane V/C Ratio	-	-	0.092	0.018	-
HCM Control Delay (s)	-	-	12.8	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	10	90	70	370	350	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	40	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	98	76	402	380	16
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	943	389	397	0	-	0
Stage 1	389	-	-	-	-	-
Stage 2	554	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	291	659	1162	-	-	-
Stage 1	685	-	-	-	-	-
Stage 2	575	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	272	659	1162	-	-	-
Mov Cap-2 Maneuver	272	-	-	-	-	-
Stage 1	685	-	-	-	-	-
Stage 2	537	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.7	1.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1162	-	577	-	-
HCM Lane V/C Ratio	0.065	-	0.188	-	-
HCM Control Delay (s)	8.3	-	12.7	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.7	-	-

Intersection									
Int Delay, s/veh	1.1								

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	10	430	5	15	420	10	10	5	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	453	5	16	442	11	11	5	11

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	453	0	0	458	0	0	960	960	455
Stage 1	-	-	-	-	-	-	476	476	-
Stage 2	-	-	-	-	-	-	484	484	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1108	-	-	1103	-	-	236	257	605
Stage 1	-	-	-	-	-	-	570	557	-
Stage 2	-	-	-	-	-	-	564	552	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1108	-	-	1103	-	-	226	251	605
Mov Cap-2 Maneuver	-	-	-	-	-	-	226	251	-
Stage 1	-	-	-	-	-	-	564	551	-
Stage 2	-	-	-	-	-	-	546	544	-

Approach	EB	WB	NB
HCM Control Delay, s	0.2	0.3	17.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	310	1108	-	-	1103	-	-	274
HCM Lane V/C Ratio	0.085	0.01	-	-	0.014	-	-	0.077
HCM Control Delay (s)	17.7	8.3	-	-	8.3	-	-	19.2
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.2

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	10	5	5
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	95	95	95
Heavy Vehicles, %	2	2	2
Mvmt Flow	11	5	5

Major/Minor	Minor2		
Conflicting Flow All	963	958	447
Stage 1	479	479	-
Stage 2	484	479	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	235	257	612
Stage 1	568	555	-
Stage 2	564	555	-
Platoon blocked, %			
Mov Cap-1 Maneuver	223	251	612
Mov Cap-2 Maneuver	223	251	-
Stage 1	562	547	-
Stage 2	543	549	-

Approach	SB
HCM Control Delay, s	19.2
HCM LOS	C

Minor Lane/Major Mvmt

Two Way Analysis cannot be performed on Signalized Intersection.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	300	150	120	300	10	140	20	150	10	20	10
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	11	323	161	129	323	11	151	22	161	11	22	11
Adj No. of Lanes	1	2	1	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	322	644	288	321	634	22	237	51	373	36	175	87
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.13	0.26	0.26	0.02	0.15	0.15
Ln Grp Delay, s/veh	14.9	16.4	17.0	16.2	16.7	16.7	19.1	0.0	13.8	23.1	0.0	16.3
Ln Grp LOS	B	B	B	B	B	B	B		B	C		B
Approach Vol, veh/h		495			463			334			44	
Approach Delay, s/veh		16.6			16.6			16.2			18.0	
Approach LOS		B			B			B			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	2.0	3.0	2.0	4.0	2.0	4.0	2.0	4.0
Phs Duration (G+Y+Rc), s	11.5	12.6	9.4	10.6	11.5	12.6	4.4	15.6
Change Period (Y+Rc), s	3.5	4.6	3.5	4.0	3.5	4.6	3.5	4.0
Max Green (Gmax), s	16.5	35.4	16.5	11.0	11.5	35.4	11.5	29.0
Max Allow Headway (MAH), s	1.8	2.5	1.8	3.5	1.8	2.5	1.8	3.5
Max Q Clear (g_c+l1), s	4.8	6.1	5.6	2.7	2.2	5.7	2.3	6.2
Green Ext Time (g_e), s	0.0	1.0	0.0	0.3	0.0	1.0	0.0	0.5
Prob of Phs Call (p_c)	1.00	1.00	0.84	0.94	1.00	1.00	0.13	0.99
Prob of Max Out (p_x)	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1774		1774		1774		1774	
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		1173		3493		194
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		586		119		1419
Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Prot)		(Prot)		(Prot)		(Prot)	
Lanes in Grp	1	0	1	0	1	0	1	0

Grp Vol (v), veh/h	129	0	151	0	11	0	11	0
Grp Sat Flow (s), veh/h/ln	1774	0	1774	0	1774	0	1774	0
Q Serve Time (g_s), s	2.8	0.0	3.6	0.0	0.2	0.0	0.3	0.0
Cycle Q Clear Time (g_c), s	2.8	0.0	3.6	0.0	0.2	0.0	0.3	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	321	0	237	0	322	0	36	0
V/C Ratio (X)	0.40	0.00	0.64	0.00	0.03	0.00	0.31	0.00
Avail Cap (c_a), veh/h	664	0	664	0	463	0	463	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d1), s/veh	15.9	0.0	18.1	0.0	14.9	0.0	21.3	0.0
Incr Delay (d2), s/veh	0.3	0.0	1.1	0.0	0.0	0.0	1.8	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	16.2	0.0	19.1	0.0	14.9	0.0	23.1	0.0
1st-Term Q (Q1), veh/ln	1.4	0.0	1.7	0.0	0.1	0.0	0.1	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	1.4	0.0	1.8	0.0	0.1	0.0	0.1	0.0
%ile Storage Ratio (RQ%)	0.25	0.00	0.20	0.00	0.02	0.00	0.04	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	323	0	0	0	163	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	3.6	0.0	0.0	0.0	3.7	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	3.6	0.0	0.0	0.0	3.7	0.0	0.0
Lane Grp Cap (c), veh/h	0	644	0	0	0	321	0	0
V/C Ratio (X)	0.00	0.50	0.00	0.00	0.00	0.51	0.00	0.00
Avail Cap (c_a), veh/h	0	2844	0	0	0	1422	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	16.2	0.0	0.0	0.0	16.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.0	0.5	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	16.4	0.0	0.0	0.0	16.7	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.7	0.0	0.0	0.0	1.8	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.8	0.0	0.0	0.0	1.8	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.13	0.00	0.00	0.00	0.06	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		T+R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	161	0	33	0	171	0	183
Grp Sat Flow (s), veh/h/ln	0	1583	0	1759	0	1842	0	1612
Q Serve Time (g_s), s	0.0	4.1	0.0	0.7	0.0	3.7	0.0	4.2
Cycle Q Clear Time (g_c), s	0.0	4.1	0.0	0.7	0.0	3.7	0.0	4.2
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.33	0.00	0.06	0.00	0.88
Lane Grp Cap (c), veh/h	0	288	0	262	0	334	0	424
V/C Ratio (X)	0.00	0.56	0.00	0.13	0.00	0.51	0.00	0.43
Avail Cap (c_a), veh/h	0	1272	0	439	0	1480	0	1061
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	16.4	0.0	16.3	0.0	16.3	0.0	13.5
Incr Delay (d2), s/veh	0.0	0.6	0.0	0.1	0.0	0.4	0.0	0.3
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	17.0	0.0	16.3	0.0	16.7	0.0	13.8
1st-Term Q (Q1), veh/ln	0.0	1.7	0.0	0.3	0.0	1.8	0.0	1.8
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.8	0.0	0.4	0.0	1.9	0.0	1.9
%ile Storage Ratio (RQ%)	0.00	0.40	0.00	0.04	0.00	0.06	0.00	0.06
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		16.5						
HCM 2010 LOS		B						

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	11	37	310	11	26	303
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	38	320	11	27	312

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	691	325	0	0	331	0
Stage 1	325	-	-	-	-	-
Stage 2	366	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	410	716	-	-	1228	-
Stage 1	732	-	-	-	-	-
Stage 2	702	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	399	716	-	-	1228	-
Mov Cap-2 Maneuver	399	-	-	-	-	-
Stage 1	732	-	-	-	-	-
Stage 2	683	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.5	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	606	1228	-
HCM Lane V/C Ratio	-	-	0.082	0.022	-
HCM Control Delay (s)	-	-	11.5	8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Intersection	
Int Delay, s/veh	2.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	21	61	71	300	303	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	40	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	67	78	330	333	12

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	825	339	345	0	-	0
Stage 1	339	-	-	-	-	-
Stage 2	486	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	342	703	1214	-	-	-
Stage 1	722	-	-	-	-	-
Stage 2	618	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	320	703	1214	-	-	-
Mov Cap-2 Maneuver	320	-	-	-	-	-
Stage 1	722	-	-	-	-	-
Stage 2	578	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13	1.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1214	-	538	-	-
HCM Lane V/C Ratio	0.064	-	0.167	-	-
HCM Control Delay (s)	8.2	-	13	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.6	-	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	9	360	10	10	350	22	10	6	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	10	404	11	11	393	25	11	7	17

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	418	0	0	416	0	0	864	870	410
Stage 1	-	-	-	-	-	-	430	430	-
Stage 2	-	-	-	-	-	-	434	440	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1141	-	-	1143	-	-	274	290	642
Stage 1	-	-	-	-	-	-	603	583	-
Stage 2	-	-	-	-	-	-	600	578	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1141	-	-	1143	-	-	263	285	642
Mov Cap-2 Maneuver	-	-	-	-	-	-	263	285	-
Stage 1	-	-	-	-	-	-	598	578	-
Stage 2	-	-	-	-	-	-	582	572	-

Approach	EB	WB	NB
HCM Control Delay, s	0.2	0.2	15.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	376	1141	-	-	1143	-	-	292
HCM Lane V/C Ratio	0.093	0.009	-	-	0.01	-	-	0.131
HCM Control Delay (s)	15.6	8.2	-	-	8.2	-	-	19.2
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.4

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Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	23	5	6
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	89	89	89
Heavy Vehicles, %	2	2	2
Mvmt Flow	26	6	7

Major/Minor	Minor2		
Conflicting Flow All	870	864	406
Stage 1	428	428	-
Stage 2	442	436	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	272	292	645
Stage 1	605	585	-
Stage 2	594	580	-
Platoon blocked, %			
Mov Cap-1 Maneuver	256	287	645
Mov Cap-2 Maneuver	256	287	-
Stage 1	600	579	-
Stage 2	567	575	-

Approach	SB
HCM Control Delay, s	19.2
HCM LOS	C

Minor Lane/Major Mvmt

Two Way Analysis cannot be performed on Signalized Intersection.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	238	145	100	250	5	147	10	140	5	10	5
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	6	274	167	115	287	6	169	11	161	6	11	6
Adj No. of Lanes	1	2	1	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	322	646	289	320	644	13	246	28	407	20	164	89
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.14	0.27	0.27	0.01	0.14	0.14
Ln Grp Delay, s/veh	14.8	16.1	17.1	16.1	16.4	16.4	19.3	0.0	13.3	24.7	0.0	16.3
Ln Grp LOS	B	B	B	B	B	B	B		B	C		B
Approach Vol, veh/h		447			408			341			23	
Approach Delay, s/veh		16.5			16.3			16.3			18.5	
Approach LOS		B			B			B			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	2.0	3.0	2.0	4.0	2.0	4.0	2.0	4.0
Phs Duration (G+Y+Rc), s	11.4	12.6	9.6	10.4	11.5	12.6	4.0	16.0
Change Period (Y+Rc), s	3.5	4.6	3.5	4.0	3.5	4.6	3.5	4.0
Max Green (Gmax), s	16.5	35.4	16.5	11.0	11.5	35.4	11.5	29.0
Max Allow Headway (MAH), s	1.8	2.5	1.8	3.5	1.8	2.5	1.8	3.5
Max Q Clear (g_c+l1), s	4.5	6.2	6.0	2.4	2.1	5.2	2.1	5.9
Green Ext Time (g_e), s	0.0	0.9	0.1	0.3	0.0	0.9	0.0	0.4
Prob of Phs Call (p_c)	0.99	1.00	0.87	0.91	1.00	1.00	0.07	0.99
Prob of Max Out (p_x)	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1774		1774		1774		1774	
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		1135		3545		102
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		619		74		1496
Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Prot)		(Prot)		(Prot)		(Prot)	
Lanes in Grp	1	0	1	0	1	0	1	0

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Grp Vol (v), veh/h	115	0	169	0	6	0	6	0
Grp Sat Flow (s), veh/h/ln	1774	0	1774	0	1774	0	1774	0
Q Serve Time (g_s), s	2.5	0.0	4.0	0.0	0.1	0.0	0.1	0.0
Cycle Q Clear Time (g_c), s	2.5	0.0	4.0	0.0	0.1	0.0	0.1	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	320	0	246	0	322	0	20	0
V/C Ratio (X)	0.36	0.00	0.69	0.00	0.02	0.00	0.30	0.00
Avail Cap (c_a), veh/h	664	0	664	0	463	0	463	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d1), s/veh	15.8	0.0	18.1	0.0	14.8	0.0	21.6	0.0
Incr Delay (d2), s/veh	0.3	0.0	1.3	0.0	0.0	0.0	3.1	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	16.1	0.0	19.3	0.0	14.8	0.0	24.7	0.0
1st-Term Q (Q1), veh/ln	1.2	0.0	1.9	0.0	0.1	0.0	0.1	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	1.2	0.0	2.0	0.0	0.1	0.0	0.1	0.0
%ile Storage Ratio (RQ%)	0.22	0.00	0.22	0.00	0.01	0.00	0.02	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	274	0	0	0	143	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	3.0	0.0	0.0	0.0	3.2	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	3.0	0.0	0.0	0.0	3.2	0.0	0.0
Lane Grp Cap (c), veh/h	0	646	0	0	0	321	0	0
V/C Ratio (X)	0.00	0.42	0.00	0.00	0.00	0.45	0.00	0.00
Avail Cap (c_a), veh/h	0	2843	0	0	0	1422	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	16.0	0.0	0.0	0.0	16.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.0	0.4	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	16.1	0.0	0.0	0.0	16.4	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	1.5	0.0	0.0	0.0	1.5	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.5	0.0	0.0	0.0	1.6	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.11	0.00	0.00	0.00	0.05	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		T+R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	167	0	17	0	150	0	172
Grp Sat Flow (s), veh/h/ln	0	1583	0	1754	0	1850	0	1599
Q Serve Time (g_s), s	0.0	4.2	0.0	0.4	0.0	3.2	0.0	3.9
Cycle Q Clear Time (g_c), s	0.0	4.2	0.0	0.4	0.0	3.2	0.0	3.9
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.35	0.00	0.04	0.00	0.94
Lane Grp Cap (c), veh/h	0	289	0	253	0	336	0	435
V/C Ratio (X)	0.00	0.58	0.00	0.07	0.00	0.45	0.00	0.40
Avail Cap (c_a), veh/h	0	1272	0	438	0	1486	0	1052
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	16.5	0.0	16.3	0.0	16.1	0.0	13.1
Incr Delay (d2), s/veh	0.0	0.7	0.0	0.0	0.0	0.3	0.0	0.2
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	17.1	0.0	16.3	0.0	16.4	0.0	13.3
1st-Term Q (Q1), veh/ln	0.0	1.9	0.0	0.2	0.0	1.6	0.0	1.7
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.9	0.0	0.2	0.0	1.7	0.0	1.7
%ile Storage Ratio (RQ%)	0.00	0.42	0.00	0.02	0.00	0.05	0.00	0.06
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		16.4						
HCM 2010 LOS		B						

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	16	38	380	7	26	354
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	39	392	7	27	365

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	814	395	0	0	399	0
Stage 1	395	-	-	-	-	-
Stage 2	419	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	347	654	-	-	1160	-
Stage 1	681	-	-	-	-	-
Stage 2	664	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	337	654	-	-	1160	-
Mov Cap-2 Maneuver	337	-	-	-	-	-
Stage 1	681	-	-	-	-	-
Stage 2	645	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.9	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	511	1160	-
HCM Lane V/C Ratio	-	-	0.109	0.023	-
HCM Control Delay (s)	-	-	12.9	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Vol, veh/h	12	91	71	370	354	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	40	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	100	78	407	389	18

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	961	398	407	0	-	0
Stage 1	398	-	-	-	-	-
Stage 2	563	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	284	652	1152	-	-	-
Stage 1	678	-	-	-	-	-
Stage 2	570	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	265	652	1152	-	-	-
Mov Cap-2 Maneuver	265	-	-	-	-	-
Stage 1	678	-	-	-	-	-
Stage 2	531	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.1	1.3	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1152	-	557	-	-
HCM Lane V/C Ratio	0.068	-	0.203	-	-
HCM Control Delay (s)	8.4	-	13.1	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.8	-	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	15	430	5	15	420	30	10	6	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	100	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	17	483	6	17	472	34	11	7	11

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	506	0	0	489	0	0	1049	1059	486
Stage 1	-	-	-	-	-	-	520	520	-
Stage 2	-	-	-	-	-	-	529	539	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1059	-	-	1074	-	-	205	224	581
Stage 1	-	-	-	-	-	-	539	532	-
Stage 2	-	-	-	-	-	-	533	522	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1059	-	-	1074	-	-	194	217	581
Mov Cap-2 Maneuver	-	-	-	-	-	-	194	217	-
Stage 1	-	-	-	-	-	-	530	523	-
Stage 2	-	-	-	-	-	-	513	514	-

Approach	EB	WB	NB
HCM Control Delay, s	0.3	0.3	19.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	270	1059	-	-	1074	-	-	221
HCM Lane V/C Ratio	0.108	0.016	-	-	0.016	-	-	0.183
HCM Control Delay (s)	19.9	8.5	-	-	8.4	-	-	24.9
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0.7

K90

Intersection			
Int Delay, s/veh			

Movement	SBL	SBT	SBR
Vol, veh/h	25	5	6
Conflicting Peds, #/hr	0	0	0
Sign Control	Stop	Stop	Stop
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	89	89	89
Heavy Vehicles, %	2	2	2
Mvmt Flow	28	6	7

Major/Minor	Minor2		
Conflicting Flow All	1051	1044	489
Stage 1	522	522	-
Stage 2	529	522	-
Critical Hdwy	7.12	6.52	6.22
Critical Hdwy Stg 1	6.12	5.52	-
Critical Hdwy Stg 2	6.12	5.52	-
Follow-up Hdwy	3.518	4.018	3.318
Pot Cap-1 Maneuver	205	229	579
Stage 1	538	531	-
Stage 2	533	531	-
Platoon blocked, %			
Mov Cap-1 Maneuver	192	222	579
Mov Cap-2 Maneuver	192	222	-
Stage 1	529	523	-
Stage 2	508	522	-

Approach	SB
HCM Control Delay, s	24.9
HCM LOS	C

Minor Lane/Major Mvmt

Two Way Analysis cannot be performed on Signalized Intersection.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	309	156	120	312	10	148	20	150	10	20	10
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	11	355	179	138	359	11	170	23	172	11	23	11
Adj No. of Lanes	1	2	1	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	320	639	286	319	632	19	245	51	381	35	178	85
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.14	0.27	0.27	0.02	0.15	0.15
Ln Grp Delay, s/veh	15.0	16.8	17.6	16.5	17.2	17.2	19.5	0.0	13.8	23.3	0.0	16.4
Ln Grp LOS	B	B	B	B	B	B	B		B	C		B
Approach Vol, veh/h		545			508			365			45	
Approach Delay, s/veh		17.1			17.0			16.5			18.1	
Approach LOS		B			B			B			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Case No	2.0	3.0	2.0	4.0	2.0	4.0	2.0	4.0
Phs Duration (G+Y+Rc), s	11.5	12.6	9.6	10.6	11.5	12.6	4.4	15.9
Change Period (Y+Rc), s	3.5	4.6	3.5	4.0	3.5	4.6	3.5	4.0
Max Green (Gmax), s	16.5	35.4	16.5	11.0	11.5	35.4	11.5	29.0
Max Allow Headway (MAH), s	1.8	2.5	1.8	3.5	1.8	2.5	1.8	3.5
Max Q Clear (g_c+l1), s	5.1	6.6	6.1	2.7	2.2	6.2	2.3	6.5
Green Ext Time (g_e), s	0.0	1.1	0.1	0.3	0.0	1.1	0.0	0.5
Prob of Phs Call (p_c)	1.00	1.00	0.88	0.95	1.00	1.00	0.13	0.99
Prob of Max Out (p_x)	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Left-Turn Movement Data								
Assigned Mvmt	1		3		5		7	
Mvmt Sat Flow, veh/h	1774		1774		1774		1774	
Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		3539		1192		3506		190
Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		570		107		1422
Left Lane Group Data								
Assigned Mvmt	1	0	3	0	5	0	7	0
Lane Assignment	(Prot)		(Prot)		(Prot)		(Prot)	
Lanes in Grp	1	0	1	0	1	0	1	0

Grp Vol (v), veh/h	138	0	170	0	11	0	11	0
Grp Sat Flow (s), veh/h/ln	1774	0	1774	0	1774	0	1774	0
Q Serve Time (g_s), s	3.1	0.0	4.1	0.0	0.2	0.0	0.3	0.0
Cycle Q Clear Time (g_c), s	3.1	0.0	4.1	0.0	0.2	0.0	0.3	0.0
Perm LT Sat Flow (s_l), veh/h/ln	0	0	0	0	0	0	0	0
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Serve Time (g_u), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Perm LT Q Serve Time (g_ps), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Lane Grp Cap (c), veh/h	319	0	245	0	320	0	35	0
V/C Ratio (X)	0.43	0.00	0.69	0.00	0.03	0.00	0.31	0.00
Avail Cap (c_a), veh/h	660	0	660	0	460	0	460	0
Upstream Filter (I)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
Uniform Delay (d1), s/veh	16.2	0.0	18.2	0.0	15.0	0.0	21.4	0.0
Incr Delay (d2), s/veh	0.3	0.0	1.3	0.0	0.0	0.0	1.8	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	16.5	0.0	19.5	0.0	15.0	0.0	23.3	0.0
1st-Term Q (Q1), veh/ln	1.5	0.0	2.0	0.0	0.1	0.0	0.1	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	0.00	1.00	0.00	1.00	0.00	1.00	0.00
%ile Back of Q (50%), veh/ln	1.5	0.0	2.1	0.0	0.1	0.0	0.1	0.0
%ile Storage Ratio (RQ%)	0.28	0.00	0.23	0.00	0.02	0.00	0.04	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

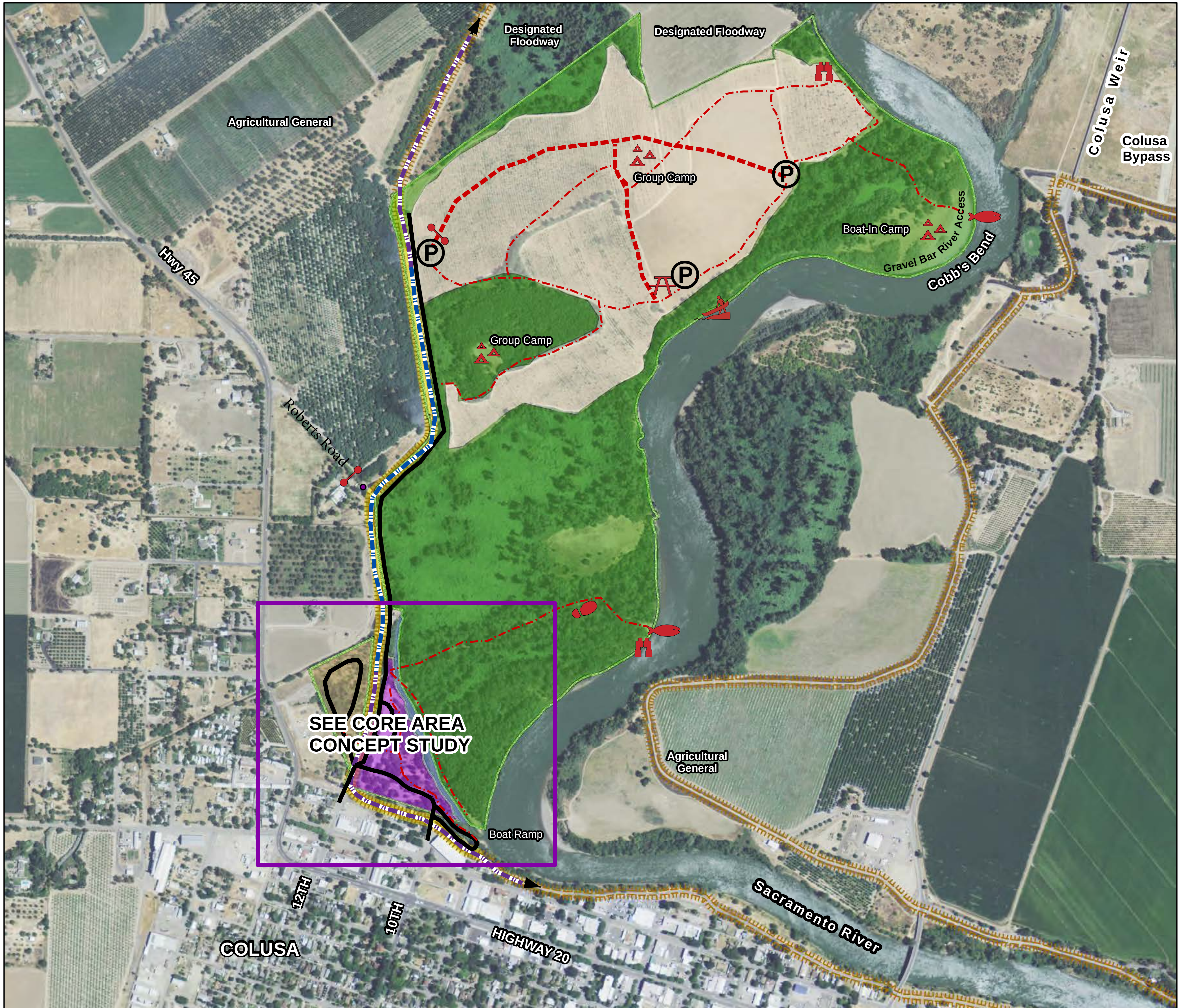
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T				T		
Lanes in Grp	0	2	0	0	0	1	0	0
Grp Vol (v), veh/h	0	355	0	0	0	181	0	0
Grp Sat Flow (s), veh/h/ln	0	1770	0	0	0	1770	0	0
Q Serve Time (g_s), s	0.0	4.1	0.0	0.0	0.0	4.1	0.0	0.0
Cycle Q Clear Time (g_c), s	0.0	4.1	0.0	0.0	0.0	4.1	0.0	0.0
Lane Grp Cap (c), veh/h	0	639	0	0	0	319	0	0
V/C Ratio (X)	0.00	0.56	0.00	0.00	0.00	0.57	0.00	0.00
Avail Cap (c_a), veh/h	0	2823	0	0	0	1412	0	0
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d1), s/veh	0.0	16.6	0.0	0.0	0.0	16.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.0	0.0	0.6	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	16.8	0.0	0.0	0.0	17.2	0.0	0.0
1st-Term Q (Q1), veh/ln	0.0	2.0	0.0	0.0	0.0	2.0	0.0	0.0
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0

3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	2.0	0.0	0.0	0.0	2.1	0.0	0.0
%ile Storage Ratio (RQ%)	0.00	0.15	0.00	0.00	0.00	0.07	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		T+R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	179	0	34	0	189	0	195
Grp Sat Flow (s), veh/h/ln	0	1583	0	1762	0	1844	0	1612
Q Serve Time (g_s), s	0.0	4.6	0.0	0.7	0.0	4.2	0.0	4.5
Cycle Q Clear Time (g_c), s	0.0	4.6	0.0	0.7	0.0	4.2	0.0	4.5
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.32	0.00	0.06	0.00	0.88
Lane Grp Cap (c), veh/h	0	286	0	264	0	332	0	432
V/C Ratio (X)	0.00	0.63	0.00	0.13	0.00	0.57	0.00	0.45
Avail Cap (c_a), veh/h	0	1263	0	437	0	1471	0	1053
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	16.8	0.0	16.4	0.0	16.6	0.0	13.5
Incr Delay (d2), s/veh	0.0	0.8	0.0	0.1	0.0	0.6	0.0	0.3
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	17.6	0.0	16.4	0.0	17.2	0.0	13.8
1st-Term Q (Q1), veh/ln	0.0	2.0	0.0	0.4	0.0	2.1	0.0	1.9
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	2.1	0.0	0.4	0.0	2.2	0.0	2.0
%ile Storage Ratio (RQ%)	0.00	0.46	0.00	0.04	0.00	0.07	0.00	0.07
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Intersection Summary								
HCM 2010 Ctrl Delay		16.9						
HCM 2010 LOS		B						

K95

DD&A

FEHR PEERS



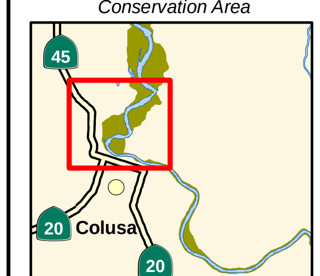
COLUSA-SACRAMENTO RIVER STATE RECREATION AREA DRAFT GENERAL PLAN

APPENDIX L

PARKWIDE CONCEPT STUDY

Legend

- Viewpoint
- Primitive Tent Camp Ground
- Parking
- Fishing Access
- Picnic Sites
- Gate
- Recreational Vehicle Campground
- Interpretive Trail
- Human-Powered Boat Launch
- Boat Launch
- Entrance Station
- Levees
- PAVED ROAD
- TRAIL
- UNPAVED ROAD
- OFF ROAD BIKE TRAIL
- ON STREET BIKE ROUTE



Map Location, showing Sacramento River Conservation Area

Data Sources:
1) Levees - Sacramento River GIS.
2) Image: NAIP, 2012.
3) Land Use Zones: Colusa County General Plan Land Use, May 5, 2011, City of Colusa General Plan, Oct 30, 2007.

Original Scale
1:9,600
1 inch = 800 feet
Feet
0 400 800 1,200

NOTES:
Parcel boundaries are approximate and should not be considered legal descriptions. Maps are intended for study purposes only.

NORTHERN SERVICE CENTER

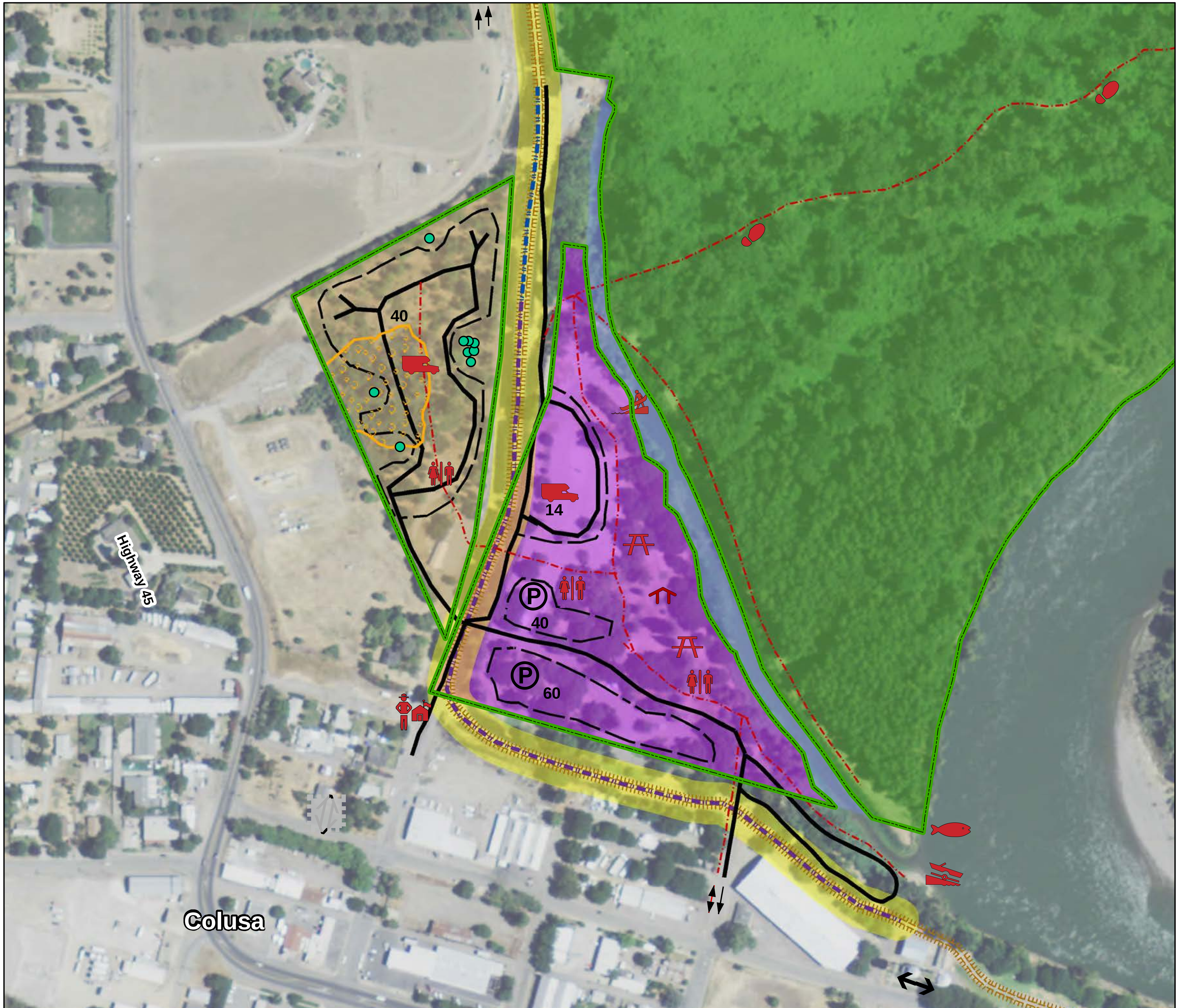
GENERAL PLAN SECTION

Date: 03/12/2015
California Department of Parks & Recreation
DRAFT

COLUSA-SACRAMENTO RIVER STATE RECREATION AREA DRAFT GENERAL PLAN

APPENDIX L

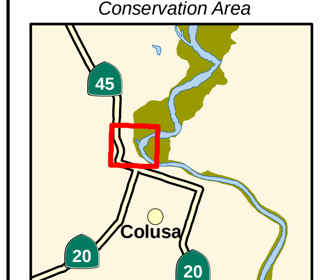
CORE AREA CONCEPT STUDY



LEGEND

- Viewpoint
- Parking Lot
- Picnic Facilities
- Recreational Vehicle Campground
- Human Powered Boat Launch
- PAVED ROAD
- TRAIL
- UNPAVED ROAD
- OFF ROAD BIKE TRAIL
- ON STREET BIKE ROUTE
- PARKING FACILITY LIMIT
- Primitive Tent Camp Ground
- Fishing Access
- Gate
- Interpretive Trail
- Entrance Station
- Boat Launch
- Restroom
- Outdoor Event Facility
- Levees
- Elderberry
- Remnant Riparian

Map Location, showing Sacramento River Conservation Area



Data Sources:
1) Levees - Sacramento River GIS.
2) Image: NAIP, 2012

Original Scale
1:2,750
1 inch = 229 feet

Feet
0 200 400

N

NOTES:
Parcel boundaries are approximate and should not be considered legal descriptions. Maps are intended for study purposes only.

NORTHERN SERVICE CENTER

GENERAL PLAN SECTION

Date: 8/10/2015

California Department of Parks & Recreation

DRAFT

California Department of Parks and Recreation
Resource Services
STANDARD PROJECT REQUIREMENTS

M1

General

- Prior to the start of on-site construction work, a **[insert who]** will consult with the contractor and project manager to identify all resources that must be protected.
- No track-mounted or heavy-wheeled vehicles will be allowed in identified environmentally sensitive areas at any time; foot traffic will only be allowed with specific permission from the State's Representative after clearance from **[insert who]**.
    - At the discretion of **[insert who]**, mechanized vehicles on **[insert discipline]** resource sites will be restricted to a short term use of rubber tire tractors only. All such vehicles must enter and exit the area via the same route of travel (by backing up). Vehicles are strictly prohibited from turning on the surface of site(s).
- Prior to the start of on-site construction work, a DPR-qualified **[insert discipline]** Resources Specialist will train construction personnel in **[insert discipline]** Resource identification and protection procedures.
- Prior to the start of on-site construction work, and at the discretion of a **[insert who]**, a **[insert who]** will flag and/or fence all **[insert discipline or resource]** with a buffer of **[insert distance]** for avoidance during on-site construction activities. The **[insert who]** will remove the fencing after project completion.
- Prior to any earthmoving activities, a DPR-qualified **[insert who]** will approve all subsurface work, including the operation of heavy equipment within **[insert distance]** of the identified Environmentally Sensitive Area (ESA).
- Prior to the start of **[insert type]** work, **[Insert who]** will notify the **[insert Office name and who]** or **[insert alternative Office name and who]** a minimum of three weeks in advance, unless other arrangements are made, to schedule **[insert discipline or resource]** monitoring.
- A DPR qualified [**insert who]** will monitor all ground disturbing phases of this project at his/her discretion.

Cultural Resources

General Cultural Standard Requirements

- If forest thinning activities are required within a culturally sensitive area, downed timber and other forest debris will be removed by aerial suspension; no portion of logs, slash or debris will be dragged across the surface.
- Prior to the start of on-site construction work, the **[insert who]** will notify the **Cultural Resources Supervisor**, unless other arrangements are made in advance, a minimum of three weeks to schedule a **Cultural Resource Specialist** to monitor work, as necessary, to ensure that removal and reconstruction of historic fabric will occur in a manner consistent with the Secretary of the Interior's Standards.
- Before, during, and after construction, a **[Insert who]** will photo-document all aspects of the project and will add the photos to the historical records (archives) for the park.
- Prior to the start of on-site construction work, and to the extent not already completed, a **[insert who]** will map and record all cultural features within the proposed Area of Potential Effects (APE) to a level appropriate to the Secretary of Interior Standards.

Historian's Standard Requirements

- All historic work will comply with the Secretary of the Interior Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings.
  - Historic character will be retained and preserved;
    - where safe, original materials that still maintain structural integrity will be retained; and
    - where replacement is required, materials and features will be replaced "in kind".
  - A **[insert who]** familiar with the project site's cultural/historic resources will monitor all construction activities. All historical resources uncovered during the project will be recorded in place with a photograph and/or drawing showing any new material or recovered and archived, at the discretion of the monitor.
  - Upon completion of the project, **[Insert who]** will record any modifications to historic buildings or alterations of historic fabric on as-built drawings.

Archaeologist's Standard Requirements

- Prior to the start of any ground-disturbing activities, a DPR-approved archaeologist will complete pre-construction testing to determine specific avoidance areas.
  - If necessary, a DPR-qualified Cultural Resource Specialist will prepare a research design, including appropriate trenching and/or pre-construction excavations
  - Based on preconstruction testing, project design and/or implementation will be altered, as necessary, to avoid impacts to archaeological resources or reduce the impacts to a less than significant level, as determined in consultation with a DPR-qualified archaeologist.
- **[Insert who]** will manually remove or flush cut vegetation to avoid ground-disturbing activities; removal of roots will not be allowed. In areas lacking appropriate archaeological survey coverage only chemical treatments will be allowed unless archaeological surveys are performed first.
- If **anyone** discovers previously undocumented cultural resources during project construction, work within **[insert distance]** of the find will be temporarily halted until the archaeologist designs and implements appropriate treatments in accordance with the Secretary of the Interiors Standards and Guidelines for archaeological resource protection.
  - **[Insert who]** will modify the project to ensure that construction activities will avoid cultural resources upon review and approval of a **[insert who]**.
  - If ground disturbing activities uncover intact cultural features (including but not limited to dark soil containing shellfish, bone, flaked stone, groundstone, or deposits of historic ash), when a DPR Qualified cultural resources specialist is not on-site, **[insert who]** will contact the DPR State Representative immediately and **[insert who]** will temporarily halt or divert work within the immediate vicinity of the find a DPR-qualified cultural resources specialist evaluates the find and determines the appropriate treatment and disposition of the cultural resource.
- In the event that human remains are discovered, work will cease immediately in the area of the find and the project manager/site supervisor will notify the appropriate DPR personnel. Any human remains and/or funerary objects will be left in place or returned to the point of discovery and covered with soil. The DPR Sector Superintendent (or authorized representative) will notify the County Coroner, in accordance with §7050.5 of the California Health and Safety Code, and the Native American Heritage Commission (or Tribal Representative). If a Native American

monitor is on-site at the time of the discovery, the monitor will be responsible for notifying the appropriate Native American authorities. The local County Coroner will make the determination of whether the human bone is of Native American origin.

- If the Coroner determines the remains represent Native American interment, the NAHC in Sacramento and/or tribe will be consulted to identify the most likely descendants and appropriate disposition of the remains. Work will not resume in the area of the find until proper disposition is complete (PRC §5097.98). No human remains or funerary objects will be cleaned, photographed, analyzed, or removed from the site prior to determination.
- If it is determined the find indicates a sacred or religious site, the site will be avoided to the maximum extent practicable. Formal consultation with the State Historic Preservation Office and review by the Native American Heritage Commission/Tribal Cultural representatives will occur as necessary to define additional site mitigation or future restrictions.

Natural Resources

General Biological Resource Standard Project Requirements

- All project activities that could spread **[insert organism]** to new locations will be subject to Best Management Practices developed by **[insert group name]** and available online at **[insert location – i.e. web address]**.
- Prior to the start of on-site construction activities, **[insert who]** will conduct a survey of the project area for **[insert what]**.
- Prior to the start of on-site construction activities, **[insert who]** will determine the minimum area required to complete the work and define the boundaries of the work area on the project drawings and with flagging or fencing on the ground, as appropriate.
- To prevent the spread of noxious weeds, all construction vehicles and equipment will enter and leave the project site free of soil, vegetative matter or other debris that could contain weed seeds.
- All construction will be consistent with the State Parks Trail Manual guidelines.
- At the discretion of **[insert who]**, project activities will be monitored to ensure that impacts to **[insert species name(s)]** are minimized.
- **[Insert who]** will submit a summary report of all collecting activities conducted at **[Insert park name]** to the **[insert District name]** Environmental Scientist upon completion of the project.
- The **[insert who]** will post information signs near project areas with restricted access or closures lasting longer than 3 months. The signs will include the following information:
  - Explanation for and description of the project; and
  - Anticipated completion date.

Plants

- No rare or endangered species will be cut, pruned, pulled back, removed or damaged in any way.
- If **[insert plant species or community]** are located within **[insert number]** feet of the project area, the **[insert what]** will be flagged by **[insert who]**, fenced off prior to the start of on-site construction activities, and completely avoided.
- Best Management Practices (BMPs) to avoid creation of dust will be employed during all construction activities within [insert distance] of **[insert species or plant community]**.

Standard Project Requirements

- If **[insert what]** of **[insert species or plant community name]** are discovered within **[insert distance]** of the project area, a **[insert who]** will flag and fence these locations during construction activities to avoid impacts.
- Prior to the start of on-site construction activities and when the plants are in a phenological stage conducive to positive identification (i.e., usually during the blooming period for the species), a **[insert who]** will conduct surveys for special-status plant species throughout the project area.
- Prior to the start of on-site construction activities, a **[insert who]** will flag and fence plant communities (e.g., vegetation series, alliances, or associations) within **[insert number]** feet of the project area to avoid impacts.
- No **[insert what – staging, ground-disturbing, etc.]** will be allowed within **[insert number]** times the diameter-at-breast-height (dbh) of retention trees, unless approved in advance by a DPR-approved biologist, forester, or certified arborist.
- The **[insert who]** will avoid or minimize impacts to federally protected wetlands to the extent practicable by conducting work in upland areas.
- A **[insert who]** will be present during all ground-disturbing activities within the **[insert quantitative area]** of trees.
- Project area will be monitored and maintained by **[insert who]** for up to **[insert time period]**. Including regular watering and replacement planting, as necessary to assure an approximately **[insert percentage]** survival rate.
- Any trenching in a “structural root zone” will be completed by hand; no roots larger than **[insert diameter size]** in diameter will be cut or damaged.
- All herbicides will be handled, applied, and disposed of in accordance with the MSDS Fact Sheet and all local, State, and federal laws.
- To maintain genetic integrity, only plant stock collected within the **[insert area name]** will be used for re-vegetation in the project area.
- **[Insert who]** will employ Best Management Practices (BMPs) for erosion control to avoid runoff of project-related sediments, vehicle fluids, and other liquids into special plant communities.
- The percolation testing will be conducted at a minimum distance of **[insert quantitative distance]** of any significant tree over **[insert number]** DBH.

Wildlife

- **[Insert Name]** will schedule all work between **[insert dates]** to avoid the **[insert species name]** **[insert what – breeding, maternity, nesting, flight period, etc.]**.
- If work is required during the **[insert what]** season (**[insert dates]**), a **[insert who]** will conduct a survey to identify **[insert what - nest, colony, etc]** within **[insert distance]** of the project area. The survey will be conducted no more than **[insert number]** calendar days prior to the beginning of construction.
- If **[insert what]** are located within **[insert distance]** feet of the project area, no construction will occur within **[insert distance]** of the **[insert what]** during the **[insert what]** season or until the young have fledged, as determined by a DPR-approved biologist.
- If work must occur during the breeding season, the USFWS’s *“Transmittal of Guidance: Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California”* (dated July 31, 2006) may be used by a DPR-approved biologist to allow limited construction activities that do not create noise disturbance above ambient levels.

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  - If limited activities are allowed during the **[insert species name] [insert what breeding, nesting, etc.]** season, work activities will not begin until **[insert number]** hours after sunrise and will cease **[insert number]** hours before sunset each day.
- Prior to the start of on-site construction activities, a **[insert who]** will train on-site construction personnel on the life history of **[insert species name]**, work constraints, and any other pertinent information related to the species.
- Within **[insert number]** hours prior to the start of construction activities, a **[insert who]** will conduct surveys for **[insert what]** in the project area and up to **[insert number]** feet outside the project boundaries.
- If individuals or other recent signs of **[insert species name]** are observed within **[insert distance]** of the project area, **[insert who]** will be present on the site to monitor during construction activities at his/her discretion.
- Immediately prior to the start of work each morning, **[insert who]** will conduct a visual inspection of the construction zone.
- If **[insert species name]** is found on the project site, work in the vicinity of the animal will be delayed until the species moves out of the site on its own accord, or is temporarily relocated by **[insert agency name - approved or -permitted]** biologist.
- To prevent trapping of **[insert species name]**, all holes and trenches will be covered at the close of each working day with plywood or similar materials, or will include escape ramps constructed of earth fill or wooden planks; all pipes will be capped. A **[insert who]**, or other staff trained by a **[insert who]** will inspect trenches and pipes for **[insert species name]** at the beginning of each workday. If a trapped animal is discovered, they will be released in suitable habitat at least **[insert quantitative distance]** from the project area.
- All field staff will wear protective clothing and equipment while working with **[insert species name]** live animals and handling carcasses.
- Baiting will not occur between **[insert months]** when **[Insert sensitive species name]** are present.
- **[Insert who]** will not remove any trees equal to or greater than **[insert number]**-inches dbh unless first inspected by **[insert who]** and determined to be unsuitable as nesting habitat for **[insert species name]**.

<u>Aesthetics</u>

- Projects will be designed to incorporate appropriate park scenic & aesthetic values including the choices for: specific building sites, scope & scale; building and fencing materials and colors; use of compatible aesthetic treatments on pathways, retaining walls or other ancillary structures; location of and materials used in parking areas, campsites and picnic areas; development of appropriate landscaping. The park scenic and aesthetic values will also consider views into the park from neighboring properties.
- **[Insert who]** will store all project-related materials outside of the viewshed of **[insert name of street/place/building]**.
- **[Insert who]** will equip any permanent structure with outdoor light shields that concentrate the illumination downward to reduce direct and reflected light pollution. The direct source of the lighting (bulb, lens, filament, tube, etc) will not be visible off site and the lighting will be installed as low as possible on poles and/or structures to minimize light pollution of the night sky. The candle power of the illumination at ground level will not exceed what is required by any safety or security regulations of any government agency with regulatory oversight.

<u>Air Quality</u>

- During dry, dusty conditions, all active construction areas will be lightly sprayed with dust suppressant to reduce dust without causing runoff.
- All trucks or light equipment hauling soil, sand, or other loose materials on public roads will be covered or required to maintain at least two feet of freeboard.
- All gasoline-powered equipment will be maintained according to manufacturer's specifications, and in compliance with all State and federal requirements.
- Paved streets adjacent to the Park shall either be swept or washed at the end of each day, or as required, to remove excessive accumulations of silt and/or mud that could have resulted from project-related activities.
- Excavation and grading activities will be suspended when sustained winds exceed 15 miles per hour (mph), instantaneous gusts exceed 25 mph, or when dust occurs from remediation related activities where visible emissions (dust) cannot be controlled by watering or conventional dust abatement controls.

Geology and Soils (erosion)

- After a large earthquake event (i.e., magnitude 5.0 or greater within 50 miles of the project site), **[insert who]** will inspect all project structures and features for damage, as soon as is possible after the event. Any damaged structures or features will be closed to park visitors, volunteers, residents, contractors, and staff.
- No track-mounted or heavy-wheeled vehicles will be driven through **[insert work area name]** areas during the rainy season or when soils are saturated to avoid compaction and/or damage to soil structure.
- **[Insert who]** will develop a rehabilitation plan for the decommissioned trail that includes using brush and trees removed from the new trail alignment for bio-mechanical erosion control (bundling slash and keying it in to fall of trail, filling damaged trails sections with soil and duff removed from the new trail alignment, constructing water bars, and replanting native trees and shrubs).
- **[Insert who]** will clearly block both ends of the trail and scatter its length with vegetative debris from new trail construction to discourage continued use and degradation of the decommissioned portion of the trail.

Hazards

- Prior to the start of on-site construction activities, **[insert who]** will inspect all equipment for leaks and regularly inspect thereafter until equipment is removed from the project site. All contaminated water, sludge, spill residue, or other hazardous compounds will be contained and disposed of outside the boundaries of the site, at a lawfully permitted or authorized destination.
- Prior to the start of on-site construction activities, **[insert who]** will prepare a Spill Prevention and Response Plan (SPRP) as part of the Storm Water Pollution Prevention Plan (SWPPP) for **[insert who]** approval to provide protection to on-site workers, the public, and the environment from accidental leaks or spills of vehicle fluids or other potential contaminants. This plan will include (but not be limited to);
    - a map that delineates construction staging areas, where refueling, lubrication, and maintenance of equipment will occur;
    - a list of items required in a spill kit on-site that will be maintained throughout the life of the project;
    - procedures for the proper storage, use, and disposal of any solvents or other chemicals used in the restoration process;

- and identification of lawfully permitted or authorized disposal destinations outside of the project site.

- **[Insert who]** will develop a Materials Management Plan to include protocols and procedures that will protect human health and the environment during remediation and/or maintenance activities that cause disturbances to the native soil and/or mine and mill materials causing the potential exposure to metals and dust resulting from materials disturbances. All work will be performed in accordance with a Site Health and Safety Plan. The Materials Management Plan will include the following (where applicable):
  - Requirement that staff will have appropriate training in compliance with 29 CFR, Section 1910.120;
  - Methods to assess risks prior to starting onsite work;
  - Procedures for the management and disposal of waste soils generated during construction activities or other activities that might disturb contaminated soil;
  - Monitoring requirements;
  - Storm water controls;
  - Record-keeping; and,
  - Emergency response plan.
- **[Insert who]** will set up decontamination areas for vehicles and equipment at Park entry/exit points. The decontamination areas will be designed to completely contain all wash water generated from washing vehicles and equipment. Best Management Practices (BMPs) will be installed, as necessary, to prevent the dispersal of wash water beyond the boundaries of the decontamination area, including over-spray.
- Prior to the start of construction, **[insert who]** will develop a Fire Safety Plan for **[insert name]** approval. The plan will include the emergency calling procedures for both the California Department of Forestry and Fire Protection (CDF) and local fire department(s).
- All heavy equipment will be required to include spark arrestors or turbo chargers (which eliminate sparks in exhaust) and have fire extinguishers on-site.
- Construction crews will park vehicles **[insert distance]** from flammable material, such as dry grass or brush. At the end of each workday, construction crews will park heavy equipment over a non-combustible surface to reduce the chance of fire.
- DPR personnel will have a State Park radio at the Park, which allows direct contact with CalFire and a centralized dispatch center, to facilitate the rapid dispatch of control crews and equipment in case of a fire.
- Prior to the start of on-site construction activities, **[insert who]** will clean and repair (other than emergency repairs) all equipment outside the project site boundaries.
- Under dry conditions, a filled water truck and/or fire engine crew will be onsite during activities with the potential to start a fire.
- **[Insert who]** will designate and/or locate staging and stockpile areas within the existing maintenance yard area or existing roads and campsites to prevent leakage of oil, hydraulic fluids, etc. into **[insert where i.e., native vegetation, sensitive wildlife areas, creek, river, stream , etc.]**.

<u>Hydrology</u>

- Prior to the start of construction involving ground-disturbing activities, **[insert who]** will prepare and submit a Storm Water Pollution Prevention Plan (SWPPP) for DPR approval that identifies temporary Best Management Practices (BMPs) (e.g., tarping of any stockpiled materials or soil; use of silt fences, straw bale barriers, fiber rolls, etc.) and permanent (e.g., structural containment, preserving or planting of vegetation) for use in all construction areas to reduce or eliminate the discharge of soil, surface water runoff, and pollutants during all excavation, grading, trenching, repaving, or other ground-disturbing activities. The SWPPP will include BMPs for hazardous waste and contaminated soils management and a Spill Prevention and Control Plan (SPCP), as appropriate.

- All heavy equipment parking, refueling, and service will be conducted within designated areas outside of the 100-year floodplain to avoid water course contamination.
- The project will comply with all applicable water quality standards as specified in the **[insert WQCB name]** Basin Plan.
- All construction activities will be suspended during heavy precipitation events (i.e., at least 1/2-inch of precipitation in a 24-hour period) or when heavy precipitation events are forecast.
- If construction activities extend into the rainy season (**[insert dates]**) or if an un-seasonal storm is anticipated, **[insert who]** will properly winterize the site by covering (tarping) any stockpiled materials or soils and by constructing silt fences, straw bale barriers, fiber rolls, or other structures around stockpiles and graded areas.
- **[Insert who]** will install appropriate energy dissipators at water discharge points, as appropriate.

<u>Traffic</u>

- Prior to the start of on-site construction activities that would result in **[insert number]** or more vehicle trips during peak hours (7:00 a.m. to 9:00 a.m. or 4:00 p.m. to 6:00 p.m.) for a period exceeding 6 months in duration, **[insert who]** will prepare a Traffic Impact Study (TIS) for submittal and approval by **[insert who]**. The TIS will include, but will not be limited to:
  - Description of traffic inducing actions;
  - Types of vehicles anticipated;
  - Approximate traffic volumes on/ offsite and roadways to be used;
  - Existing Traffic Counts;
  - Analysis of Project Action traffic volume impacts on intersections and traffic index; and
  - Any other TIS requirements as outlined in the appropriate jurisdiction's guidance on TIS preparation
- Prior to delivery and/or removal of project-related equipment or materials that could impede or block access to driveways, cross streets, or street parking, **[insert name]** will coordinate with the local jurisdictions to develop and implement traffic control measures.

<u>Noise</u>

- Temporary or permanent noise barriers such as berms or walls will be used, as appropriate, to reduce noise levels.
- Internal combustion engines used for project implementation will be equipped with a muffler of a type recommended by the manufacturer. Equipment and trucks used for Project-related activities will utilize the best available noise control techniques (e.g., engine enclosures, acoustically attenuating shields or shrouds, intake silencers, ducts, etc.) whenever necessary.
- **[Insert who]** will locate stationary noise sources and staging areas as far from potential sensitive noise receptors, as possible. If they must be located near potential sensitive noise receptors, stationary noise sources will be muffled or shielded, and/or enclosed within temporary sheds.
- Construction activities will generally be limited to the daylight hours, Monday – Friday. If work during weekends or holidays is required, no work will occur on those days before **[insert time]** a.m. or after **[insert time]** p.m. (check contract docs for time restrictions)
- Internal combustion engines used for any purpose at the job site will be equipped with a muffler of a type recommended by the manufacturer. Equipment and trucks used for

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construction will utilize the best available noise control techniques (e.g. engine enclosures, acoustically-attenuating shields, or shrouds, intake silencers, ducts, etc.) whenever necessary.

State of California

Department of Parks and Recreation

Riparian Forest Restoration Plan
Borrow Area and Shop Area,
Colusa-Sacramento River State Recreation Area

November 14, 2000

By James Dempsey
Environmental Services Intern
Northern Buttes District

APPROVED:

Kathryn V. Foley — 11/22/00

Kathryn Foley, District Superintendent — Date

H Woody Elliott — 11-17-00

H. Woody Elliott, District Resource Ecologist — Date

N2

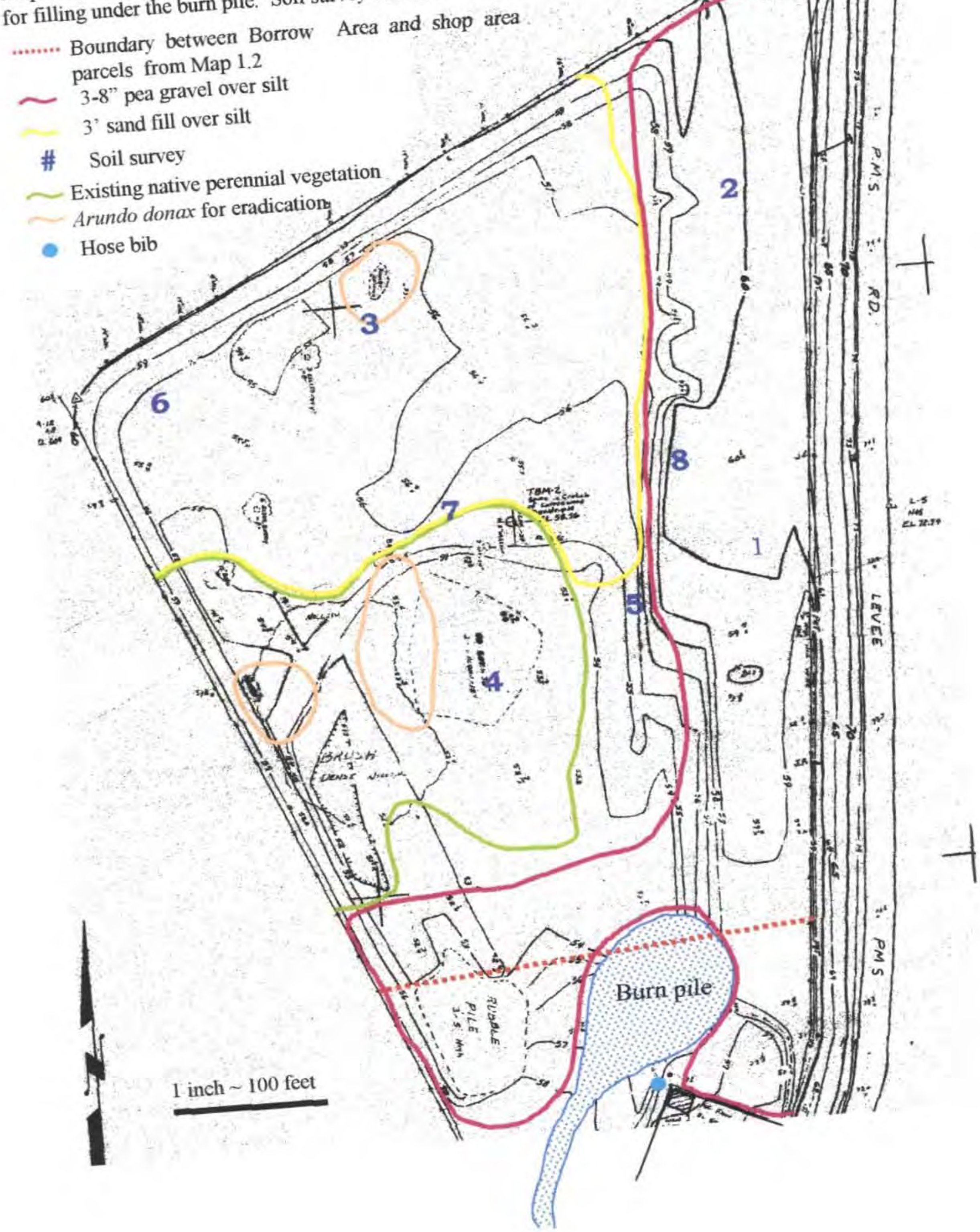
Figure 1.2 shows a flat field, and the 1976 topographical map (Map 1.3), there must have been substantial excavation from the site. Soil survey holes show that much of the site has been filled three feet deep with fill material (unsorted gravelly sand with glass shards and iron artifacts). Given that the 1976 topography is still largely accurate today, the extent of excavation was 2-3 feet deeper than indicated by the depression drawn on Map 1.3. According to Fua (1982), "The depressed condition of the area was caused by previous removal of earth for highway construction" (Appendix A1.3-3). In 1975, an amendment (Appendix A1.1-6) was made to the deed to delete the excavation and access rights held by the Reclamation Board, ending the status of the site as a borrow pit.

Figure 1.2 Aerial photo dated 9-6-37 (DWR, flight no. AAY-77-25).

N3

Map 1.3 Site map.

Map adapted from Draper (1976). Topography shown is roughly current except for filling under the burn pile. Soil survey data are in Appendix A2.



N4

From September 1983 until Spring 1988, the City of Colusa held a Temporary Use Permit with the California Department of Parks and Recreation to dispose of wood chips, fall leaves from street sweepings, and soil within the depression area delineated by elevation 58 feet shown on Map 1.3 (Appendix A1.3-4). The area was described as "low and marshy" by the Colusa County Environmental Health Department (Fua, 1982), and the idea was to provide the least expensive means for the City to dispose of its organic debris as well as allow the State to reclaim the area for use as additional park area (Appendix A1.3-9). The materials dumped could have been "7500 yd^3 fall leaf season .... 4-6" dirt fill over rolled and compacted leaves" or 3000-5000 yd^3 per year of leaves and wood chips, not including soil cover (Appendices A1.3-8 and A1.3-9). The recent soil survey indicates that the organic matter has completely decomposed. It may be seen as the black organic in a sand matrix 12 inches thick in holes 3 and 6 (Map 1.3).

In 1988 the California Waste Management Board became concerned that this may be a Solid Waste Facility operating without a Permit (Appendix A1.3-12). The City decided to end the disposal rather than go through the expense of obtaining the permit (Appendix 1.3-13). The California Integrated Waste Management Board eventually determined that the City's dumping of leaf, wood, and soil did not constitute a solid waste landfill as defined in the Public Resources Code, Section 46027 (Appendix A1.3-15).

Map 1.3 shows a large area of the site adjacent to the levee covered with three to ten inches deep with pea gravel for a total of perhaps 1600 yd^3. The gravel appears to be deliberately spread in a strip parallel to the levee. But Levee authorities claim no knowledge of the pea gravel (Tippin, 2000). The pea gravel has been there since at least 1984 (Dragoo, 2000 and Coronado, 2000). Possibly it was placed during the original construction of the SRA facilities (Appendix A1.4-2).

2 Current Conditions

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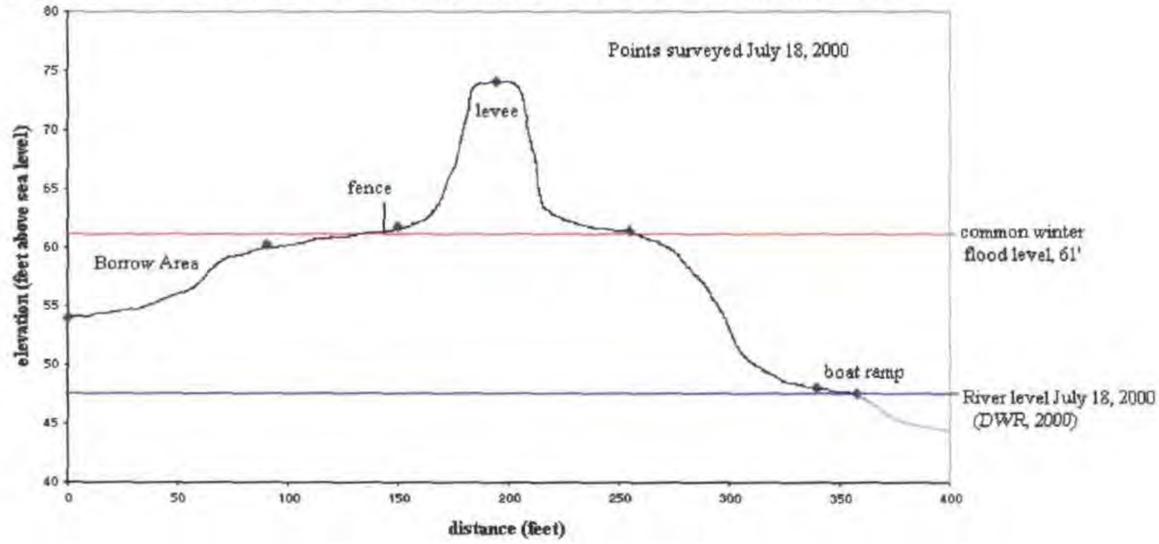
2.1 Site Description – Physical Environment.

The Borrow Area covers 5 acres, and the adjacent unused portion of the shop area considered for revegetation covers about ½ acre (Map 1.3). Native soil consists of recent loamy silt to fine sand river deposits. It is well drained but for the winter high water table which inundates a small portion of the site most years. Topography of the site may be described as a swale, limited to 0-3 % slopes with a total relief of 11 feet over the site. The surface elevation lays between 51 and 62 feet above sea level which is within 10 feet above the summer river level (approximate groundwater level) and below typical winter flood levels (Figure 2.1 and Table 2.1).

The immediate water table is influenced by seepage under the levee from the Sacramento River to the East and possibly by infrequent localized seepage from the Roberts Irrigation Company Ditch along the north property boundary. In early 1997, almost the entire site was inundated up to the shop building footings (elevation 58 feet) from where it drained away southward. During the past 3 winters, no standing water was noticed (Henderson, 2000).

Figure 2.1 Elevation cross-section, Borrow Area to Sacramento River.



A common river flood level of 61 feet, shown in Figure 2.1 and Table 2.1, gives an idea of the Borrow Area elevation in relation to high water levels of the Sacramento River. The elevation difference between the river level at the nearby Colusa river gauging station on Colusa Bridge (Map 1.1) and the river level at the SRA boat ramp (Figure 1.1) is less than one foot. The "Monitor Stage" at the Colusa gauging station is 63.0 feet, which is the river level that may produce over-bank flows sufficient to cause minor flooding of low-lying lands and local roads. At "Flood Stage" of 70.0 feet, over-bank flows cause considerable inundation of land and roads and/or significant hazard to life and property.

N6

Table 2.1. Record of Sacramento River level above 61 feet above sea level (') at Colusa Bridge, 1997 to present (DWR, 2000).

Year	Dates above 61' Level	Days above 61' Level	Peak Level this Period
2000	2/12 – 3/15	Total 32 to date	65.64'
1999		Total 31	
	3/26	1	61.55'
	2/17 - 3/13	25	64.37'
	2/08 - 2/12	5	64.86'
1998		Total 46	
	3/22 – 4/09	19	65.82'
	1/13 – 3/08	27	68.32'
1997		Total 44	
	12/04 – 12/05	2	62.22'
	12/01 – 12/02	2	63.25'
	(1996) – 2/09	40	68.65'

Details of soil substrate areas are discussed in Section 1.3 and shown on Map 1.3. Soil survey data are in Appendix A2. There is a water hose bib (a ¾" line with 45 psi and a flow of 10 gpm) on the west side of the SRA shop, which may be used for irrigation.

2.2 Site Description – Biological.

Currently, the site (Map 1.3) is covered by approximately 4½ acres of mostly non-native grasses and annual forbs. One acre is occupied by a copse of mature cottonwoods at the low point of the swale, native blackberry, poison oak, several recently girdled black walnut trees, and three large patches of *Arundo donax*, which are being treated with glyphosate herbicide (Round-Up). Several young valley oaks grow in the north part of the pea gravel area.

Figure 1.2 shows the English walnut trees in an orchard overhanging the north boundary of the site. A little-used industrial storage yard with compacted soils covered by annual weeds occupies the property to the west. The Sacramento River Flood Control Project west setback levee right-of-way forms the east boundary of the site. It is maintained denuded of vegetation except for a black walnut at the boundary fence. Across the levee from the Borrow Area is the parking lot and access for the SRA day use area and boat ramp, planted with several ornamental tree species. Also across the levee from the Borrow Area at the north end is a section of mature cottonwood riparian forest along the dredged channel that connects the Roberts Ditch Irrigation Company ditch to the Sacramento River at Arnold Bend.

N7

2.3 Permits required.

The State Reclamation Board no longer holds excavation nor access rights, according to the 1975 deed amendment (Appendix A1.1-6). Although mineral rights are retained by the Reclamation Board, this has no bearing on the Riparian Forest Restoration Plan (Fong, 2000). Correspondence is attached in Appendix A3.

The State Board of Reclamation requires an encroachment permit if trees are planted in a designated floodway. No encroachment permit is required for this site, since it is not within a designated floodway. It is located outside of the Sacramento River Flood Control Project west setback levee.

To apply herbicides, an Operator/Site Identification Number is required by the County Agricultural Commissioner's Office. Trained DPR employees are currently qualified to apply herbicide at Colusa-Sacramento River SRA with the appropriate monthly report of herbicide usage to the County Agricultural Commissioner's Office.

N8

3 Goals and Objectives

Goals:

1) To bring the Borrow Area within the umbrella of stated conservation and recreation policies and functions of the Colusa-Sacramento River State Recreation Area and the California State Park System (see Section 4, Justification).
2) To restore natural ecosystem processes to the site, contributing to cumulative rivershed effects such as water quality and habitat for endangered species.
3) To augment the natural setting for public enjoyment and relaxation.

Objectives:

To reestablish native riparian forest to the site and eliminate weedy exotic plants.

N9

4 Justification

4.1 California Department of Parks and Recreation policy.

Resource Management Directives - May 1979

"A. Environmental Resources.

1831 Ever since its beginnings, the California State Park system has been oriented toward preserving and safeguarding elements of the natural and cultural environment. It has now become apparent that the natural environment of California is in jeopardy from urbanization, industrialization, exploitation of resources, pollution, etc. Human influences are extensive, pervasive, and devastating to the natural environment: they are felt throughout California, regardless of the locales of the actions producing them, and irrespective of management and use practices on specific parcels of land. In short, the simple interplay of ecological factors no longer produces a natural biological relationship. It is important to remember that human influences arise from developments or manipulation of the environment, and from overprotection from fire an other natural factors.

(26) IT IS AN OBJECTIVE OF THE DEPARTMENT TO IDENTIFY THE TOTAL FRAMEWORK OF ENVIRONMENTAL AND ECOLOGICAL FACTORS INFLUENCING THE LANDS OF THE STATE PARK SYSTEM, INCLUDING THOSE ARISING FROM HUMAN ACTIVITIES, AND TO PROMULGATE AND APPLY RESOURCE MANAGEMENT TECHNIQUES REQUIRED TO NEGATE DELETERIOUS HUMAN INFLUENCES, AND TO ACHIEVE THE ENVIRONMENTAL OBJECTIVES ESTABLISHED FOR THE SYSTEM.

1831.1 Vegetation.

The most conspicuous and dynamic single element in natural landscape is usually the vegetation. This is generally true regardless of whether the dominant vegetation is forest, chaparral, grassland, or a combination of types. Accordingly, vegetation is usually the primary object of environmental management programs in units of the State Park System. However, wildlife is important, is recognized, and its protection is provided for in every plan for environmental resource management.

Vegetation may be the primary object of preservation efforts in a park system unit, or it may provide a suitable background and environment for other dominant resources. In either case, it is essential to distinguish at the beginning of any management undertaking whether the vegetation is in a climax condition or is at some sub-climax stage. If the latter, it is important to note the direction and speed with which the vegetation is moving through the process of plant succession.

It will not be assumed, as was done in the earlier years of the State Park System, that vegetation and associated biological elements will remain in, or attain, satisfactory condition, if left alone and merely protected from destructive influences.

(29) IN THE STATE PARK SYSTEM, PERPETUATION OF VALUES IN TODAY'S ENVIRONMENT MAY REQUIRE A PURPOSEFUL GUIDING OF DYNAMIC

N10

ECOLOGICAL FACTORS THAT ARE CONSTANTLY UNDERGOING A SUCCESSIONAL TREND THROUGH THE INTERACTION OF NATURAL AND EXTRANEOUS FORCES. THIS GUIDANCE MAY NOT ALWAYS INVOLVE SIMPLY THE STATIC PROTECTION OF THE FEATURES OR ELEMENTS THAT HAPPEN TO BE A PART OF THE EXISTING ENVIRONMENT IN ANY PARTICULAR PERIOD OF TIME.

Nature is dynamic and ever changing, in many instances, particularly in response to human influences, natural processes work rapidly and inexorably toward destruction or elimination of the special conditions, which are recognized as constituting State Park system quality. In some circumstances, natural succession will, within a few years, eliminate the values, which constitute the major reason for establishment of a park system unit.
(30) FOLLOWING CAREFUL CONSULTATION WITH THE PUBLIC AND WITH COOPERATING AGENCIES, THE DEPARTMENT SHALL IDENTIFY, IN THE INDIVIDUAL RESOURCE ELEMENTS,THE VALUES THAT CONSTITUTE SIGNIFICANT PARK SYSTEM RESOURCES. THESE VALUES SHALL BE EXPRESSED IN TERMS OF ECOLOGICAL FACTORS, SUCCESSIONAL TRENDS, AND RELATED RECREATIONAL OPPORTUNITIES.

Once the values have been identified, it is time to establish a management program for each unit that sets forth the measures and techniques to be used to ensure their perpetuation. In some instances, this will require an active and continuous management program to preserve certain sub-climax conditions, and to prevent them from disappearing. In other cases, a gradual or long-range program will be required to ensure that a climax association will perpetuate itself, and will not be disrupted by direct or indirect human activities. In still other instances, the purpose of a unit may be such that the management program may permit natural successional changes to take place with a minimum of interference.
(31) IN CARRYING OUT THE PROVISIONS OF THE RESOURCE ELEMENTS FOR UNITS OF THE STATE PARK SYSTEM, IT IS AN OBJECTIVE OF THE DEPARTMENT TO APPLY CREATIVE AND EFFECTIVE TECHNIQUES OF ENVIRONMENTAL RESOUURCE MANAGEMENT FOUND BY SCIENTIFIC ANALYSIS TO BE REQUIRED TO ACHIEVE THE PROTECTION AND PERPETUATION OF THE VALUES AROUND WHICH THE UNITS ARE BUILT. ”

4.2 Other pertinent State of California policy.

Restoring this land to riparian habitat meets several CALFED (Calfed, 2000) and California Senate Bill 1086 objectives (Sacramento River Advisory Council, 2000):

- Provides habitat for threatened or endangered species (Swainson’s hawk, western yellow-billed cuckoo, wood ducks, neotropical migratory birds, valley elderberry longhorn beetles), which promotes recovery and establishment of self-sustaining populations and minimizes the need for future endangered species listings.

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- Promotes ecosystem processes, which support natural aquatic and terrestrial residents of these forests. For example, improving groundwater quality by providing a buffer zone of pollutant immobilization and nutrient uptake around the River, displacing and suppressing non-native plants, etc.
- Increases the area and quality of riparian habitat and the continuity of the riparian corridor.
- Eliminates and helps to prevent reestablishment of non-native weeds.

5 Methods and Materials

The restoration plan includes eliminating weedy exotic plants, options of dealing with the pea gravel, clearing, planting, installing an irrigation system, and evaluating plant establishment. Follow-up includes inspection of the irrigation line function, invasive weed control to ensure establishment and eradicate *Arundo donax*, and evaluation of the project.

5.1 Eliminating exotic weeds.

A few woody exotics are slated to be eliminated in fall 2000 by a girdling treatment and left standing as dying snags for future wildlife habitat. *Arundo donax* eradication is a three-year process of repeated glyphosate herbicide ("RoundUp") treatment in the fall with no subsequent mechanical removal, which apparently stimulates new growth (Atkinson, 2000). *Arundo* was sprayed in June 2000, and on November 01 all remaining green leaves appeared sickly and unlikely to survive. Spring 2001 emergence of regrowth is anticipated.

5.2 Clearing.

Just before planting, the planting areas may be mowed with a flail mower. On some of the site, the mower operator will need scouting ahead for manual removal of hard obstacles, such as concrete. The *Arundo* donax patch should not be mowed.

Controlled burning is another possibility for clearing prior to planting.

5.3 Planting

5.3.1 Plant materials

Since the soil is moist close to the surface on much of the site and the water table is likely accessible to deep-rooting plants as suggested by Figure 2.1, some of the earlier successional riparian species which need a permanent water source (phreatophytes, such as willow and cottonwood) could become established.

Plants are chosen based on soil texture, depth to the water table capillary zone, natural riparian community composition (Conard et.al., 1977; Barbour and Major, 1977), and likelihood of later natural establishment. For example, birds attracted to the inplanted trees should easily seed in understory plants such as grape, native blackberry, pipevine, and poison oak. These do not need to be planted.

A total of 604 plants are distributed at a spacing of 15 feet, allowing 20 feet from the levee fence for mowing (fire control) and 15 feet from the other property bounds (Map 5.1). The site is divided into three planting areas based on soil type and proximity to existing forested areas.

A cottonwood riparian forest mix is proposed along a band from the existing cottonwood copse on the site towards the existing mature cottonwood forest across the levee north of the boat ramp. The plant list for this cottonwood community is Table 5.1.

Map 5.1 Planting layout.

Plant codes are listed in Tables 5.1, 5.2, and 5.3.

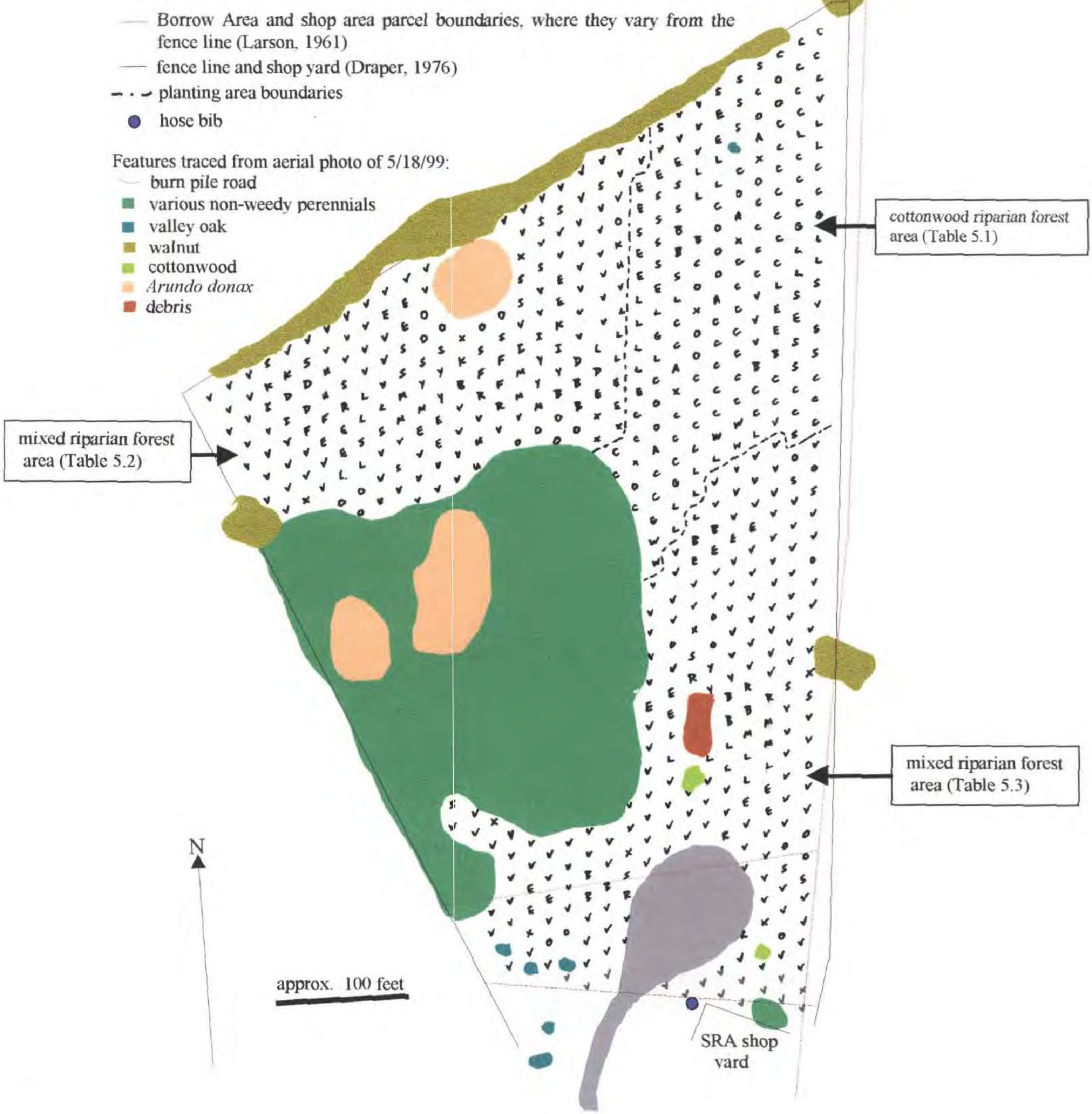

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Table 5.1 Planting list for the cottonwood riparian forest planting area.

Species	Common Name	Plant Code	Number of Plants (Acorns)
Populus fremontii	Fremont cottonwood	C	65
Salix lasiolepis	Arroyo willow	L	27
Plantanus racemosa	California sycamore	S	21
Fraxinus latifolia	Oregon ash	O	14
Sambucus mexicana	Blue elderberry	E	13
Quercus lobata	Valley oak	V	12 (x2)
Salix goodingii	Black willow	G	5
Cephalanthus occidentalis var. *cal.*	Buttonbush	B	5
Salix exigua	Sandbar willow	W	5
Alnus rhombifolia	White alder	A	5
Acer negundo var. californicum	Box elder	X	5
			Total: 177

The other two planting areas are for mixed riparian forest dominated by valley oak. The sandy fill area will favor more drought- or sand-tolerant species such as California sycamore and *Baccharis sp.* . The plant list for this area is Table 5.2. Table 5.3 lists the plants proposed for the remaining area. Map 5.1 is a layout of the 604 plants, at a spacing of roughly 15 feet, allowing 20 feet from the levee fence for mowing (fire control) and 15 feet from the other property bounds.

Table 5.2 Planting list for the mixed riparian forest area in the sandy fill.

Species	Common Name	Plant Code	Number of Plants (Acorns)
Quercus lobata	valley oak	V	95
Plantanus racemosa	California sycamore	S	18
Fraxinus latifolia	Oregon ash	O	14
Sambucus mexicana	blue elderberry	E	14
Salix lasiolepis	arroyo willow	L	9
Cephalanthus occidentalis	buttonbush	B	7
Acer negundo var. calif.	box elder	X	7
Baccharis pilularis ssp. consanq.	coyote bush	Y	6
Baccharis salicifolia	mulefat	M	6
Aesculus californica	California buckeye	K	5
Cercis occidentalis	California redbud	D	5
Quercus wislizenii	interior live oak	I	5 (x2)
Rhamnus californica	California coffeeberry	F	5
Umbellularia californica	California bay	U	5
Rosea californica	wild rose	R	3
			Total: 203

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Table 5.3 Planting list for the mixed riparian forest area out of the sandy fill.

Species	Common Name	Plant Code	Number of Plants (Acorns)
Quercus lobata	valley oak	V	153 (x2)
Fraxinus latifolia	Oregon ash	O	13
Sambucus mexicana	blue elderberry	E	13
Plantanus racemosa	California sycamore	S	9
Salix lasiolepis	arroyo willow	L	9
Cephalanthus occidentalis	buttonbush	B	8
Acer negundo var. californicum	box elder	X	7
Rosea californica	wild rose	R	6
Baccharis pilularis ssp. consanq.	coyote bush	Y	3
Baccharis salicifolia	mulefat	M	3
			Total: 224

5.3.2 Planting methods.

The *Quercus* acorns may be planted in the manner described by Motz (1996).

Populus fremontii and the three *Salix* species may be planted at some cost savings by using dormant hardwood cuttings in January or February only. Details on collecting material and planting are included in Appendix 4.

Plant protectors such as "blue-x" tubes should be used with the *Quercus* acorns and the dormant hardwood cuttings, to maintain humidity and protect from herbicide spray, among other benefits. The other plants may be planted together with open-ended milk cartons buried around the seedlings, which can protect from herbicide as well as rodent damage, at low cost. Wire screens may be needed to prevent deer browsing damage.

Herbicide application might be reduced or eliminated by using a suitable biodegradable weed-suppressant mulch, such as sisal mats (recycled from mattresses). Additional benefits include conservation of moisture and reduction of rodent habitat and damage. Cardboard (flattened corrugated boxes) may be used as a less expensive alternative, overlapped to form a four to six foot diameter ring around each seedling, allowing irrigation emitters a space to percolate through the center, or placed underneath. The cardboard would last for 2-3 years if uncovered, and may be held in place with grass sod staples or geotextile stakes.

5.4 Irrigation.

The groundwater table is probably within ten feet of the surface over much of the site, and the soil survey found July moisture within the upper two feet of the silt soils (Map 1.3 and Appendix A2). However, plants would not get established in the sandy fill soil area without irrigation. Irrigating will be cost-effective insurance for establishment over

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the entire site. The water faucet located at the shop building is convenient and adequate, so it should not be difficult to install a drip irrigation system, watering 1.5 gallons per plant two or three times a week from May to October. The drip irrigation system would require regular monitoring for rodent damage and proper flow. Otherwise the system would be automated with a timer/valve.

5.5 Pea gravel alternatives.

The pea gravel layer covering the area adjacent to the levee fence inhibits natural regeneration of many native riparian plants, so removal would be desirable. Tilling the gravel into the underlying silt would make little difference unless the gravel were mixed uniformly to a depth of two to three feet. This would be impractical. The gravel could be dealt with in some combination of three ways:

Pea gravel alternative 1: No action.

This alternative can take advantage of the existing gravel as mulch during establishment. However, natural regeneration of most natives would continue to be inhibited and weeds would prevail in the long run.

Pea gravel alternative 2: Limited removal after establishment.

Initially plant seedlings into the gravel as is –with seedling bases level with the native soil level-- and allow space between the planting rows to accommodate machinery for removing gravel after 3 summers of plant establishment. This option takes advantage of the gravel as 'mulch' to conserve water and suppress weed competition during establishment, by scaling down the expensive movement of large quantities of heavy material, and by still allowing a significant part of the native substrate to be exposed and available for natural regeneration. By planting in rows separated by 15 feet, 60-80% of the surface could be cleared of gravel.

Pea gravel alternative 3: Removal.

The pea gravel layer ranges from two to ten inches deep over the 100' by 650' area. The upper two to five inches of gravel (about 400 cubic yards) is loose and clean, except for the growth of Bermuda grass. The dirtier gravel below amounts to about 1200 yd^3, for a total volume of 1600 yd^3.

Pea gravel alternative 4: Onsite containment.

Pile the gravel layer in mounds/berms, leaving the rest of the 100' by 650' area with the native substrate exposed. Perhaps grading the gravel into an access road along the west boundary fence would help keep this fence clear of growth, a desire of the maintenance staff.

6 Resource Monitoring

The irrigation system would need weekly monitoring during the irrigation season, because rodents may gnaw into the drip lines and the drip emitters may become plugged.

The site would need to be monitored for invasive weeds through the first three summers, including spraying *Arundo donax* patches each fall with glyphosate herbicide. Spot spraying of herbicide will be necessary to eliminate competition and rodent cover, especially if irrigation is used. Weedy growth at the base of planted seedlings encourages rodent habitat and rodents tend to girdle (kill) the seedlings.

Success criteria relate to the stated Objective: plant survival and growth. Plant survival can be documented by comparing a survival census to a planting map after two summers without irrigation. Wildlife variety, use, frequency, and number, as well as forest canopy structure, are subjective or extremely difficult to evaluate in terms of quantifying "success" for this kind of project, so they are not useful as success criteria.

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7 Project Budget

$20,000 has been allocated for this project under the title, "Riparian Habitat Restoration – Shop Parcel" (California Department of Parks and Recreation, Northern Buttes District, Project #MAH197) for fiscal years 1999 – 2001.

Modest savings may accrue by opportunistically using plant overstock and surplus materials from other projects.

Current estimates for various components of this project are listed as follows. Values are approximate and subject to change.

Task .	Labor Costs	Material Costs	Subtotal Cost
Planning	$3000.	-	$3000.
Clearing and planting	$2500.	$2500.	$5000.
Irrigation system installation and removal	$2500.	$2000.	$4500.
Pea gravel removal			$5000.
herbicide spraying, transportation, irrigation system maintenance, incidental			$2500.
			Total: $20,000.

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A Appendices

A1 Historical documents.
- A1.1 Deed and Amendment.
- A1.2 Ownership map.
- A1.3 City of Colusa leaf disposal paper trail.
- A1.4 Colusa County Library references.

A2 Soil survey data.

A3 Correspondence.

A4 Dormant hardwood cutting collection and planting methods.

AGREEMENT FOR THE TRANSFER OF CONTROL AND POSSESSION
SACRAMENTO AND SAN JOAQUIN DRAINAGE DISTRICT
COLUSA-SACRAMENTO RIVER STATE PARK

THIS AGREEMENT, made and entered into this 20th day of December, 1957, by and between the SACRAMENTO AND SAN JOAQUIN DRAINAGE DISTRICT, acting by and through The Reclamation Board, hereinafter called "District", and the STATE OF CALIFORNIA, acting by and through the State Park Commission, hereinafter called "Commission",

W I T N E S S E T H:

WHEREAS, District has control and possession of certain lands located in the County of Colusa, said lands being hereinafter particularly described; and

WHEREAS, Commission proposes to acquire additional lands in the County of Colusa for State Park purposes and has applied to District for a transfer of control and possession of the hereinafter described lands; and

WHEREAS, District desires to cooperate with Commission and to transfer the control and possession of the hereinafter described property for such park purposes;

NOW, THEREFORE, in consideration of the mutual benefits to be derived by each party, and in accordance with established departmental procedure, and pursuant to the provisions of Section 13110 of the Government Code and Section 5005 of the Public Resources Code of the State of California, District hereby transfers to Commission and Commission hereby accepts the control and possession of the following described Parcel 1 of real property:

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PARCEL 1

All that certain real property situate, lying and being in the County of Colusa, State of California, being portions of Lots 17 and 18 of "Amos Roberts Tract", as said lots are delineated and so designated upon the official map or plat of said tract filed in the office of the Recorder of the County of Colusa, California, September 30, 1887, in Book 4 of Patents, Page 80, and more particularly described as follows, to-wit:

Commencing at the intersection of the center lines of 12th and Main Streets in the Town of Colusa, thence N. 16° 00' E., 400.00 feet, more or less, along said center line of 12th Street to the north line of Levee Street; thence S. 74° 00' E., 12.50 feet, more or less, along said north line of Levee Street to the landward right of way line of the west levee of the Sacramento River, as conveyed by L. M. O'Rourke and J. L. O'Rourke, executors of the will of J. J. O'Rourke, deceased, to the Sacramento and San Joaquin Drainage District, dated June 6th, 1939, and recorded in Book 94 of Official Records of Colusa County, at Page 318; thence N. 16° 09' E., 131.74 feet along said levee right of way line to the point of beginning of the herein described tract of land.

Thence from said point of beginning N. 23° 55' W., 884.32 feet; thence N. 61° 38' E., 589.55 feet, more or less, to the above mentioned landward levee right of way line; thence along said levee right of way line the following courses and distances:

S. 3° 56' W., 419.84 feet; S. 8° 08' W., 430.25 feet; and S. 16° 09' W., 253.73 feet, more or less, to the point of beginning and containing 6.5 acres, more or less.

Reserving, however, unto District, its successors and assigns, the perpetual right to excavate and remove earth and other materials from the hereinafter described Parcel 2 of real property for the purpose of constructing, reconstructing, operating, repairing or maintaining any and all works of the Sacramento River Flood Control Project, together with a right over, upon and across the above described Parcel 1 of ingress to and egress from the said Parcel 2 for the purposes recited herein: Said Parcel 2 of real property is located in Colusa County, State of California, and is described as follows:

PARCEL 2

> Beginning at the most westerly corner of the lands conveyed by L. M. O'Rourke and J. L. O'Rourke, executors of the will of J. J. O'Rourke, deceased, to the Sacramento and San Joaquin Drainage District dated June 6, 1939, and recorded in Book 94 of Official Records of Colusa County, at Page 318; thence North 61° 33' East 589.55 feet, more or less, to the landward levee right of way line of the west levee of the Sacramento River; thence along said levee right of way line the following courses and distances; South 3° 56' West 419.84 feet; South 8° 08' West 233.98 feet; thence leaving said right of way line South 84° 34' 30" West 282.04 feet; thence North 23° 55' West 434.32 feet to the point of beginning.

This Transfer of Control and Possession is subject to the following covenants, conditions and reservations:

1. This transfer of control and possession shall be for the uses and purposes incident to the powers and duties granted to Commission by Division 5, Chapter 1 of the Public Resources Code of the State of California as the same now exists or may from time to time be amended, except as same may be inconsistent with the conditions and reservations as recited herein.

2. Commission shall have no control over and shall not be possessed of the minerals, oil and gas contained in the lands described herein, and District shall have the sole right to remove and/or dispose of the same; provided, however, that the surface of said parcel hereinabove described shall not be disturbed except that District may locate an oil, gas or other well thereon at a location satisfactory to it and Commission.

3. Commission hereby accepts Control and Possession of the herein described parcel of land subject to all land, oil,

oil and gas leases, easements, rights of way and encumbrances which are in existence as of the date of this agreement.

IN WITNESS WHEREOF, the parties hereto have executed this agreement on the day and year first above written.

SACRAMENTO AND SAN JOAQUIN DRAINAGE DISTRICT, Acting by and through The Reclamation Board

By [signature]
President

By [signature]
Secretary

STATE OF CALIFORNIA, Acting by and through its State Park Commission

By [signature]
J. R. KNOWLAND, Chairman

ATTEST:

[signature]
J. H. COVINGTON
Executive Secretary

DEPARTMENT OF FINANCE
APPROVED
APR 3 1958
JOHN M. PEIRCE, Director
By [signature] Deputy

APPROVED:

[signature] Chief
Division of Administrative Services
DeWITT NELSON
Director of Natural Resources

APPROVED:

JOHN M. PEIRCE
Director of Finance

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STATE OF CALIFORNIA }
COUNTY OF SACRAMENTO } ss.

On this - - 20th - - day of - - - - December - - - - - A.D. 19 57, before me, - - - - - Mary K. Hicks - - - - - - - - - , a Notary Public in and for the said county and State, duly commissioned and qualified, personally appeared - - A. R. Gallaway, Jr. - - - - - - - and - - - George H. Holmes - - - - - -, known to me to be the President and Assistant Secretary, respectively, of The Reclamation Board of the State of California, and acknowledged to me that they executed the foregoing instrument for and on behalf of The Reclamation Board of the State of California.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal, the day and year in this certificate first above written.

My commission expires
July 22, 1960

Mary K. Hicks
Notary Public in and for the County of Sacramento, State of California

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STATE OF CALIFORNIA }
COUNTY OF Alameda } ss.

On this 21st day of May, 1958, before me Rena Walck, a Notary Public in and for the County of Alameda, State of California, residing therein, duly commissioned and sworn, personally appeared J. R. Knowland, known to me to be the Chairman of the State Park Commission of the State of California, the body politic and sovereign that executed the within instrument, known to me to be the person who executed the within instrument on behalf of said State of California and acknowledged to me that said State of California executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal on the day and year in this certificate first above written.

Rena Walck
Notary Public in and for the County of
State of California My Commission Expires Oct. 17, 1960

Chief
Division of Administrative Services

RECORDED AT REQUEST OF
Division of Beaches & Parks
AT 10 MIN. PAST 11 A.M.
OFFICIAL RECORDS COLUSA COUNTY, CALIF.
JUL 21 1958
Lola Smith
RECORDER FEE $ no fee

Department of Finance
Administrative Adviser
DEC 30 1957
RECEIVED

BOOK 257 PAGE 276

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AMENDMENT TO TRANSFER OF CONTROL AND POSSESSION

COLUSA-SACRAMENTO RIVER STATE PARK

W I T N E S S E T H:

WHEREAS, on December 20, 1957 the SACRAMENTO AND SAN JOAQUIN DRAINAGE DISTRICT, acting by and through The Reclamation Board, hereinafter called "District", and the STATE OF CALIFORNIA, acting by and through the State Park Commission (now entitled: Department of Parks and Recreation), hereinafter called "Parks" entered into an agreement transfering control and possession of land more particularly described as "Parcel 1" and "Parcel 2" in the above mentioned document to Parks; and

WHEREAS, District reserved the right to excavate and remove earth and other materials from Parcel 2 needed for constructing, reconstructing, operating, repairing or maintaining any and all works of the Sacramento River Flood Control Project together with a right over, upon and across Parcel 1 of ingress to and egress from the said Parcel 2 for the purposes recited herein; and

WHEREAS, District finds that the rights described above are no longer needed for purposes of the Sacramento River Flood Control Project;

NOW THEREFORE, it is mutually agreed between District and Parks that the right to remove material and the right of access over Parcel 1 as set forth in the Transfer of Control and Possession dated December 20, 1957 and recorded in Book 257, Page 276, Colusa County Records, are hereby deleted.

All other provisions of the [illegible] the same.

///

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IN WITNESS WHEREOF, the parties hereto have executed this agreement on May , 1975.

SACRAMENTO AND SAN JOAQUIN DRAINAGE DISTRICT, Acting by and through The Reclamation Board

By Wallace McCormack
President

Approved as to legal form and sufficiency:

[signature]
Counsel, Reclamation Board
Subscribing witness

By Ronald Kavanagh
Secretary

STATE OF CALIFORNIA, Acting by and through the Department of Parks and Recreation.

By Herbert Rhodes
Director

APPROVED
Department of General Services
JUL 14 1975
By [signature]
Supervising Land Agent

Approved as to Legal Form and sufficiency for The Reclamation Board

[signature]
Counsel

BOOK 428 PAGE 457

N30

SUBSCRIBING WITNESS

STATE OF CALIFORNIA
COUNTY OF Sacramento } ss.

On May 29, 1975 before me, the undersigned, a Notary Public in and for the State of California, personally appeared Allan I. Wendroff known to me to be the person whose name is subscribed to the within instrument as a witness thereto, who, being by me duly sworn, deposed and said: that he resides in the County of Sacramento, State of California; that he was present and saw Wallace McCormack and Ronald R. Harrington personally known to him to be the persons described in and whose names are subscribed to the within instrument, execute the same; and that affiant subscribed his name thereto as a witness to said execution.

WITNESS my hand and official seal. (Seal)

OFFICIAL SEAL
MARJORIE L. SMITH
NOTARY PUBLIC - CALIFORNIA
COUNTY OF SACRAMENTO
My Commission Expires March 8, 1977

Marjorie L. Smith
Name (Typed or Printed)
Notary Public in and for the State of California

Marjorie L. Smith

STATE OF CALIFORNIA
COUNTY OF SACRAMENTO } ss.

On this 14th day of MAY, in the year of 1975, before me, NEIL E. O'BRIEN, a Notary Public in and for the State of California, duly commissioned and sworn, personally appeared HERBERT RHODES known to me to be the Director of Parks and Recreation of the State of California and acknowledged to me that he executed the within instrument in the name of and on behalf of the State of California.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal in said County, the day and year first above written.

NEIL E. O'BRIEN
NOTARY PUBLIC
SACRAMENTO COUNTY, CALIFORNIA
My commission expires March 8, 1976

Neil E. O'Brien
Notary Public

BOOK 428 PAGE 458

N31

May 23, 1975

RIGHT OF WAY ACQUISITION

b. PROPERTY MANAGEMENT -

Amendment to Transfer of Control and Possession, Colusa-Sacramento River State Park.

Mr. Lew Morse said that in 1957 the Reclamation Board transferred a parcel in the City of Colusa to the Department of Parks & Recreation, and in that transfer certain rights were reserved -- the right to excavate and remove material, the right of access and mineral rights. The City of Colusa and the Department of Parks & Recreation wish to develop this site into an all-year campground. Mr. Morse said he had checked with Mr. John Wright, Department of Water Resources, and he follows the opinion these rights, with the exception of the mineral rights, would not be needed; therefore it was Mr. Morse's recommendation that an amendment to the Transfer of Control and Possession document be approved and executed by the Board. The mineral rights are to be retained by the Reclamation Board.

STATE OF CALIFORNIA)
COUNTY OF SACRAMENTO)ss.
Office of The Reclamation Board)

I, JOHN V. PAYNE, Assistant Secretary of The Reclamation Board, do hereby certify that the above is a true and correct extract from the Minutes of the meeting of said Board held on May 23, 1975.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of The Reclamation Board this 27th day of May, 1975.

(Seal)

John V. Payne

JOHN V. PAYNE, Assistant Secretary
The Reclamation Board

RECORDED AT REQUEST OF State of California DATE July 22, 1975 428 Official Records p. 456 Colusa County, California INDEXED

1 Min. past 12 P.M. $ No Fee

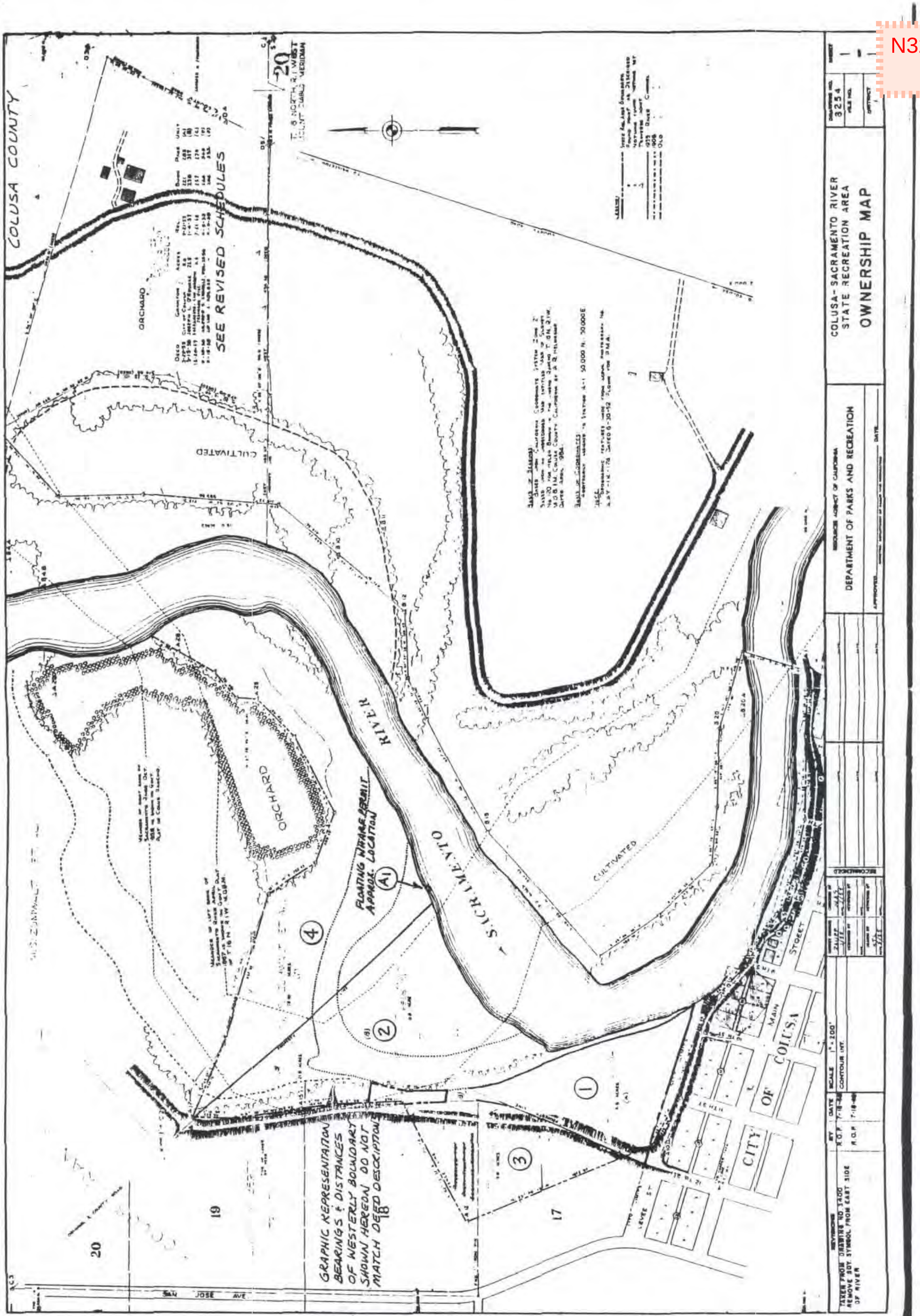
Marcia Munson RECORDER

SRB 016

2260

BOOK 428 PAGE 459

N32


COLUSA COUNTY
SEE REVISED SCHEDULES
ORCHARD
CULTIVATED
SACRAMENTO
RIVER
FLOATING NWARA PERMIT
APPROX. LOCATION
GRAPHIC REPRESENTATION
BEARINGS & DISTANCES
OF WESTERLY BOUNDARY
SHOWN HEREON DO NOT
MATCH DEED DESCRIPTION
CITY OF COLUSA
MAIN
STREET
LEVEE ST
SAN JOSE AVE
COLUSA-SACRAMENTO RIVER
STATE RECREATION AREA
OWNERSHIP MAP
DEPARTMENT OF PARKS AND RECREATION
3254

CITY OF COLUSA

N33

COLUSA, CALIFORNIA 95932 , Phone 916-458-4941

From the Office of: Public Works Director
425 Webster
P.O. Box 1063

June 14, 1982

State of California
Department of Parks and Recreation
P.O. Box 2430
Shasta, California 96087

Attention: Mr. Jack Schlotter
Area Manager

Dear Mr. Schlotter:

The City of Colusa requests the cooperative use of approximately four (4) acres of low land west of the levee at the Colusa State Park and north of the Park Maintenance building for dirt and leaf disposal.

The low land area in question will be used for dirt and leaf disposal by the City of Colusa until the low land is filled to its natural ground level.

The City of Colusa will maintain the area in an orderly manner as to not cause an unsightly condition. No uses for disposal by the general public will be permitted without Colusa State Park autorization.

The City will maintain existing roadway from the top of the levee entrance point to the State Maintenance building through to the disposal site.

I have discussed this proposed agreement with the local Park Ranger, Mr. Will Rose, Mr. Kenneth Wilbur, Chief Ranger of the North Valley of Chico and yourself, and all have agreed to the tenative agreement of this disposal site proposal by the City of Colusa.

I wish to thank all of the State Department of Parks and Recreation staff for their cooperation in this proposed agreement with the City of Colusa.

We will be looking forward to hearing from you as soon as possible regarding the specific terms and conditions of this proposed agreement.

If any other information is needed please contact me at (916) 458-4941.

Thank you.

Roy G. Triplett
Public Works Director

RGT/mw

STATE OF CALIFORNIA—THE RESOURCES AGENCY EDMUND G. BROWN JR.,

N34

DEPARTMENT OF PARKS AND RECREATION
Northern Region Headquarters
3033 Cleveland Avenue, Suite 110
Santa Rosa, CA 95401
(707) 576-2185

RECEIVED
SEP 30 1982
CITY OF COLUSA

September 27, 1982

Roy G. Triplett
Public Works Director
City of Colusa
P. O. Box 1063
Colusa, California 95932

Dear Mr. Triplett:

The following is the clarification you requested concerning condition Number 7 of the Temporary Use Permit at Colusa-Sacramento SRA for the dirt and leaf landfill.

The intent of this section is to insure that at the termination of the permit the Permittee will restore the area to the proximate condition prior to the commencement of work, including the condition of access roads, fences, gates, etc., and to insure the removal of all equipment and materials used on the site. It is not intended in any way to require the removal of any of the landfill materials placed in accordance with the other terms of the Permit.

I hope this clarification is adequate for your purposes. Should you need further assistance please call Land Agent Jim Rennie in Santa Rosa at (707) 576-2325.

Sincerely,

Curtis B. Mitchell
Regional Director

Central Valley Region

RECEIVED N35
OCT 14 1982
CITY OF COLUSA

MEMORANDUM

TO: Larry F. Nash

5 October 1982

FROM: Dan S. Fua

SUBJECT: PROPOSED DIPSOSAL SITE FOR LEAVES AND STREET SWEEPINGS, CITY OF COLUSA, COLUSA COUNTY

An inspection of the proposed disposal site for leaves and street sweepings from the City of Colusa was made on 30 September 1982. Mr. Craig King, Colusa County Director of Environmental Health; Mr. Roy Tripplet, City of Colusa, Director of Public Works; and Jon Marshack, of our office, accompanied me.

The proposed site is adjacent to the California Department of Parks and Rerea-tion maintenance building, outside the City of Colusa's city limit and owned by the State of California. It is bounded by Highway 45 on the west, Sacramento River levee on the east, the City of Colusa on the south and an orchard on the north. The depressed condition of the area was caused by previous removal of earth for highway construction. The area was previously described by Mr. King as low and marshy. It is presently unused. There are trees surrounding it and vegetation growing in it. The proposal to use the site for disposal of leaves and street sweepings for a year trial basis was considered by City staff as the least costly of all alternatives and could also serve the purpose of refilling the depressed area. Mr. Tripplet said the Department of Parks and Recreation had given approval to the City for the use of the site.

Jon and I saw no water quality problem on the use of the site for disposal of leaves and street sweeping for a year and recommend a waiver of permit. The disposed wastes should, however, be capped to prevent rainwater from leaching them. I will be observing this operation to track down conditions and disposal practices that may adversely affect water quality.

DSF:rar

cc: Mr. Craig King, Environmental Health Department, Colusa County
Mr. Roy Tripplet, Public Works Department, City of Colusa

STATE OF CALIFORNIA—THE RESOURCES AGENCY

George Deukmejian

DEPARTMENT OF PARKS AND RECREATION

Northern Region Headquarters
3033 Cleveland Avenue, Suite 110
Santa Rosa, California 95401
(707) 576-2185

RECEIVED
JUL 21 1983
CITY OF COLUSA

July 18, 1983

Roy G. Triplett, Public Works Director
City of Colusa
425 Webster, P.O. Box 1063
Colusa, California 95932

Dear Mr. Triplett:

Enclosed is a fully executed copy of the Tempory Use Permit to allow the City of Colusa to utilize a portion of Colusa-Sacramento State Recreation Area as a land fill for dirt and leaf disposal material.

I would like to thank you and your staff for the continued cooperation you have shown in fulfilling the terms of the Permit.

Sincerely,

Curtis B. Mitchell

Curtis B. Mitchell
Regional Director

CBM:JWR:ik

Enclosures

cc: Jack Schlotter, Cascade Area Manager
w/attachments

N37

STATE OF CALIFORNIA - RESOURCES AGENCY
DEPARTMENT OF PARKS AND RECREATION

TEMPORARY USE PERMIT

PERMITTEE:

City of Colusa
425 Webster, P.O. Box 1063
Colusa, California 95932
(Name and Address of Permittee)

Permittee is hereby granted permission to use subject to the conditions set forth below for the period commencing September 1, 1983 and ending November 30, 1987, that portion of Colusa-Sacramento River State Recreation Area as outlined in red on Drawing No. 15322, Sheet No. 3, attached hereto.

This permit is issued for the purpose of providing a landfill consisting of dirt and leaf disposal material as outlined in the letter dated June 14, 1982, attached hereto.

This permit is issued upon the following conditions:

1. That the premises be used only for the purposes specified above.

2. That the exercise of any of the privileges granted in this permit constitutes acceptance of all the conditions of this permit.

3. Permittee, in the exercise of the privileges herein granted, shall at all times comply with all applicable laws, rules and regulations including, but not limited to, rules and regulations for the State Park System now in effect or hereinafter adopted.

4. That no tree or plant shall be cut, injured or disturbed by Permittee without approval of the State. Any tree or slash so cut or removed shall be disposed of in a manner satisfactory to State.

N38

5. This permission is subject to all valid and existing contracts, leases, licenses, encumbrances and claims of title which may affect said property; and the use of the word "grant" herein shall not be construed as a covenant against the existence of any thereof.

6. Permittee hereby waives all claims and recourse against the State of California for loss or damage to persons or property arising from, growing out of, or in any way connected with or incident to this permit. Permittee agrees to indemnify, save harmless, and defend the State of California, its officers, agents, and employees against any and all claims, demands or causes of action that may be brought against the State of California, its officers, agents and employees arising out of, or in any way connected with or incident to this permit.

7. That upon termination of this permit, Permittee shall remove all property and equipment placed by or for Permittee upon said premises, except for dirt and leaf disposal material placed in accordance with the terms and conditions of this Permit, and restore said premises as nearly as possible to the same state and condition they were in prior to Permittee's entry upon said premises; but if Permittee shall fail to do so and in the event Permittee shall not correct such breach within ten (10) days after being requested in writing to do so by State, then State may do so all at Permittee's cost and expense, to be paid by Permittee on demand.

8. The route of ingress, egress and access by Permittee for the purposes herein shall be reasonably designated and redesignated by the State.

N39

9. In its use of the area Permittee shall comply with all State requirements including, but not limited to, parking control and the uses contemplated herein.

10. This permit shall terminate at the end of the period as hereinabove provided except that State reserves the right to terminate at any time during said period upon giving ten (10) days' written notice to Permittee of State's intention to terminate. Upon breach by Permittee of any of the conditions set forth herein, State may terminate the permit immediately by written notice to Permittee.

11. This permit shall not, nor shall any interest therein or thereunder, be assigned, mortgaged, hypothecated or transferred by Permittee whether voluntary or involuntary or by operation of law, nor shall Permittee let or sublet, or grant any license or permit with respect to the use and occupancy of the said premises, or any portion thereof without the written consent of State being first had and obtained.

The terms of the above permit accepted by the Permittee this 29 day of June, 1983

PERMITTEE:

CITY OF COLUSA

By Roy S. Triplett
Public Works Director

STATE OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
NORTHERN REGION

BY Curtis B. Mitchell
Curtis B. Mitchell
Regional Director

N40

CITY OF COLUSA

COLUSA, CALIFORNIA 95932 · Phone 916-458-4941

RECEIVED
... 15 1982

AREA MANAGER
V.S. SUPERVISOR
MAINT. SUPERVISOR
ADMIN. SUPERVISOR
UNITS

From the Office of: Public Works Director
425 Webster
P.O. Box 1063

June 14, 1982

State of California
Department of Parks and Recreation
P.O. Box 2430
Shasta, California 96087

Attention: Mr. Jack Schlotter
Area Manager

Dear Mr. Schlotter:

The City of Colusa requests the cooperative use of approximately four (4) acres of low land west of the levee at the Colusa State Park and north of the Park Maintenance building for dirt and leaf disposal.

The low land area in question will be used for dirt and leaf disposal by the City of Colusa until the low land is filled to its natural ground level.

The City of Colusa will maintain the area in an orderly manner as to not cause an unsightly condition. No uses for disposal by the general public will be permitted without Colusa State Park autorization.

The City will maintain existing roadway from the top of the levee entrance point to the State Maintenance building through to the disposal site.

I have discussed this proposed agreement with the local Park Ranger, Mr. Will Rose, Mr. Kenneth Wilbur, Chief Ranger of the North Valley of Chico and yourself, and all have agreed to the tenative agreement of this disposal site proposal by the City of Colusa.

I wish to thank all of the State Department of Parks and Recreation staff for their cooperation in this proposed agreement with the City of Colusa.

We will be looking forward to hearing from you as soon as possible regarding the specific terms and conditions of this proposed agreement.

If any other information is needed please contact me at (916) 458-4941.

Thank you.

Roy B. Triplett

Roy B. Triplett
Public Works Director

7500 CU YDS - FALL LEAF SEASON
4-6" DIRT FILL OVER ROLLED AND COMPACTED
3.5 ACRES

RGT/mw

A1.3-8

CITY OF COLUSA

COLUSA, CALIFORNIA 95932 • Phone 916-458-4941

From the Office of: Millard C. Totman, Director
Department of Public Works
P.O. Box 1063
425 Webster Street

October 26, 1987

Janet Krug, Director
Department of Environmental Health
P.O. Box 610
Colusa, CA

RE: City of Colusa
Leaf Removal Site

Dear Ms. Krug:

The City of Colusa has a permit, from the State of California Department of Parks and Recreation, to haul and deposit, on approximately four acres of their land lying West of the West (or right) levee of the Sacramento River, the annual leaf removal, wood chips from the City's pruning activities and soil. The object is to fill an existing low level area, with an elevation of 53±, to an elevation of 58, U.S.G.S. datum, thereby allowing the State to reclaim and use the area for additional Park area.

The City must maintain the existing roadway from the top of the levee entrance point to the State Maintenance building through to the disposal site. The area is not open to the use of the public. During approximately 45 days each year there will be from 1½ to 3 truck loads, (36 compacted cubic yards per load) of leaves hauled into the area per day. These leaves are spread and compacted by a Cat 12 and a Cat loader, and a layer of imported soil (approximately 2 to 4 inches deep) is placed over the leaves. The wood chips are brought to the site on an average of one to two truck loads per day for approximately 200 days a year. A truck load consists of approximately 3 uncompacted cubic yards. These are spread with the leaves and covered. There is no sludge, slurry, etc. deposited.

The City's operation is monitored by the State Department of Parks and Recreation, and at the conclusion of the operation the City must restore the area to the proximate condition prior to the commencement of work, including the condition of access road, fences, gate, etc.

As the area is abuted by an orchard on one side, levee on another and the Park's maintenance yard on the third, it does not create a public nuisance, as there are no nearby residences.

The filling of this low area with clean fill material would be beneficial in the sense that the area could not then be used as an illegal dump and possibly contaminate ground water.

If you have any questions regarding this topic, or if I can provide you with any further information, please do not hesitate to give me a call.

Sincerely,

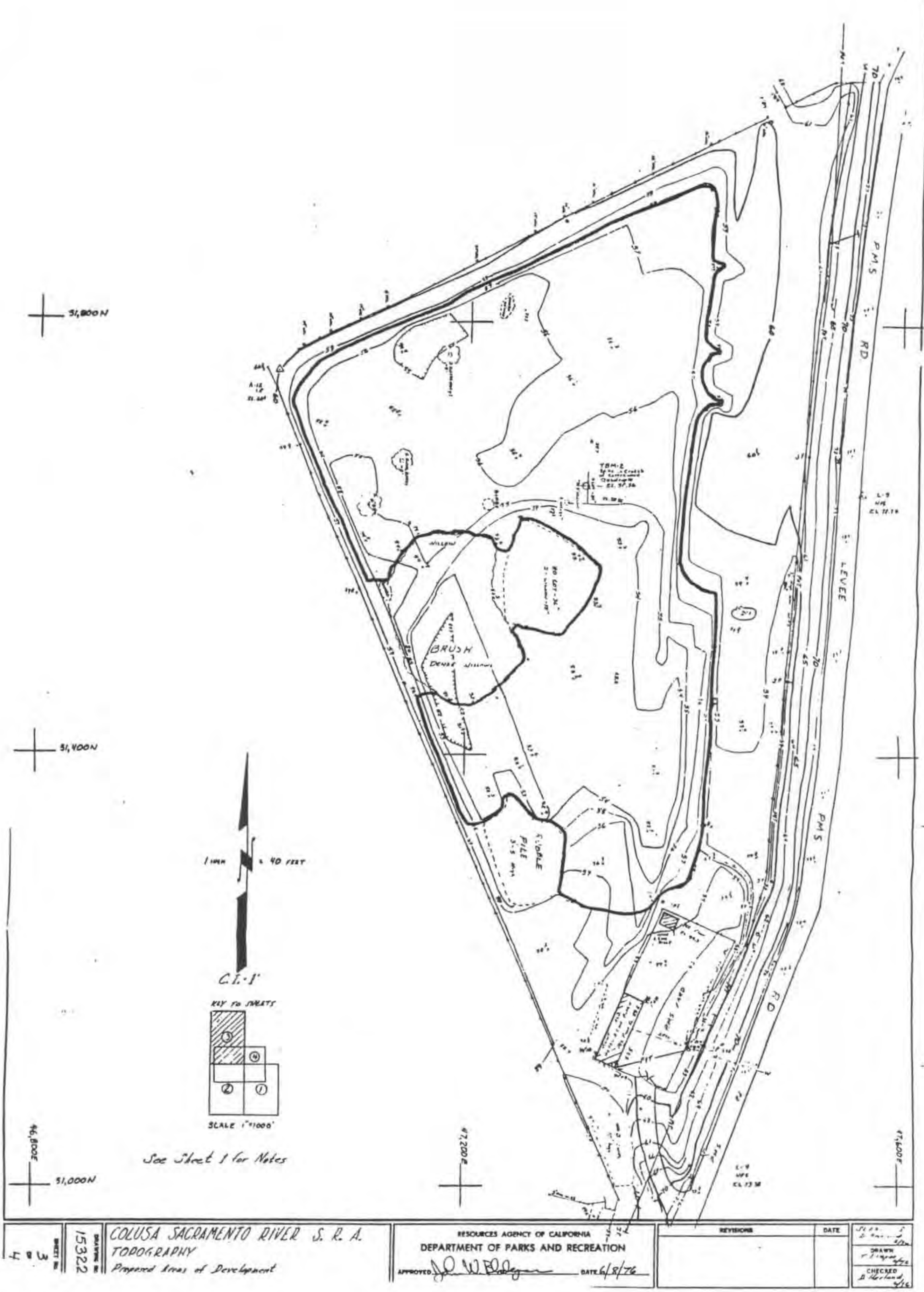
Millard C. Totman

Millard C. Totman, Director
Department of Public Works

Enc.

JM:jv

N43



31,800 N
31,400 N
31,000 N
46,800 E
47,200 E
47,600 E
BRUSH
PILE
P.M.S.
RD
LEVEE
C.I.-1'
KEY TO SHEETS
SCALE 1"=1000'
See Sheet 1 for Notes
COLUSA SACRAMENTO RIVER S. R. A.
TOPOGRAPHY
Proposed Areas of Development
RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF PARKS AND RECREATION
APPROVED
DATE 6/8/76
REVISIONS
DATE
DRAWN
CHECKED
15322
3
4

N44

STATE OF CALIFORNIA—THE RESOURCES AGENCY GEORGE DEUKMEJIAN, Governor

CALIFORNIA WASTE MANAGEMENT BOARD
1020 NINTH STREET, SUITE 300
SACRAMENTO, CALIFORNIA 95814

AUG 15 1988

RECEIVED
AUG 16 1988

Mel Totten, Director
City of Colusa Public Works
425 Webster Street
Colusa, CA 95932

RE: Unpermitted Facility

Dear Mr. Totten:

California Waste Management Board (Board) staff recently conducted a review of Board records to determine which facilities in the state were operating without a Solid Waste Facilities Permit (SWFP). The following unpermitted site was identified in the County of Colusa:

06-AA-0005 Colusa State Park

All solid waste facilities, as defined by Title 7.3, Government Code (GC), Section 66720.1, are required by 7.3 GC 66796.30 to obtain a SWFP **before** initiating operations unless the facility has been exempted from permit requirements pursuant to 7.3 GC 66796.31.

As the operator of record, you are requested to contact your Local Enforcement Agency (LEA), in writing, regarding the operational status of your facility, i.e., active, inactive, closed, etc. by **August 31, 1988,** and to receive additional instructions. Failure to respond may result in enforcement action.

You may contact your Local Enforcement Agency, the Colusa County Department of Environmental Health, by calling Janet Krug at (916) 458-7717.

Sincerely,

John K. Bell

John K. Bell, Manager
Monitoring and Compliance
Headquarters

JKB:AM:tk

cc: Bob Kennedy, Director, Inyo County Department of Environmental Health

N45

CITY OF COLUSA

COLUSA, CALIFORNIA 95932 • Phone 916-458-4941

From the Office of: Director of Public Works
425 Webster Street
P.O. Box 1063

August 22, 1988

Colusa County Environmental Health
251 East Webster Street
Colusa, Ca. 95932

Attention: Mrs. Janet Krug

Re: Leaf Disposal - Colusa State Park

Dear Janet:

The City of Colusa has ceased using the State Park adjacent to Colusa for the dumping of leaves.

After talking with Ken Wilbur from the State Parks, we have decided against going to the expense for the testing requirement, just for the disposal of leaves from the City's trees.

The City stopped our operation there last spring when the State's temporary permit ran out.

Sincerely,

M.T.

M. C. Totman
Director of Public Works

MCT/mw

COUNTY OF COLUSA
PUBLIC HEALTH DEPARTMENT

N46

Health (916) 458-5177
Environmental Health (916) 458-7717
Child Health & Disability Program (CHDP) 458-5177
Animal Control (916) 458-4500
California Children Services (CCS) (916) 458-5177

P.O. Box 610 • 251 E. Webster Street • Colusa, CA 95932

RECEIVED
NOV 9 1988
CITY OF COLUSA

November 4, 1988

Mr. John K. Bell, Manager
Monitering and Compliance, CWMB
1020 Ninth Street, Suite 300
Sacramento, Ca. 95814

Re: Unpermitted Facility - Colusa State Park 06-AA-0005

Dear Mr. Bell:

In August you requested a determination of whether the above referenced facility is a solid waste facility or not and whether it poses a threat to the public health, safety and the environment. You requested a written response no later than August 31, 1988.

I called your office on at least two occasions (8/22 and 9/2) in order to speak to you. When I found that you were not in, I left messages but have not yet received a call back.

I need assistance on this matter. The city provides pick up service for yard trimmings that are laid out by the roadside, and disposes of them at this site. They cannot continue to provide the service if they must haul the trimmings to the Evans Road Landfill. Is it the intent of the law for this type of site to be treated the same as a Class 2 landfill? Is there some method provided for by law where they could be brought into compliance without requiring more staff time than it is worth in order to complete the permit process?

It would not be a problem to list this site in the County Solid Waste Management Plan. An amendment is currently underway to list a proposed brine disposal facility. Must all other aspects of facility permitting be completed or are there some streamlining provisions for "facilities" of this type?

Neither the city or the county want to circumvent the law. The public health, safety and the environment are priorities. However, they would like to continue to provide this service to their citizens if they can afford the permitting process.

I am anxious to get this matter resolved and look forward to your response.

Sincerely,

Janet Krug, R.S.

Janet Krug, R.S.
Environmental Health Officer

CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD
1020 NINTH STREET, SUITE 300
SACRAMENTO, CALIFORNIA 95814

SEP 20 1990

RECEIVED
SEP 25 1990
CITY CLERK
CITY OF COLUSA

Mr. Mike Dragoo
California Department of Parks and Recreation
P. O. Box 207
Colusa, CA 95932-0207

SUBJECT: Determination of Alternative Certification for Colusa State Park, Facility No. 06-AA-0005

Dear Mr. Dragoo:

This letter is in response to the Alternative Certification for Non-Operation or Applicability of Requirements for a Solid Waste Landfill received by this office for the above facility. The alternative certification was submitted in lieu of preparing an initial cost estimate and establishing a financial mechanism for solid waste facility closure and postclosure maintenance.

It is the California Integrated Waste Management Board (Board) staff's determination that the above facility is, by definition, excluded from the above closure and postclosure maintenance requirements because:

- The facility is not a solid waste landfill, as defined in the Public Resources Code, Section 46027.

The above site is, therefore, not a solid waste landfill and is not subject to the requirements of Government Code, Section 66796.22, Closure and Postclosure Maintenance: initial cost estimates and financial assurances.

If you have any questions concerning this determination, please contact Michael Finch of the Closure Branch at (916) 327-9339.

Sincerely,

for George H. Larson
Chief Executive Officer

GHL:mof

cc: John Heckman, Colusa County Environmental Health Department
William Crooks, Central Valley Regional Water Quality Control Board
E. V. Anderson, Board of Equalization
City Council, City of Colusa

N48

Irrigation Company took over the system in 1903, it extended the river branch to a point three miles south of Princeton, with the result that one of the very finest communities of small farmers in the county gathered there. Incidentally, a great injustice was done these people, for they bought their lands with a water right included, and then, by the decision of the supreme court in 1915, were deprived of the water right. They are now forming a district of their own, and will pump water from the river.

The Central Canal itself is sixty feet wide on the bottom, and is made to carry six feet of water. The original contractor was the San Francisco Bridge Company, which had a special excavating machine built to dig the canal. The machine weighed two hundred seventy-five tons and cost fifty thousand dollars. It worked night and day, employing a crew of thirty men during the day and twelve at night, and doing the work of four hundred men. In twenty-two hours it excavated about four thousand cubic yards of earth.

On September 26, 1906, the Central Canal and Irrigation Company, having completed the canal to its intake, began to install a pump to put water into it. The capacity decided upon was one hundred cubic feet a second, capable of irrigating twenty thousand acres. The original district contained one hundred fifty-six thousand five hundred acres.

For several years the Sacramento Valley Irrigation Company has been in financial straits, and has been selling off its lands. Thus the lands are passing back into the hands of individual owners, where they should be, and the strife and turmoil caused by the old Central Irrigation District are almost at an end.

In the year 1888, the year after the passage of the Wright Act, two efforts were made to form districts under that act, in the vicinity of Arbuckle and College City. Both attempts failed, and Arbuckle and College City are yet without irrigation.

For over ten years after Central District was launched, the question of irrigation lay dormant in this county; but in 1902 a number of farmers living just northwest of Colusa united and formed the Amos Roberts Ditch Company. They put in a pump and a system of ditches capable of irrigating the fifteen hundred acres in the district. This district was not organized under the Wright Act, but was a cooperative corporation, all profits being absorbed in the shape of lower water rates. The moving spirit in this enterprise, which has been eminently successful from the beginning, was L. L. Hicok, who has been the president of the company since its organization. The first directors, besides Mr. Hicok, were W. C. Roberts, A. E. Potter, W. R. Merrill, and J.

History of Colusa & Glenn Counties
Historic Record Company
1918
L.A, CA
History by Charles Davis McComish + Mrs. Rebecca T. Lambert
Illus. complete w one vol.

Assessor's office: Deeds etc
Steve Scortino
Thurs./Fri.
Cty. Clerk
John Morton

N49

Grover. The present directors are L. L. Hicok, A. E. Potter, J. C. Mogk, George Stafford, and J. S. O'Rourke. Some of the finest fruit and alfalfa in the state are grown under irrigation from this ditch, and the Roberts Ditch Company deserves great credit for the improvement it has made in the appearance of the country about Colusa.

9-18-58

Colusa Park Gravel 'Fill' Job Started

The hauling of about 36,000 yards of gravel from the Colusa Weir area to the new Colusa-Sacramento River State Park to fill low spots and level the old dump area will begin immediately, Ken Stanley, park supervisor, announced today.

The gravel will be hauled by A. Teichert and Son, Woodland contractors, who will also do the work on the park boat ramp.

Stanley said the boat ramp work will get under way next month — when the ditch in which the ramp is located is not being used for irrigation.

The work is being done under a single contract and is to cost a total of about $65,000. Work has already started on construction of a comfort station at the park site.

Stanley said the Teichert projects are the first major jobs to be done at the new park.

The boat ramps are not expected to be completed in time for much use prior to the winter rainy season, but are expected to be ready next spring.

Further work at the park depends upon the availablity of funds, Stanley said.

A1.4-2

Appendix A2. Soil survey data.
Hole numbers correspond to those of Map 1.3.
Field work was done on 07 and 21 July, 2000. Textures by feel (Thien, -).

Hole 1. Bermuda grass cover.

0-8”	gravel	
8-30”	silt	
30-60+”	silty very fine sand	(moist below 30”)

Hole 2. Bermuda grass.

0-4”	gravel	
4-12”	organic silt loam	
12-18”	silt loam	
18-44””	silty very fine sand	(moist)
44-54”	silt loam	(moist)
54-60+”	organic loam	(moist)

Hole 3. Open space next to *Arundo donax* patch.

0-6”	gravelly sandy loam	
6-18”	organic gravelly sand	
18-30”	gravelly sand	
30-51”	gravelly sandy loam	(moist; glass shard and organics @ 36”)
51-60+”	silt	(moist)

Hole 4. Bermuda grass under Fremont cottonwood.

0-5”	organic loamy fine sand	
5-36”	fine sand	(moist below 20”)
36-42+”	silty fine sand	(moist)

Hole 5. Tall, thick dry grass and yellow starthistle.

0-4”	gravel	
4-36+”	silty very fine sand	(moist below 18”)

Hole 6. Sparse yellow starthistle.

0-12”	organic gravelly sand	
12-40”	gravelly sand	(Iron oxide horizon <1” thick @ 20”)
40-60+”	silt	(moist)

Hole 7. Dry oats and sparse mugwort.

0-2”	organic sand	
2-12”	sand	
12-14”	irregular silt horizon	
14-32”	gravelly sand	(oxidized iron artifacts, e.g. large nail)
32-54”	silty sand	(moist)
54-60+”	silt	(moist)

Hole 8. Bermuda grass.

0-4”	gravel	
4-8+”	silt	

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Appendix A3. Correspondence.

A3.1 Letter to Peter Rabbon, State Reclamation Board, July 26, 2000.
A3.2 Letter from Reclamation District 1004 (Colusa), July 20, 2000.
A3.3 Letter to Jeff Fong, Lands and Rights-of-Way, Department of Water Resources, September 15, 2000.

N52

Northern Buttes District (NBD)
400 Glenn Drive
Oroville, California 95966
(530) 538-2212

Peter D. Rabbon, General Manager
State Reclamation Board
1416 9th Street, Room 1601
Sacramento, California 95814

July 26, 2000

Dear Mr. Rabbon:

Reforestation Proposal / Permission, Borrow Area of the Colusa-Sacramento River State Recreation Area

Jeffrey Fong in Lands and Rights-Of-Way, DWR, suggested that I write to you (tel. 7/25/00). We would like to reforest a 5 acre parcel within the Colusa-Sacramento River State Recreation Area, which according to the 1957 property deed is a borrow area with excavation rights pertaining to the Sacramento and San Joaquin Drainage District. The site is just outside of the Sacramento River Flood Control Project (SRFCP) West Levee. I have attached copies of the deed and pertinent maps (maps 1 and 2).

We would like to know if the Sacramento and San Joaquin Drainage District, which I understand to now mean the State Reclamation Board, maintains interests in this particular Borrow Area which may prevent or affect DPR reforesting the area, or if the Reclamation Board would want to reserve an interest in reforesting it themselves as a mitigation area.

Based on our examination of the soils on the site (map 3 attached), I would suppose that this Borrow Area is of limited use as a source of borrow material, given the coarse-textured nature of the substrate (very little clay content). The native substrate appears to be silt to very fine sand, and is covered with some overlying coarse fill deposits, including at least 7000 yd^3 unsorted gravelly coarse sand and perhaps 900 yd^3 pea gravel.

Removal of this pea gravel, and perhaps the sandy fill, would facilitate reforestation efforts. We are not sure whether removal of any of this material may affect the SRFCP West Levee adjacent to the Borrow Area, given a) the Borrow Area becomes inundated to some extent most years during River high water from seepage under the levee, and b) the pea gravel appears to be deliberately spread out over the area adjacent to the levee right-of-way.

In any case, we propose to restore the site to a native riparian forest, and would like to know what interests you may have regarding the property or what permitting process you may require.

Sincerely,

James Dempsey
Environmental Services Intern

Cc: H. Woody Elliott, NBD Senior Staff Resource Ecologist; Kate Foley, NBD Superintendent

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Reclamation District No. 1004

July 20,2000

James Dempsey
State Department of Parks & Recreation
Northern Butte District
400 Glen Drive
Oroville, Ca. 95966

Dear Mr Dempsey:

As per our conversation, I am informing your department that Reclamation District 1004 has no holdings within the Colusa State Park area, nor the shop area Hopefully this will clear up some of the questions you have concerning that area.

If we can be of any other assistance to you, please feel to give us a call.

Sincerely

Lola Jeffers
District Secretary

A3.2-1

134 Fifth Street, Colusa, California 95932 • (530) 458-7459 • Fax: (530) 458-4276

State of California • The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

Gray Davis, *Governor*
Rusty Areias, *Director*

N54

Northern Buttes District
400 Glenn Drive
Oroville, California 95966
(530) 538-2200

September 15, 2000

Jeff Fong
Lands and Rights-of-Way
Department of Water Resources
1416 9th Street, Room 425
Sacramento, California 95814

Dear Mr. Fong:

<u>Reforestation Proposal / Permission, Borrow Area of the Colusa-Sacramento River State Recreation Area</u>

I am writing to follow up your telephone conversation this morning with Woody Elliott, District Resource Ecologist. As promised, the *Draft Riparian Forest Restoration Plan, Borrow Area and Shop Area, Colusa-Sacramento River State Recreation Area* is attached. It includes considerable detail about the site, including information about the soil substrate critical to evaluating the site potential as a borrow pit.

My concern and motivation for this reforestation proposal is that the area, as it currently exists, serves none of the goals nor policy functions of the Colusa-Sacramento River State Recreation Area (SRA) nor of the California Department of Parks and Recreation (DPR). However, DPR carries the burden of maintaining the area.

James Dempsey of my staff, wrote to Peter Rabbon, General Manager of State Reclamation Board on July 26, 2000 at your suggestion to inquire about reforesting the Borrow Area site. I hope the enclosed plan will facilitate Mr. Rabbon's response.

Sincerely,

Kathryn V. Foley

Kathryn Foley,
District Superintendent

Reply pending per tel. Oct 16

Enclosure

Cc: W. Elliott, J. Dempsey

N55

Appendix A4. Dormant hardwood cutting collection and planting methods for *Populus fremontii, Salix exigua, Salix goodingii, and Salix lasiolepis* (Nature Conservancy, 1998; pp. 49-52, 63-77).

Cuttings methodology.

Time: collect hardwood stem-cuttings of dormant one-year old growth during January and February.

Method: hardwood stem-cuttings. Collect cuttings from trees as close to the planting site as possible. Cuttings should be from one year old growth. Often one year old branches can be identified by green stripping which runs the length of the stems.

1. Cut ¾" to 1 ½" diameter branches four to six feet long with pole saws or loppers.
2. Remove all side growth from the collected branches, then cut the branch at a 45 degree angle into 18 to 24 inch long stem-cuttings.
3. The ideal cutting is about three-quarters of an inch in diameter and 18 to 24 inches long.
4. Place the cuttings in five-gallon buckets or thirty-five gallon trash cans. Immerse base of the cuttings in water as soon as possible. Do not submerse completely.
5. Cuttings can be stored this way for several days in a cool, dark place. Replenish or freshen the water daily.
6. Plant the cuttings as soon as possible. Follow the long-term storage recommendations below if cuttings can't be planted immediately.

Supplies Needed: leather gloves, pole saws, loppers, hand pruners, five gallon buckets, thirty-five gallon trash cans and fresh water.

Storage: hardwood stem-cuttigns may be stored under a cold (31 degree), moist conditions for several weeks or months. Cuttings may be stored at a commercial cold storage facility which also stores bare-root trees. When removed from cold-storage, the cuttings should be placed into buckets of aerated water to induce root-bed formation (ten days) before planting in the field.

Field planting.

Field planting procedures will depend upon earlier site preparation. Cuttings should be planted into weed free rows. Cuttings are susceptible to desiccation and death before they form new roots and shoots. This can be the result of warm temperatures and lack of rain in February and March. Drying can be reduced by installing plant protectors (discussed below), which will maintain high humidity around the cutting while its roots and shoots are developing. The proper plant protectors have shown to significantly increase the survival of winter planted pole cuttings.

Time: plant dormant hardwood cuttings from January to February.

Method:

1. Dig one foot deep, "V" shaped hole. Break apart large soil clods and remove any remaining weeds.
2. Insert the cutting into the hole with two-thirds of the cutting below the soil surface. Make sure the cutting is "right-side up" with growth buds pointing up.

N56

1. Firmly tamp the replaced soil around the planted cutting to remove air pockets in the soil which could cause the cutting to dry out.
2. Install plant protectors, following manufacturer specifications.
3. Water (½ gallon).

Remarks

Disease can be spread from the parent tree when collecting cuttings. One to two year-old saplings will show infection.

Cuttings will send vigorous new growth from below the soil level which will replace the original cutting and early top-growth. The original cutting and top growth will die with the dead wood persisting for several years. This dead wood may be an entry site for pathogens.

Cottonwood, sandbar willow, Gooding's willow, and arroyo willow have all been planted on several sites with other Mixed Riparian Forest species. Growth monitoring shows that they have done best on medium to fine textured soils when 10' above the water table. They do not become established in coarse soil with the water table at the same depth.

Salix exigua and *lasiolepis.*

Cuttings have been collected in winter, stored, and planted in spring with success, although it is recommended to plant cuttings within a couple of days from collection.

Plant Protectors

1. Protectors should be placed on the seedlings or cuttings at the time of planting into the field. The solid translucent plastic cylinders (blue-x and tube-x) function to retain humidity and to elevate daytime temperatures in early spring. This "greenhouse" climate retains moisture in the soil and in stem cuttings. It also allows for rapid growth earlier in the spring, thereby taking advantage of more favorable soil moisture conditions.
2. Milk cartons are cheap and effective for protection from herbicide drift. They should be used only with vigorously growing seedlings since light enters only from the top, not the sides as with blue-x and tube-x, resulting in relatively dark conditions at the bottom of the carton.

N57

The Reclamation Board
Room 1335
Resources Building
1416 Ninth Street
Sacramento, CA 95814

April 17, 1975

Colusa-Sacramento River
State Recreation Area -
Release of Agreement
Reservation

Attention: Mr. A. E. McCollam, Chief Engineer
and General Manager

By an Agreement for the Transfer of Control and Possession, dated December 20, 1957, between the Sacramento and San Joaquin Drainage District, acting through The Reclamation Board and the State Department of Parks and Recreation, District transferred to Parks, control and possession of Parcel 1, outlined in green on the attached map. However, the District reserved unto themselves, its successors and assigns, the perpetual right to excavate and remove earth and other materials from Parcel 2, outlined in red, and also the right of ingress to and egress from Parcel 2. In addition, the District also retained the right to remove and/or dispose of the minerals, oil and gas contained in Parcel 1.

Parks, at the request of the City of Colusa, is considering the development of an all-year campground within Parcel 1. This area, being on the city side of the levee, should not be affected by the high waters of the Sacramento River during the winter months as the existing park day-use and campgrounds are now affected. The development of the all-year campground would produce additional income for both the park and the merchants in the city from users of this campground. The concept of an all-year campground at this state park is also a recommendation of the Preliminary Sacramento River Boating Trail Report.

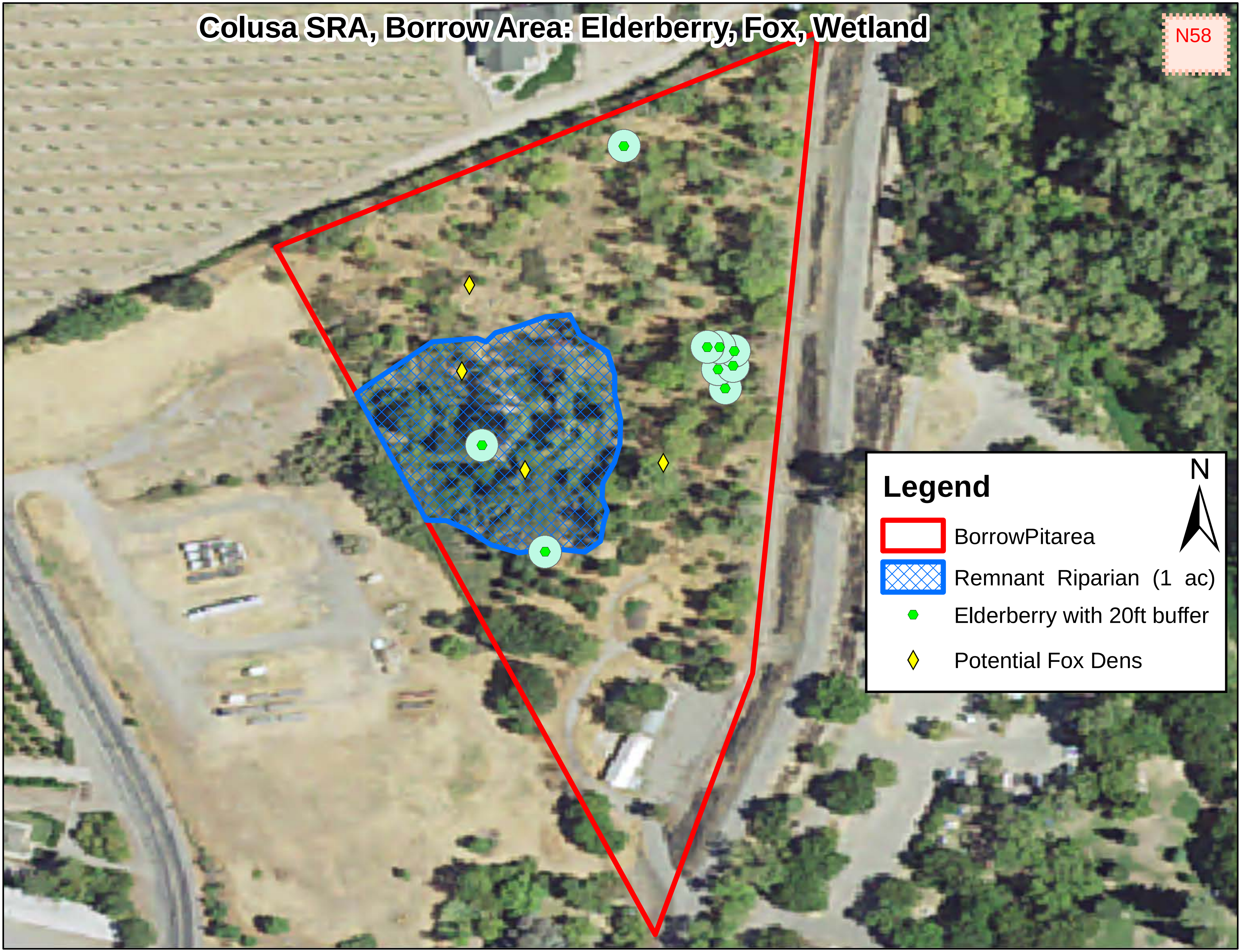
For the reasons stated above, Parks requests The Reclamation Board to release to Parks all its interests to Parcel 1. We would be happy to meet with you, or prepare the Transfer Agreement should you concur to this request. Should you have any questions, please contact Bill Kuromoto at 5-4330.

ORIGINAL SIGNED BY
J. LESLIE McCARGO

Les McCargo, Supervisor
Program Management and
Special Services Branch

Attachment

E-4a/1
LM:BK
cc: Dale Wilson
District 1 (2)


Colusa SRA, Borrow Area: Elderberry, Fox, Wetland
N58
Legend
N
BorrowPitarea
Remnant Riparian (1 ac)
Elderberry with 20ft buffer
Potential Fox Dens

Colusa-Sacramento River
State Recreation Area

Sacramento River looking south toward Sutter Buttes. SOURCE: Courtesy of Dennis Dahlin