United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In Reply Refer To:
81420-2010-CPA-0211

MAY 27 2010

Alicia Kirchner
Chief, Planning Division
Corps of Engineers, Sacramento District
1325 J Street
Sacramento, California 95814-2922

Dear Ms. Kirchner:

The Corps of Engineers has requested coordination under the Fish and Wildlife Coordination Act (FWCA) for the Folsom Dam Safety/Flood Damage Reduction Project (Joint Federal Project). The proposed action is construction of the control structure for the new auxiliary spillway. The proposed project would occur southeast of the main Folsom Dam, Sacramento County, California. This letter constitutes the Fish and Wildlife Service's supplemental FWCA report for the proposed project.

Background
The Final Folsom Dam Safety and Flood Damage Reduction Environmental Impact Statement/Environmental Impact Report (FEIS/FEIR) was issued in March 2007. The Joint Federal Project implements dam safety and security features along with flood damage reduction features at Folsom Dam and its associated facilities (Folsom Facility). The Fish and Wildlife Service (Service) provided a FWCA report for this overall action in April 2007.

The flood damage reduction features of the Joint Federal Project include the construction of a gated auxiliary spillway, southeast of the main dam. Initial excavation of the spillway has been initiated by the Bureau of Reclamation and is expected to be completed in the summer of 2010. As part of the 2007 FEIS/EIR, the evaluation of the auxiliary spillway included the control structure, the lining of the spillway chute and stilling basin. These features were generally addressed and the potential effects, based on the level of design at the time, were analyzed. However, the Corps has completed design refinements for the construction of the control structure, installation of the six tainter gates, the lining of the spillway chute and stilling basin, and exploratory geotechnical borings.

Proposed Project
Folsom Dam is a concrete gravity dam. The main section is flanked by two earthfill wing dams. The new auxiliary spillway is located on the left abutment of the main dam, immediately downstream of the existing left wing dam (Figure 1). The "project area" consists of the site of

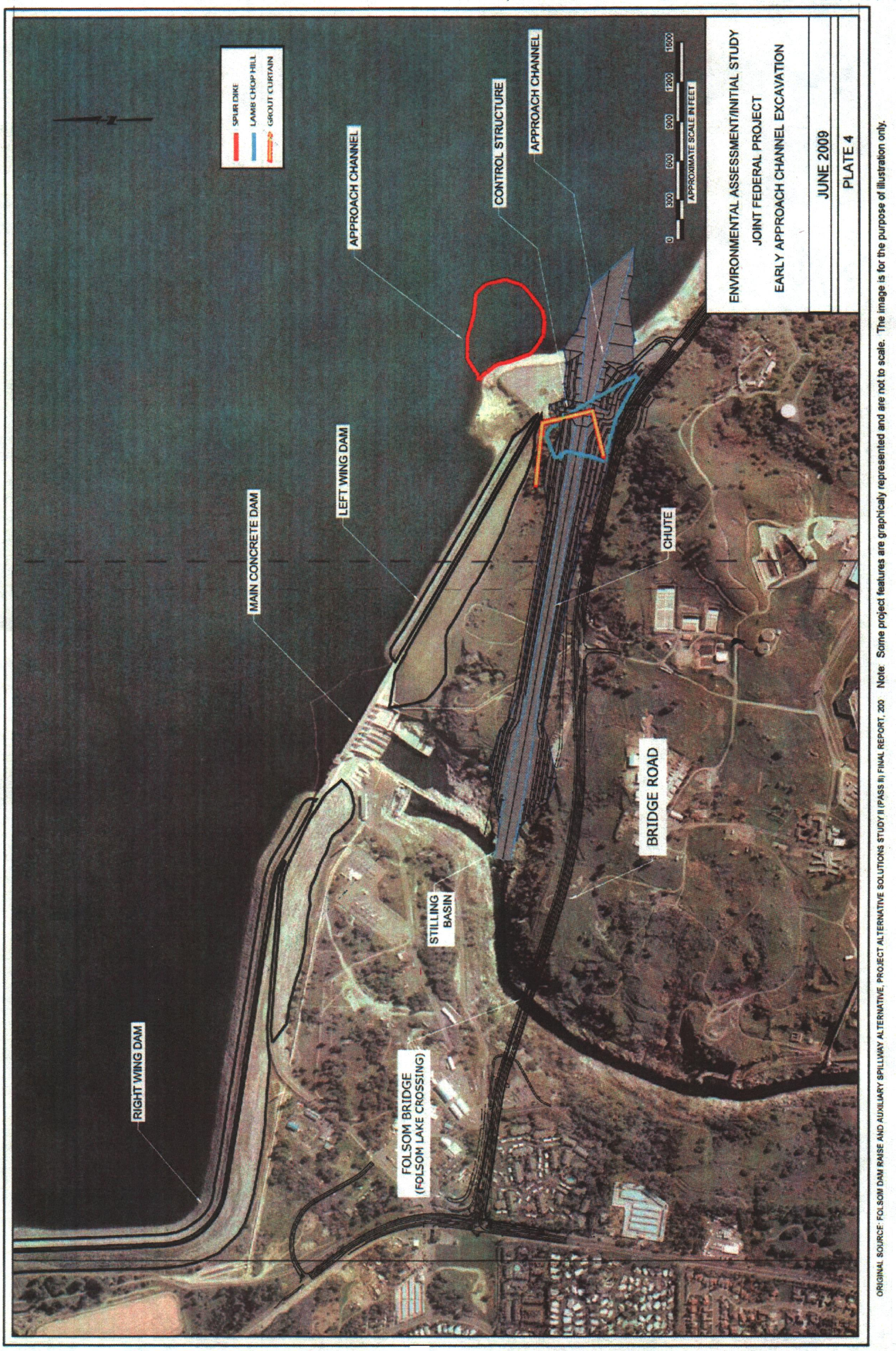
SPUR DIKE
LAMBS CHOP HILL
GROUT CURTAIN
APPROACH CHANNEL
CONTROL STRUCTURE
APPROACH CHANNEL
APPROXIMATE SCALE IN FEET
LEFT WING DAM
MAIN CONCRETE DAM
CHUTE
BRIDGE ROAD
STILLING BASIN
RIGHT WING DAM
FOLSOM BRIDGE
(FOLSOM LAKE CROSSING)
ENVIRONMENTAL ASSESSMENT/INITIAL STUDY
JOINT FEDERAL PROJECT
EARLY APPROACH CHANNEL EXCAVATION
JUNE 2009
PLATE 4
Note: Some project features are graphically represented and are not to scale. The image is for the purpose of illustration only.
ORIGINAL SOURCE: FOLSOM DAM RAISE AND AUXILIARY SPILLWAY ALTERNATIVE, PROJECT ALTERNATIVE SOLUTIONS STUDY II (PASS II) FINAL REPORT, 200

Figure 1

the ongoing spillway construction including all haul routes, staging, and disposal areas. The staging areas, disposal areas, and haul roads that would be used for this project were previously evaluated in the 2007 JFP FEIS/EIR. Therefore, the analysis of potential impacts in this report is limited to the site of the control structure construction, the lining of the chute and stilling basin and the location of exploratory borings for the in-reservoir approach channel.

Principal features of the new auxiliary spillway include an 1,100 foot-long approach channel, which begins in Folsom Reservoir; a concrete control structure that regulates releases through the submerged tainter gates, a 2,782-foot long concrete-lined spillway chute (of which the last 682 feet is a stepped concrete chute), and a concrete-lined stilling basin. Flows will discharge onto a rock exit channel before emptying directly into the American River channel downstream of the main Folsom Dam, converging with releases from the main dam.

This latest stage in the Corps' ongoing effort to complete the Folsom Dam JFP involves three elements: (1) construction of the control structure, (2) concrete lining of the spillway chute and stilling basin, and (3) exploratory borings for the approach channel cofferdam walls. The control structure, spillway chute, and stilling basin are each major, permanent features of the Joint Federal Project; while the borings for the approach channel cofferdam are temporary actions. These borings are to be drilled solely for the purpose of gathering geotechnical information for construction of the cofferdam, which can then be used to hold lake water back during excavation efforts for the approach channel. The impacts of the excavation of the approach channel will be covered under future coordination in 2012.

Since the development of the 2007 Joint Federal Project FEIS/EIR, additional information has become available through the detailed design of the control structure, spillway chute, and stilling basin, including boring locations for the approach channel cofferdam walls. Details on aspects such as the design features, construction methods (batch plant, access, and staging), site preparation, restoration and cleanup, borrow and disposal sites, and construction personnel schedules are now known.

The Service has reviewed this information and concluded the impacts to fish and wildlife species are similar to those already analyzed in our earlier coordination efforts with the Corps on this overall project with the exception of the exploratory borings for the approach channel coffer dam. Therefore, the remainder of this letter will focus on the proposed exploratory borings.

As a part of the approach channel design, cofferdams are being considered to keep part of the site dry during construction. Exploratory borings are needed along the proposed cofferdam alignment to gather information on the location of supportive rods that would keep the cofferdam in place and help it to withstand water pressure from the upstream side of the dam. It is estimated that up to 25 borings would be needed. The borings would be drilled within the 410 to 420 foot elevation contour range of the lakebed. The holes would be spaced about 100 feet apart. The borings would be cylindrical borings that would consist of a 4-inch diameter hole extending a minimum of 25 feet into moderately weathered rock.

The borings are expected to be conducted from November 2010 to January 2011. The estimated water elevation during this time of year is expected to be near 390 feet. Therefore, it is anticipated that most of the borings would be able to be done in the dry. However, some may have to be done in the wet.

Generally, the procedures for access and staging are the same as for the control structure. Access for the drill rig to the boring locations would be via the Folsom Point boat ramp. When drilling is done in the dry, the drill rig would be located on the lake bottom. If drilling is done in the wet, the drill rig would be mounted to a barge.

Since the equipment needed for the borings needs a relatively level surface, some minor soil reshaping might be needed, if the borings would occur in the dry. If the borings are done from a barge, no site preparation would be needed.

At the completion of the boring effort, the site, including all staging and access areas, would be returned to its pre-project condition. All equipment and excess materials would be transported offsite via the existing haul routes. The work sites and staging areas would be cleaned of all rubbish, and all parts of the work area would be left in a safe and neat condition suitable to the setting of the area.

The drilling associated with the cofferdam borings would take place intermittently, as needed between November 2010 and January 2011. Drilling would occur during the weekdays and during the daytime hours (7:00 a.m. to 5:00 p.m.). The crew would likely consist of four workers. There would be one drill rig and one hole would be drilled at a time.

Discussion

There are two potential effects of the proposed work which were not discussed in previous coordination with the Corps. The first is continued blasting in the vicinity of the spillway as part of the excavation process for the structure. This area has been highly disturbed continually for at least 3 years now with activities associated with construction of Folsom Lake Crossing road and bridge across the American River just downstream of Folsom Dam and excavation, which includes blasting, of the adjacent auxiliary spillway channel. Therefore, any wildlife species, including migratory birds, in the area have likely adjusted to the construction activities and noise levels. Monitoring for nesting migratory birds has been done in the past and should continue if blasting is conducted during the nesting season, generally February through mid-August.

The second effect is the potential to introduce aquatic nuisance species into Folsom Reservoir through use of watercraft (boats and barges) and other equipment which has been in contact with other bodies of water containing these potentially harmful species if the exploratory borings are conducted by barge. On February 3, 1999, President Clinton signed Executive Order 13112, which directs the agencies of the executive branch of the Federal government to work to prevent and control the introduction and spread of invasive species. Species that are likely to harm the environment, human health, or the economy are of particular concern. The executive order builds on the National Environmental Policy Act (NEPA) of 1969, the Federal Noxious Weed Act of 1974, and the Endangered Species Act of 1973 to prevent the introduction of invasive species; provide for their control; and take measures to minimize economic, ecological, and human health effects.

Since it is currently unknown who the contractor may be or where their equipment may come from it should be a condition that the contractor develop a Hazard Analysis and Critical Control Point Plan (HACCP) based on the following seven principles if in-water work is proposed:

- Conduct a hazard analysis. Prepare a list of steps in the process where significant hazards occur and describe preventive measures.
- Identify the critical control points (CCP) in the process.
- Establish controls for each CCP identified.
- Establish CCP monitoring requirements. Establish procedures for using monitoring results to adjust the process and maintain control.
- Establish corrective actions to be taken when monitoring indicates a deviation from an established critical limit.
- Establish procedures to verify that the HACCP system is working correctly.
- Establish effective record-keeping procedures that document the HACCP system.

To prevent the spread of aquatic nuisance species all vessels and vessel accessories should be thoroughly inspected. For watercraft and vessels with jet drives, impeller areas can contain quagga and zebra mussels and aquatic plants. Once upon the trailer, run the engine for 5 to 10 seconds to blow out excess water, mussels and plants. Before leaving water access, inspect and remove any mussels or plants from intake, steering nozzle, hull, and trailer.

- All vessels should be cleaned with a high pressure wash of hot water. This is especially important if the vessel has been moored for more than a day.

- Remove aquatic plants from boat, motor and trailer. Check all underwater fittings and equipment, such as rollers, axle, bilge and trailer, and above water equipment, such as anchors. Place any aquatic plants in trash if possible.

- Drain any lake or river water from equipment including the motor, bilges, heat exchangers and coolers. Ensure all drained areas are dry. Ensure the watercraft's lower outboard unit is drained and dry.

- Be aware that transferring a vessel that has been in infested waters will allow the spread of quagga mussels, or the closely related zebra mussels. Physically inspect all exposed surfaces. The presence of quagga mussels will feel like sandpaper to the touch. Report presence of quagga mussels to California Department of Fish and Game, hotline at (866) 440-9530, open from 8 am to 5 pm PST.

- Any vessel traveling from Lake Mead, Lake Mohave, Lake Havasu, the Colorado River, or lakes that receive water from the Colorado Aqueduct, including: Lake Skinner (Riverside County), Lake Mathews (Riverside County), San Vicente Reservoir (San Diego County), Dixon Lake (San Diego County), Lower Otay Reservoir (San Diego County), and Lake Murray (San Diego County) should remain dry and out of water for a minimum of 5 days.

Recommendations
The Service recommends the Corps implement the following measures for construction of the control structure, spillway lining and exploratory borings.

1. Monitor for the presence of nesting migratory birds in the vicinity of the proposed project and any effects blasting has on nesting behavior. Contact the Service and California Department of Fish and Game for guidance if nests are located or nesting behavior alters with blasting.

2. Require contractors involved with the boring effort to develop a Hazard Analysis and Critical Control Point Plan if in-water work is planned to minimize the potential for introduction of aquatic nuisance species into Folsom Reservoir. The Service and/or California Department of Fish and Game can be contacted for additional specific information.

If you have any questions regarding this report on the proposed project, please contact Doug Weinrich at (916) 414-6563.

Sincerely,

for M. Kathleen Wood
Assistant Field Supervisor

Enclosure

cc:
Jane Rinck, COE, Sacramento, CA
NOAA Fisheries, Sacramento, CA
Reg. Mgr, CDFG, Region 2, Rancho Cordova, CA

Appendix B. Listed Animal and Plant Species having the Potential to Occur Within the Project Area.

	Species Name		Status		Habitat	Potential to Occur
	Common	Scientific	Federal	State		
Invertebrates	Conservancy fairy shrimp	Branchinecta conservatio	endangered		Vernal pools and other seasonal wetlands.	No suitable habitat is present within the project area.
	Vernal pool fairy shrimp	Branchinecta lynchi	threatened		Vernal pools and other seasonal wetlands.	No suitable habitat is present within the project area.
	Vernal pool tadpole shrimp	Lepidurus packardi	endangered		Vernal pools and swales.	No suitable habitat is present within the project area.
	Valley elderberry longhorn beetle	Desmocerus californicus dimorphus	threatened		Elderberry shrubs, typically in riparian habitat.	Elderberry shrubs are present within the Folsom Facility but not within the project area.
Fish	Delta smelt	Hypomesus transpacificus	threatened	threatened	Thought to spawn in shallow marginal areas of upper freshwater reaches of the Delta; or in Suisun Marsh or the Napa River. Typically rear in shallow, open waters of the estuary. They are mostly found in the salinity range of 2-7 parts per thousand.	No suitable habitat is present within the project area. Delta smelt are restricted from western San Pablo Bay and the Napa River, eastward to Suisun Bay and the tidal freshwater reaches of the Sacramento-San Joaquin River Delta.
	Central Valley steelhead	Oncorhynchus mykiss	threatened		Requires cold, freshwater streams with suitable gravel for spawning; rears in riverine slackwater zones having cover such as floodplain, marginal, backwater, pocketwater, and/or pool habitat.	No suitable habitat is present within the project area. Steehead can access the lower American River downstream of Nimbus Dam (6 miles downstream of Folsom Dam) but cannot ascend the river upstream of Nimbus Dam.
	Central Valley spring-run Chinook salmon	Oncorhynchus tshawytscha	threatened	threatened	Requires cold, freshwater streams with suitable gravel for spawning; rears in riverine slackwater zones having cover such as floodplain, marginal, backwater, pocketwater, and/or pool habitat.	No suitable habitat is present within the project area. Salmon can access the lower American River downstream of Nimbus Dam (6 miles downstream of Folsom Dam) but cannot ascend the river upstream of Nimbus Dam.

Appendix B (cont.). Listed Animal and Plant Species having the Potential to Occur Within the Project Area.

	Species Name		Status		Habitat	Potential to Occur
	Common	Scientific	Federal	State		
Fish (cont.)	Winter-run Chinook salmon, Sacramento River	Oncorhynchus tshawytscha	endangered	endangered	Requires cold, freshwater streams with suitable gravel for spawning; rears in riverine slackwater zones having cover such as floodplain, marginal, backwater, pocketwater, and/or pool habitat.	No suitable habitat is present within the project area. Salmon can access the lower American River downstream of Nimbus Dam (6 miles downstream of Folsom Dam) but cannot ascend the river upstream of Nimbus Dam.
	Hardhead minnow	Mylopharlodon conocephalus		Species of special concern	Undisturbed, cool, well-oxygeneated low- to mid-elevation streams or riverine reservoirs. Prefer deep, clear pools and runs with rocky substrates and slow velocities. Do not tolerate predatory bass presence.	No suitable habitat is present within the immediate project area. They have only been found far upstream within the tributary arms of Folsom Reservoir.
Amphibians	California tiger salamander, central population	Ambystoma californiense	threatened	candidate endangered	Vernal pools and seasonal wetlands with burrows & other below-ground refuge.	No suitable habitat is present within the project area.
	California red-legged frog	Rana aurora draytonii	threatened		Emergent riparian vegetation closely associated with deepwater and the absence of predatory fish and bullfrogs.	No suitable habitat is present within the project area. Current populations are limited to coast and coastal mountain ranges of California and in the Sierra Nevada (above elevation 1,000 feet) from Butte County to Fresno County.
Reptiles	Giant garter snake	Thamnophis couchi gigas	threatened	threatened	Rice fields, irrigation supply and drainage canals, freshwater marshes, sloughs, ponds, and other aquatic habitats with permanent summer water and vegetative cover.	No suitable habitat is present within the project area. Current populations are limited to rice-producing areas in the Central Valley, portions of the Yolo Bypass, portions of the Sacramento-San Joaquin Delta, and in the San Joaquin Valley.

Appendix B (cont.). Listed Animal and Plant Species having the Potential to Occur Within the Project Area.

	Species Name		Status		Habitat	Potential to Occur
	Common	**Scientific**	**Federal**	**State**		
Birds	Bald Eagle	Haliaeetus leucocephalus		endangered	Nests and roosts in coniferous forests near lakes, reservoirs, or streams. Over-winters at lakes, reservoirs, and along river systems.	An active nest is located approximately six miles away from the project area.
Plants	Stebbins's morning-glory	Calystegia stebbinsii	endangered	endangered	Openings within chaparral and foothill woodland areas on gabbroic soils. Elevation around 980 feet.	No suitable habitat is present within the project area. Stebbins's morning-glory occur at elevations higher than the project area within localized locations of El Dorado County (Salmon Falls area) and Nevada County.
	Pine Hill ceanothus	Ceanothus roderickii	endangered	rare	Chaparral and cismontane woodland with serpentinite or gabbroic soils at elevations between 260-630 m.	No suitable habitat is present within the project area. Project area is below elevation range.
	Pine Hill flannel bush	Fremontodendron californicum ssp. decumbens	endangered	rare	Chaparral and cismontane woodland with serpentinite or gabbroic soils and rocky areas. Elevations between 425-760 m.	No suitable habitat is present within the project area. Project area is below elevation range.
	El Dorado bedstraw	Galium californicum ssp. sierrae	endangered	rare	Chaparral, cismontane woodland, lower montane, and coniferous forest habitats and gabbroic soils within an elevation range from 100-585 m.	No suitable habitat is present within the project area, which is lacking coniferuous forest and gabbroic soils in the immediate area.
	Sacramento Orcutt	Orcuttia viscida	endangered	endangered	Vernal pools.	No suitable habitat is present within the project area (no vernal pools).
	Layne's butterweed	Senecio layneae	threatened	rare	Chaparral and cismontane woodland with serpentinite or gabbroic soils and/or rocky areas. Elevations between 200-1,000 m.	No suitable habitat is present within the project area. Specific soil types do not occur within the project area.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNA 95814

REPLY TO
ATTENTION OF

Environmental Resources Branch

Mr. Nicolas Fonseca, Chairperson
Shingle Springs Band of Miwok Indians
P.O. Box 1340
Shingle Springs, California 95682

Dear Mr. Fonseca

The U.S. Army Corps of Engineers (Corps) is writing pursuant to Section 106 of the National Historic Preservation act of 1966 as amended, to inform you of proposed design refinements to the Folsom Dam Safety/Flood Damage Reduction Project, referred to as the Joint Federal Project (JFP) in a letter we sent you dated November 25, 2008. Your Cultural Resources Director, Daniel Fonseca replied to us in a phone call on March 9, 2009 indicating that there were no known sites in the original area of potential effects.

The revised area of potential effects (APE) for the project is located southeast of the existing main Folsom Dam on the Folsom, California (1980) and Clarksville, California (1980) U.S.G.S. 7.5 minute quadrangles (Enclosure 1). Proposed refinements include construction of a control structure, concrete lining of the spillway chute and stilling basin, and exploratory geotechnical borings for the approach channel cofferdam walls. The geotechnical borings are temporary actions; the others are major, permanent features of the JFP.

The records and literature search conducted for the JFP previously in March of 2009 and a pedestrian survey conducted approximately one month later. These efforts indicate that there are two known cultural resources within or directly adjacent to the APE. The first, Folsom Dam, was found eligible for listing in the National Register of Historic Places (NRHP) in 2006. The second cultural resource, PLI-FDEIS-1, is a possible prospecting pit with associated spoil piles and drainage.

The Corps is sensitive to the interests of Native Americas and will make all possible effort to avoid traditional cultural properties and sacred sites. If you know of any such properties or sites or other areas of concern located within or near the proposed APE, please inform us of them so that we may take appropriate actions. Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or require further information please contact Ms. Montag at (916) 557-7907 or by email at Melissa.L.Montag@usace.army.mil. We appreciate your ongoing consultation.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
1325 J STREET
SACRAMENTO, CALIFORNA 95814

REPLY TO ATTENTION OF

Environmental Resources Branch

Ms. Jessica Tavares, Chairperson
United Auburn Indian Community of the Auburn Rancheria
10720 Indian Hill Road
Auburn, California 95603

Dear Ms. Tavares

The U.S. Army Corps of Engineers (Corps) is writing pursuant to Section 106 of the National Historic Preservation act of 1966 as amended, to inform you of proposed design refinements to the Folsom Dam Safety/Flood Damage Reduction Project, referred to as the Joint Federal Project (JFP) in a letter we sent you dated November 25, 2008.

The revised area of potential effects (APE) for the project is located southeast of the existing main Folsom Dam on the Folsom, California (1980) and Clarksville, California (1980) U.S.G.S. 7.5 minute quadrangles (Enclosure 1). Proposed refinements include construction of a control structure, concrete lining of the spillway chute and stilling basin, and exploratory geotechnical borings for the approach channel cofferdam walls. The geotechnical borings are temporary actions; the others are major, permanent features of the JFP.

The records and literature search conducted for the JFP previously in March of 2009 and a pedestrian survey conducted approximately one month later. These efforts indicate that there are two known cultural resources within or directly adjacent to the APE. The first, Folsom Dam, was found eligible for listing in the National Register of Historic Places (NRHP) in 2006. The second cultural resource, PLI-FDEIS-1, is a possible prospecting pit with associated spoil piles and drainage.

The Corps is sensitive to the interests of Native Americas and will make all possible effort to avoid traditional cultural properties and sacred sites. If you know of any such properties or sites or other areas of concern located within or near the proposed APE, please inform us of them so that we may take appropriate actions. Correspondence may be sent to Ms. Melissa Montag, U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions or require further information please contact Ms. Montag at (916) 557-7907 or by email at Melissa.L.Montag@usace.army.mil.

Sincerely,

Alicia E. Kirchner
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

Environmental Resources Branch

JUL 19 2010

Mr. Milford Wayne Donaldson
State Historic Preservation Officer
Office of Historic Preservation
P.O. Box 942896
Sacramento, California 94296-0001

Dear Mr. Donaldson:

The U.S. Army Corps of Engineers (Corps), Sacramento District, is writing in regard to continuing consultation for the Control Structure, Chute, and Stilling Basin Phase II Project (Phase II). Phase II is a component of the Folsom Dam Joint Federal Project (JFP) which includes Flood Damage Reduction (FDR) measures to Folsom Dam, Dikes and associated features. The Bureau of Reclamation (Bureau) is responsible for construction of Dam Safety features for the JFP while the Corps is in the process of constructing the Flood Damage Reduction (FDR) features of the overall JFP. The Corps, in coordination with the California Department of Water Resources, is implementing the JFP FDR features in order to significantly decrease the flood risk to the Sacramento area. Previous consultation with your office occurred under reference number COE081120C for Phase I of the Corps' JFP FDR measures (Enclosure 1).

In a letter dated May 5, 2009 Mr. William Soule of your office concurred with our finding of No Adverse Effect, in accordance with 36 CFR 800.5(b) for the Phase I project. As described in our previous consultation, the overall FDR measures that we will be constructing for the JFP consist of a continuing series of construction projects with separate environmental compliance efforts for each project. Due to the nature of these iterative phases, because descriptive information on what each construction effort will include will not be available until plans are developed in the months leading up to the estimated construction schedule, and in consultation with Mr. Soule, we determined that the Section 106 compliance for each phase would be handled separately and as information becomes available. As a result, and pursuant to 36 CFR 800.5(b), we are providing you with information on the current construction effort for the Corps' JFP FDR measures and are requesting your concurrence with our finding of No Adverse Effect for the Phase II Project.

In accordance with 36 CFR 800.4(a)(1) we are further defining the APE for Phase II. The APE for Phase II is located near and below the Left Wing Dam at the Folsom Overlook and Folsom Dam, and near Dikes 7 and 8 and the Mormon Island Auxiliary Dam (MIAD) in Sacramento County. The project is located on the Folsom, California, 7.5-minute U.S.G.S. topographic map, T10N R7E, in portions of Section 19, 29, and 30 (Enclosure 2). This revised APE is similar to the APE consulted on for Phase I (Enclosure 3), with some additional areas included around the spillway, Dike 7 and MIAD. The revised APE is within the APE that the Bureau included in their consultation during the 2007 JFP EIS/EIR.

The JFP FDR measures include a gated spillway containing six submerged tainter gates. Principal features of the new auxiliary spillway include an approximately 1,100 foot-long approach channel, which begins in Folsom Reservoir; a concrete control structure that regulates releases through the submerged tainter gates, a 2,782-foot long spillway chute, and a concrete-lined stilling basin. Phase II will include (1) construction of the control structure, (2) concrete lining of the spillway chute and stilling basin, and (3) exploratory borings for the approach channel cofferdam walls (Enclosure 4):

Construction of the control structure. The control structure feature of the auxiliary spillway is the Corps' major construction contract as part of the FDR measures. Construction activities would include the excavation of the remainder of the earth and rock for the foundation of the control structure followed by mass concrete placement in order to build up the structure. The control structure would be a large, vertical, reinforced concrete gravity structure having a top of dam elevation of approximately 483 feet. The control structure would be founded on bedrock and would include two independent flow-through monoliths which would house three submerged tainter gates, totaling six gates in all to control flow releases. After construction, the top of the control structure will have a permanent two-lane roadway, designed to meet all Bureau security, maintenance, and operational needs. The detailed design of the construction of the control structure is included in Enclosure 5.

Concrete lining of the spillway chute and stilling basin. The spillway chute and stilling basin together will comprise a concrete-lined conduit system designed to transmit outflows from the control structure's submerged tainter gates. Water will flow down the spillway chute into a stilling basin before entering the outflow area from Folsom Dam, and finally entering the American River downstream of the dam. The spillway chute work, including the stepped chute portion and the stilling basin, will include the final foundation preparation for the chute slab, installation of the drainage and slab anchorage systems, reinforced concrete placement, and backfill behind the chute walls. Additionally, the stilling basin work will include baffle block anchorage and concrete placement, end sill concrete placement, and any required backfill behind the stilling basin walls. The detailed designs of the concrete lining of the spillway chute and stilling basin are included in Enclosures 6 and 7.

Exploratory borings for the approach channel cofferdam walls. As part of the approach channel design, cofferdams are being considered to keep part of the site dry during construction. The exploratory borings will gather information on the location of supportive rods that will keep the cofferdam in place and help it to withstand water pressure from the upstream side of the dam. An estimated 25 borings would be drilled within the 410 to 420 foot elevation contour range of the Folsom lakebed. The holes would be spaced an average of 100 feet apart and would be cylindrical borings that would consist of a four inch diameter hole extending 25 feet into disturbed rock rubble.

All of the existing access to the site, including on site haul roads and staging for the construction of the control structure chute and still basin work would be as described in the 2007 JFP EIS/EIR completed by the Bureau of Reclamation.

The above three actions constitute the entirety of the proposed actions for completion of the Phase II Project. Our efforts to identify previously completed surveys, sites, and potentially interested Native Americans are described below.

We completed a records and literature search at the North Central Information Center located at California State University, Sacramento on March 13, 2009. The records search indicated that, other than those areas within the Folsom Lake reservoir, the entire Phase II APE has been previously surveyed for cultural resources. For the Phase II Project there are two known cultural resources within or directly adjacent to the APE: Folsom Dam and its associated Left or Right Wing Dams and Dikes (Folsom Dam) and PLI-FDEIS-1, a possible prospecting pit. In consultation with your office in 2009 for the Phase I Project we determined that we would avoid PLI-FDEIS-1 and that there would be no adverse effect to Folsom Dam, a resource eligible for listing in the National Register of Historic Places. The determinations of effect described in our April 29, 2009 letter for the Phase I Project apply to the Phase II Project.

Construction of the control structure and the concrete lining of the spillway chute and stilling basin would be in an area entirely disturbed by the excavation for the auxiliary spillway completed previously by the Bureau and by the Corps' efforts during Phase I construction. The exploratory borings for the approach channel cofferdam walls are in the area we previously consulted on for construction of the spillway approach channel and spur dike by Folsom Overlook. In our consultation in April 2009 we determined there was very low probability of affects to any previously unknown or buried resources within Folsom Overlook and around the reservoir lakebed of this area due to construction of Folsom Dam and the overlook. We have determined that these conclusions for the Phase I Project are applicable to the APE and construction efforts for the Phase II Project.

As part of our identification efforts for the Phase II project we have made attempts to contact potentially interested Native Americans to solicit any information they may have about traditional cultural properties and sacred sites. Letters dated June 3, 2010 were sent to the Shingle Springs Band of Miwok Indians and the United Auburn Indian Community of the Auburn Rancheria. To date we have not received any replies, however, for the Phase I Project Daniel Fonseca of the Shingle Springs Band of Miwok Indians contacted us and asked us to contact them if any previously unidentified resources are discovered during project construction.

In summary, we have further defined the APE for the Phase II Project pursuant to 36 CFR 800.4(a)(1). We have described the proposed project for Phase II, the current year's construction effort. We have described identification efforts, previous surveys, and sites in the APE in accordance with 36 CFR 800.4(b) and determined that the only historic properties within the APE are Folsom Dam and PLI-FDEIS-1. PLI-FDEIS-1 will be avoided during construction.

We have described efforts to identify and contact potentially interested Native Americans pursuant to 36 CFR 800.4(a)(4). In accordance with 36 CFR 800.5(b), we have documented our determination of no adverse effect to Folsom Dam, the only known historic property within the APE for the proposed Phase II Project.

We request your comments on the above determinations, if any. And we request your concurrence with the Corps' determinations made in this letter. Pursuant to 36 CFR 800.3(c)(4), we request that you review the enclosed information and provide us with any comments within 30 days. Comments may be sent to Ms. Melissa Montag (CESPK-PD-R), U.S. Army Corps of Engineers, Sacramento District, 1325 J Street, Sacramento, California 95814-2922. If you have any questions, please contact Ms. Montag, Historian, at (916) 557-7907 or email: melissa.l.montag@usace.army.mil. Please contact Mr. Jason Magness, Project Manager, at (916) 557-7567 with any specific project questions.

Sincerely,

E. Scott Clark

for Alicia E. Kirchner
Chief, Planning Division

Enclosures

Copy furnished (w/enclosures):
Anastasia Leigh, U.S. Department of the Interior, Bureau of Reclamation, 2800 Cottage Way, MP-153, Sacramento, California 95825

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
1725 23rd Street, Suite 100
SACRAMENTO, CA 95816-7100
(916) 445-7000 Fax: (916) 445-7053
calshpo@parks.ca.gov
www.ohp.parks.ca.gov

July 26, 2010

In Reply Refer To: COE081120C

Alicia E. Kirchner
Chief, Planning Division
Department of the Army
U.S. Army Engineer District, Sacramento
1325 J Street
Sacramento, California 95814-2922

Re: Continued Consultation Regarding the Control Structure, Chute, and Stilling Basin for Phase II, Folsom Dam Joint Federal Project, Flood Damage Reduction (JFP-FDR); Sacramento County, California.

Dear Ms. Kirchner:

Thank you for continuing consultation with my office regarding the Folsom Dam Joint Federal Project. The U.S. Army Corps of Engineers (COE), Sacramento District, is seeking my concurrence on the effects that the proposed undertaking will have regarding historic properties pursuant to 36 CFR Part 800 (as amended 8-05-04) regulations implementing Section 106 of the National Historic Preservation Act (NHPA). Previously in this consultation (SHPO letter of December 10, 2008) I concurred that your determination of an Area of Potential Effects (APE) was appropriate pursuant to 36 CFR Part 800.4(a)(1) and in my letter of May 5, 2009, I concurred with your finding of No Adverse Effect for Phase I of this undertaking. At this time, in your letter (and attachments) of July 19, 2010, you are requesting my consultation regarding your finding of effect for Phase II of the Control Structure, Chute, and Stilling Basin component of the Flood Damage Reduction measures for the Folsom Dam Joint Federal Project.

The identification efforts by the COE have determined that two historic properties are located in the project APE. Folsom Dam, which has been determined to be eligible for the National Register of Historic Places (NRHP) under criterion A, has numerous elements located within and adjacent to the APE. The second historic property, PLI-FDEIS-1, is an historic mining feature with an adit, spoils piles and drainage, that is located near the proposed borrow disposal and storage area for the project. The COE has determined that PLI-FDEIS-1 will be avoided by the proposed project. In addition, the COE has determined that the construction of the project will not alter the characteristics of Folsom Dam that qualified it for eligibility for the NRHP, and has concluded that a finding of No Adverse Effect is appropriate pursuant to 36 CFR Part 800.5(b).

After reviewing your letter and supporting documentation, I concur that the Area of Potential Effects determined by the COE is appropriate pursuant to 36 CFR Part

800.4(a)(1), that the efforts by the COE to identify and evaluate historic properties in the APE represent a reasonable and good faith effort pursuant to 36 CFR Part 800.4, and that the finding of effect for Phase II of this undertaking, that of No Adverse Effect, is appropriate pursuant to 36 CFR Part 800.5(b).

Be advised that under certain circumstances, such as unanticipated discovery or a change in project description, the COE may have additional future responsibilities for this undertaking under 36 CFR Part 800. Thank you for seeking my comments and for considering historic properties in planning your project. If you require further information, please contact William Soule, Associate State Archeologist, at phone 916-445-7022 or email wsoule@parks.ca.gov.

Sincerely,

Susan K Stratton for

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer

Appendix A-2

Air Quality Methodology and Assumptions

A-2. Air Quality Methodology and Assumptions

This appendix presents detailed emission calculation results and tables for the construction of the control structure and lining of the spillway chute and stilling basin, including all associated activities. The analysis consists of a quantitative evaluation of construction work that would be performed during the 2010 through 2016 time period. Dispersion modeling was not conducted because the graded area would not exceed 15 acres.

A.1 Methodology and Calculations

The construction emissions were estimated from several emission models and spreadsheet calculations, depending on the source type and data availability. Emission factors from the Folsom Dam Safety and Flood Damage Reduction Final EIS/EIR (Reclamation 2007) or Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009) were used whenever possible. Project emissions were estimated from appropriate emission factors, features being worked, and associated schedules. The following construction sources and activities were analyzed for emissions:

- On-site construction equipment and construction truck engine emissions (all pollutants).
- On-site and off-site haul truck engine emissions (all criteria pollutants and carbon dioxide).
- Off-site worker vehicle trips to and from the site.
- On-site and off-site haul truck fugitive dust emissions for paved and unpaved road travel.
- On-site material storage piles.
- On-site concrete batch plants.
- On-site demolition and grading (cut/fill for control structure) fugitive dust.
- On-site blasting emissions.

Spreadsheets showing each of the calculations are included in this appendix.

A.1.1 EXHAUST EMISSIONS

Diesel- and gasoline-powered vehicles and construction equipment would emit the criteria pollutants carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter (PM) during all construction activities. This section describes the exhaust emission calculations.

A.1.1.1 On-site Construction equipment and truck engine emissions.

This EA used emission factors from The Folsom Dam Safety and Flood Damage Reduction Final EIS/EIR (Reclamation 2007). That study calculated on-site construction equipment and truck engine emissions based on the El Dorado Air Pollution Control District's (APCD) Guide to Air Quality (El Dorado, 2002).

The construction equipment emission rates are shown in Table A2-1. For this analysis, it was assumed that the emission factors for 2011 through 2016 were equal to those in 2010 and that the emission factors were based on an 8-hour work day.

The horsepower (hp) of the drilling rigs for this construction project was assumed to be 140 hp, which was less than the assumed horsepower used for the emission estimations in the Folsom Dam Safety and Flood Damage Reduction Final EIS/EIR. Therefore, emission factors from the Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009) were used for the bore/drill rigs in this EA. To be conservative, the emission factors for a 175 hp drill rig were used for calculations.

Table A2-1 . Construction Equipment Emission Factor (pounds per day) for 2009 - 2016.

	Emission Rate in Pounds Per Day			
Equipment Type	**ROG/VOC**	**CO**	**NO_x**	**PM_{10}**
Bore/Drill Rigs (Reclamation, 2007)				
2009	2.38	20.21	16.41	0.38
2010-2016	2.26	19.23	15.61	0.36
Bore/Drill Rigs (Corps, 2009)				
175 hp	0.966	6.033	9.19	0.469
	(54.76 g/hr)	(342.09 g/hr)	(521.05 g/hr)	26.59 g/hr)
Paving Equipment				
2009	1.04	8.23	6.78	0.22
2010-2016	1.04	8.52	6.39	0.19
Rollers				
2009	0.86	7.34	5.01	0.14
2010-2016	0.86	7.34	5.01	0.14
Cranes				
2009	1.44	12.27	8.37	0.23
2010-2016	1.44	12.27	8.37	0.23
Crawler Tractors				
2009	1.45	11.55	9.5	0.31
2010-2016	1.45	11.95	8.96	0.27
Crushing/Proc Equipment				
2009	2.12	16.86	13.88	0.45
2010-2016	2.12	17.45	13.09	0.4
Rough Terrain Forklifts				

2009	0.79	6.7	4.57	0.13
2010-2016	0.79	6.7	4.57	0.13
Rubber Tired Dozers				
2009	3.66	29.13	23.97	0.78
2010-2016	3.66	30.14	22.61	0.68
Rubber Tired Loaders				
2009	1.35	11.52	7.86	0.22
2010-2016	1.35	11.52	7.86	0.22
Excavators				
2009	1.84	15.64	10.67	0.29
2010-2016	1.84	15.64	10.67	0.29
Graders				
2009	1.76	14.98	10.22	0.28
2010-2016	1.76	14.98	10.22	0.28
Off-Highway Tractors/Compactors				
2009	1.84	14.65	12.05	0.39
2010-2016	1.84	15.16	11.37	0.34
Scrapers				
2009	3.64	30.96	21.12	0.58
2010-2016	3.64	30.96	21.12	0.58
Skid Steer Loaders				
2009	0.56	4.78	3.26	0.09
2010-2016	0.56	4.78	3.26	0.09
Off-Highway Trucks/Water Trucks				
2009	3.6	30.62	20.89	0.58
2010-2016	3.6	30.62	20.89	0.58
Other Construction Equipment				
2009	2.08	16.54	13.61	0.44
2010-2016	2.08	17.11	12.84	0.39
Pavers				
2009	1.37	11.62	7.93	0.22
2010-2016	1.37	11.62	7.93	0.22
Surfacing Equipment				
2009	3.77	29.99	24.68	0.8
2010-2016	3.77	31.03	23.28	0.7
Tractors/Loaders/Backhoes				
2009	0.65	5.18	4.26	0.14
2010-2016	0.65	5.36	4.02	0.12
Trenchers				
2009	1.00	8.53	5.82	0.16
2010-2016	1.00	8.53	5.82	0.16

ROG Reactive Organic Gas

VOC Volatile Organic Compound

A.1.1.2 On-site and off-site haul truck engine emissions.

This EA used emission factors from The Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009). That study used data from EMFAC2007 to calculate emission factors in grams per mile for criteria pollutants and for carbon dioxide for 2009 heavy-heavy duty diesel trucks in Sacramento County. The emission factors were based on the EMFAC mode with a speed of 15 mph. Mitigation reductions for NO_x and PM based on the Sacramento Metropolitan Air Quality Management District (SMAQMD) guidance was used for on-site haul trucks.

A.1.1.3 Off-site worker vehicle trips engine emissions.

This EA used emission factors from The Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009). That study used data from EMFAC2007 to calculate emission factors in pounds per 1000 miles for criteria pollutants and for carbon dioxide for the commutes of workers. The calculations assumed a vehicle fleet mix of fifty percent light duty automobiles and fifty percent light duty trucks. The emission factors are shown in Table A2-2.

Table A2-2. Construction Equipment Emission Factor (pounds per 1000 mile).

Vehicle Description	Emission Rate in Pounds Per 1000 Miles						
	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Light Duty Automobile (LDA)	8.87	832	0.756	0.0694	0.0393	0.00786	0.991
Light Duty Truck (LDT)	10.6	1020	1.22	0.0905	0.0566	0.0131	1.12
Average based on 50 percent LDA and 50 percent LDT	9.75	927	0.99	0.0800	0.0479	0.00959	1.06

A.1.2 FUGITIVE DUST EMISSIONS

Fugitive dust and PM emissions are produced during vehicle travel on paved and unpaved roads, during handling of stockpile material, cut and fill operations, blasting, and concrete batch plant operation.

A.1.2.1 Off-site haul truck and worker vehicle fugitive dust emissions for paved road travel.

This EA used emission factors calculated in The Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009). Paved road entrained fugitive dust emissions were estimated using the AP-42 13.2.1 emission factor (pounds per vehicle mile traveled) and the vehicle miles traveled. The emission factor was calculated based on the silt content of the road, the weight of the vehicle, and the number of days where precipitation was over 0.01 inches. The vehicles were assumed to travel on five different types of paved roads: freeway, arterial (major street/highway), collector road, local road surface and rural road surface. The off-site truck haul trucks were assumed to be heavy-heavy duty diesel trucks with an average weight of 23.5 tons. The worker fleet was assumed to be 50 percent light duty automobiles and 50 percent light duty trucks with an average weight of 1.75 tons.

A.1.2.2 On-site haul truck fugitive dust emissions for unpaved road travel.

This EA used emission factors calculated in The Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009). Unpaved road entrained fugitive dust emissions were estimated using the AP-42 13.2.2 emission factor (pounds per vehicle mile traveled) and the vehicle miles traveled. The emission factor was calculated based on the silt content of the road, the weight of the vehicle, and the number of days where precipitation was over 0.01 inches. Fugitive dust from unpaved roads during hauling of excavated material from the control structure area to the MIAD would be the primary emission source. These emissions would be produced during the nine months of excavation.

A.1.2.3 On-site material storage pile handling.

This EA used assumptions and emission factors that were calculated in The Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009). Stockpile handling fugitive dust emissions were estimated using the AP-42 13.2.4 emission factor (pounds per ton) and the amount of material handled. The emission factor was based on the mean wind speed and material moisture content. Mitigation reductions from watering controls would contribute to a 90 percent emission control efficiency compared to the unmitigated emissions.

A.1.2.4 On-site material storage pile wind erosion.

This EA used assumptions and emission factors that were calculated in The Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009). Stockpile wind erosion fugitive dust emissions were estimated using the AP-42 13.2.5 emission factor (grams per square meter of exposed area) and the area exposed to wind. The emission factor was based on the fastest mile wind speed and the number of disturbances of the storage pile. It was assumed that material would be added to the pile each day and therefore the number of disturbances to the storage pile would be equal to the number of working days per year. For the storage pile of excavated material, this would be equal to the number of workdays during the nine months of excavation, or 180 working days. For the storage pile of aggregate material (for the concrete batch plants) this would be equal to the number of workdays per year, or 240 working days.

A.1.2.5 On-site concrete batch plants.

This EA used methodology and assumptions from AP-42 11.12. The emission factors for concrete batching calculate pounds of PM_{10} per ton of mixed concrete. The emission factors are shown in Table A2-3.

Table A2-3. Concrete Batching Emission Factor (pounds of PM_{10} per ton of concrete).

Batch Plant Source	Uncontrolled	Controlled

Aggregate transfer	0.0033	ND
Sand transfer	0.00099	ND
Cement unloading to elevated storage silo (pneumatic)	0.46	0.00034
Cement supplement unloading to elevated storage silo (pneumatic)	1.10	0.0049
Weigh hopper loading	0.0024	ND
Mixer loading (central mix)	0.134	0.0048
Truck loading (truck mix)	0.278	0.016
Total	1.98	0.033

ND = No data

Mitigation reductions from watering controls would contribute to a 90 percent emission control efficiency compared to the unmitigated emissions.

A.1.2.6 On-site demolition and grading (cut and fill).

Similar to calculations in The Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009), this EA used the URBEMIS2007 model to calculate cut and fill fugitive dust emissions. The URBEMIS2007 model calculated fugitive dust emission based on the maximum daily volume disturbed. The daily volume disturbed was assumed to be 1,778 cubic yards per day based on the total volume to be excavated and the construction period.

A.1.2.7 On-site blasting emissions.

This EA used assumptions and emission factors that were calculated in The Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009). Blasting emissions were estimated using the methodology in the 2005 Blue Rock Quarry Draft Environmental Impact Report and were based on a blasting emission factor and the number of blasts per year. The calculation of the blasting emission factor depended on the blast area, blast depth, and moisture content. The mitigation control efficiency for PM_{10} was assumed to be 36 percent (Corps 2009).

A.1.3 GREEN HOUSE GAS (GHG) EMISSIONS

The principal greenhouse gases are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFC), hydrofluorocarbons (HFC), and water vapor. Carbon dioxide is produced during the burning of fossil fuels and is the predominant greenhouse gas created during this project. Because no major sources exist for the other greenhouse gases during the construction process, they are not considered to be significant and no quantitative emission calculations were made for them.

A.1.3.1 On-site Construction equipment and truck engine emissions.

This EA used CO_2 emission factors (grams per hour) from The Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009). That study used data from SMAQMD published off-road emission factors for 2009, which defined emission factors for different types and sizes of construction equipment. The Corps calculated CO_2

emissions by multiplying the emission factor by the number of hours each equipment type was estimated to operate.

A.1.3.2 On-site and off-site haul truck engine emissions.

This EA used CO_2 emission factors from The Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009). That study used data from EMFAC2007 to calculate emission factors for carbon dioxide for 2009 heavy-heavy duty diesel trucks in Sacramento County. The emission factors were based on the EMFAC mode with a speed of 15 mph.

A.1.3.3 Off-site worker vehicle trips engine emissions.

This EA used emission factors from The Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009). That study used data from EMFAC2007 to calculate emission factors for carbon dioxide for the commutes of workers. The calculations assumed a vehicle fleet mix of fifty percent light duty automobiles and fifty percent light duty trucks. The emission factor for CO_2 is shown in Table A2-2 along with the emission factors for criteria pollutants.

A.1.3.4 Concrete batch plants.

The manufacture of concrete requires large amounts of energy to produce and results in substantial GHG emissions. Calculating these emissions would be more indicative of a "life-cycle" emissions analysis and can go beyond a typical EA analysis. However, the Corps estimated CO_2 emissions from the production of concrete during this project based on published emission factors. Studies have shown that CO_2 emissions generated by typical normal strength concrete mixes were found to range between 0.29 and 0.32 metric tons of CO_2 equivalent per cubic meter of concrete (Flowers and Sanjayan, 2007). In order to be conservative, this study assumed 0.32 metric tons (320 kilograms) of CO_2 would be created per cubic meter of concrete produced.

References:

El Dorado County Air Pollution Control District, February 2002. Guide to Air Quality Assessment.

Flowers and Sanjayan, 2007 (Abstract): "Green House Gas Emissions Due to Concrete Manufacture, The International Journal of Life Cycle Assessment. Vol 12, Number 5, July 2007. Landsberg, Germany: Ecomed.

Emissions - Cumulative Summary from all Activities

Exhaust Criteria Pollutants

Borings for Approach Channel Cofferdam

(Oct 2010 through Jan 2011)
Period of Operation (months) 4

Worker Commute Emissions

Unmitigated

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Pounds	187.20	17,798.00	19.01	1.54	0.92	0.18	20.35
Tons	0.094	8.90	0.010	0.00077	0.00046	0.000090	0.010

Mitigated (No mitigations)

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Pounds	187.20	17,798.00	19.01	1.54	0.92	0.18	20.35
Tons	0.094	8.90	0.010	0.00077	0.00046	0.000090	0.010

Construction Equipment Exhaust

Unmitigated

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Average annual tons	0.14		0.58	0.016	0.016		0.042
Total annual average tons	0.23		0.59	0.017	0.016		0.052

Mitigated (Enhanced Control Practices)
20% reduction in NO_x; 45% reduction in PM_{10}

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Average annual tons	0.14		0.46	0.0088	0.0088		0.042
Total annual average tons	0.23		0.47	0.010	0.0093		0.052

Control Structure

(Jan 2011 through July 2014)
Total Period of Operation (months) 42

Months of operation during Control Structure construction:

Excavation (months)	9	Gate installation (months)	9
Aggregate and concrete	24		

Worker Commute Emissions (Excavation, Concrete Placement, Gate Installation)

Unmitigated

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Total Pounds	14,332.50	1,362,690.00	1,455.30	117.60	70.41	14.10	1,558.20
Total Tons	7.17	681.35	0.73	0.059	0.035	0.0071	0.78
Average annual pounds	4,095.00	389,340.00	415.80	33.60	20.12	4.03	445.20
Average annual tons	2.05	194.67	0.21	0.017	0.010	0.0020	0.22

Mitigated (No mitigations)

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Total Pounds	14,332.50	1,362,690.00	1,455.30	117.60	70.41	14.10	1,558.20
Total Tons	7.17	681.35	0.73	0.059	0.035	0.0071	0.78
Average annual pounds	4,095.00	389,340.00	415.80	33.60	20.12	4.03	445.20
Average annual tons	2.05	194.67	0.21	0.017	0.010	0.0020	0.22

Construction Equipment Exhaust

Unmitigated

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Excavation - Average annual tons (Jan 2011 - Sept 2011; 9 months)	15.16		13.09	0.49	0.49		1.95
Concrete Placement - Average annual tons (July 2011 - July 2013; 24 months)	5.59		4.20	0.13	0.13		0.69
Gate Installation - Average annual tons (Dec 2013 - July 2014; 9 months)	1.23		0.84	0.023	0.023		0.14
Maximum Annual Cumulative - Avg. annual tons (During the year 2011: Excavation + 6 months concrete)	17.96		15.19	0.555	0.555		2.30

Mitigated (Enhanced Control Practices)
20% reduction in NO_x; 45% reduction in PM_{10}

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Excavation - Average annual tons (Jan 2011 - Sept 2011; 9 months)	15.16		10.47	0.27	0.27		1.95
Concrete Placement - Average annual tons (July 2011 - July 2013; 24 months)	5.59		3.36	0.072	0.072		0.69
Gate Installation - Average annual tons (Dec 2013 - July 2014; 9 months)	1.23		0.67	0.013	0.013		0.14
Maximum Annual Cumulative - Avg. annual tons (During the year 2011: Excavation + 6 months concrete)	17.96		12.15	0.305	0.305		2.30

On-Site Haul Truck

Unmitigated

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Average annual tons (2011)	0.35	53.25	0.43	0.025	0.022	0.00042	0.071

Mitigated (Enhanced Control Practices)

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Average annual tons (2011)	0.35	53.25	0.34	0.014	0.012	0.00042	0.071

Off-Site Haul Truck

Unmitigated

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Average annual tons	0.67	280.40	2.66	0.10	0.088	0.0020	0.18
Maximum Annual Cumulative - Avg. annual tons (During the year 2011)	21.02		18.49	0.70	0.68		2.77

Mitigated (No mitigations)

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Average annual tons	0.67	280.40	2.66	0.10	0.088	0.0020	0.18
Maximum Annual Cumulative - Avg. annual tons (During the year 2011)	21.02		15.36	0.44	0.42		2.77

Chute and Stilling Basin

(late 2013 through 2016)
Period of Operation (months) 36

Worker Commute Emissions

Unmitigated

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Total Pounds	12,285.00	1,168,020.00	1,247.40	100.80	60.35	12.08	1,335.60
Total Tons	6.14	584.01	0.62	0.050	0.030	0.0060	0.67
Average annual pounds	4,095.00	389,340.00	415.80	33.60	20.12	4.03	445.20
Average annual tons	2.05	194.67	0.21	0.017	0.010	0.0020	0.22

Mitigated (No mitigations)

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Total Pounds	12,285.00	1,168,020.00	1,247.40	100.80	60.35	12.08	1,335.60
Total Tons	6.14	584.01	0.62	0.050	0.030	0.0060	0.67
Average annual pounds	4,095.00	389,340.00	415.80	33.60	20.12	4.03	445.20
Average annual tons	2.05	194.67	0.21	0.017	0.010	0.0020	0.22

Construction Equipment Exhaust

Unmitigated

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Average annual tons	10.42		7.77	0.25	0.25		1.29

Mitigated (Enhanced Control Practices)

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Average annual tons	10.42		6.22	0.14	0.14		1.29

Off-Site Haul Truck

Unmitigated

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Average annual tons	0.79	332.44	3.16	0.12	0.10	0.0024	0.21
Total Annual Average Emissions	13.26		11.14	0.39	0.36		1.72
Maximum Annual Cumulative for Control Structure Gate Installation plus Chute and Stilling Basin - Avg. annual tons (During the year 2014: Chute and Stilling Basin annual average + 7 months of Gate Installation)	16.07		13.65	0.48	0.44		2.10

Mitigated (No mitigations)

	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Average annual tons	0.79	332.44	3.16	0.12	0.10	0.0024	0.21
Total Annual Average Emissions	13.26		9.58	0.27	0.25		1.72
Maximum Annual Cumulative for Control Structure Gate Installation plus Chute and Stilling Basin - Avg. annual tons (During the year 2014: Chute and Stilling Basin annual average + 7 months of Gate Installation)	16.07		11.93	0.36	0.32		2.10

Emissions - Construction Equipment Exhaust

Note: No CO_2 Calculations in this worksheet

Equipment

Type	Number	Hours per day	Days per week	Months		Hours per week	Hours per Project	Calculated 8-hour days per Project		Unmitigated Emissions (pounds)				Unmitigated Emissions (tons)				Unmitigated Estimated Annual Emissions (tons)		
									ROG	CO	NO_x	PM_{10}	ROG	CO	NO_x	PM_{10}		ROG	CO	NO_x	PM_{10}
CONTROL STRUCTURE - Concrete Placement and Batch Plant (24 months)					July 2011 through July 2013																
Semi-trailer truck	20	4	5	12		400	19,200	2,400		Off-site Haul Truck calculations								Off-site Haul Truck calculations			
Belly dump truck	8	4	3	16		96	6,144	768		Off-site Haul Truck calculations								Off-site Haul Truck calculations			
Tanker trucks	2	4	3	16		24	1,536	192		Off-site Haul Truck calculations								Off-site Haul Truck calculations			
Chiller	1	10	5	12		50	2,400	300	624	5,133	3,852	117	0.31	2.57	1.93	0.059		0.31	2.57	1.93	0.059
Stationary Cranes - electric	2	8	5	12		80	3,840	480	0	0	0	0	0	0	0	0		0	0	0	0
Forklifts	2	4	5	12		40	1,920	240	190	1,608	1,097	31.2	0.095	0.80	0.55	0.016		0.095	0.804	0.548	0.016
Man lift/scissor lift - electric	2	8	5	12		80	3,840	480	0	0	0	0	0	0	0	0		0	0	0	0
Water truck	1	4	5	12		20	960	120	53	266	324	19	0.03	0.13	0.16	0.009		0.027	0.133	0.16	0.009
Street sweeper	1	8	1	12		8	384	48	100	821	616	19	0.050	0.41	0.31	0.0094		0.050	0.411	0.31	0.0094
Jackhammers	2	8	1	12		16	768	96	200	1,643	1,233	37	0.10	0.82	0.62	0.019		0.100	0.821	0.62	0.019
Cement mixers (transit)	0	4	5	12		0	0	0	0	0	0	0	0.00	0.00	0.00	0.00		0.000	0.00	0.00	0.00
Front end loaders	2	8	5	8		80	2,560	320	208	1,715	1,286	38	0.10	0.86	0.64	0.019		0.104	0.858	0.643	0.019
Flatbed delivery truck	1		5							Off-site Haul Truck calculations								Off-site Haul Truck calculations			
Control Structure Concrete Placement Annual Average Emissions																		0.69	5.59	4.20	0.13
Control Structure Concrete Placement 2011 Annual Emissions (6 months)																	2011	0.34	2.80	2.10	0.07
Control Structure Concrete Placement 2012 Annual Emissions (12 months)																	2012	0.69	5.59	4.20	0.13
Control Structure Concrete Placement 2013 Annual Emissions (6 months)																	2013	0.34	2.80	2.10	0.07
CONTROL STRUCTURE - Excavation (9 months)			January 2011 through September 2011																		
"Super" dump trucks	5	8	5	6		200	4,800	600		On-site Haul Truck calculations								Off-site Haul Truck calculations			
Water trucks	1	4	5	6		20	480	60	27	133	162	9	0.013	0.07	0.08	0.005		0.013	0.07	0.08	0.005
Fuel truck	1	2	5	8		10	320	40	18	89	108	6	0.009	0.04	0.05	0.0031		0.009	0.04	0.05	0.003
Maintenance truck	4	4	5	8		80	2,560	320	142	709	863	50	0.07	0.35	0.43	0.025		0.07	0.35	0.43	0.025
Pickup trucks	10	4	5	8		200	6,400	800	54	509	59	4.3	0.027	0.25	0.029	0.0022		0.027	0.25	0.029	0.0022
Drills for grouting - electric	6	8	5	9		240	8,640	1,080	0	0	0	0	0.00	0.00	0.00	0.000		0.00	0.00	0.00	0.000
Rock drills for setting charges	NE	NE	NE	NE	NE	NE	7,353	919	888	5,545	8,447	431	0.44	2.77	4.22	0.216		0.44	2.77	4.22	0.216
Front end loaders	2	8	5	8		80	2,560	320	208	1,715	1,286	38	0.10	0.86	0.64	0.019		0.10	0.86	0.64	0.019
Dozers with rippers	2	8	5	8		80	2,560	320	464	3,824	2,867	86	0.23	1.91	1.43	0.043		0.23	1.91	1.43	0.043
Backhoes	4	8	5	8		160	5,120	640	416	3,430	2,573	77	0.21	1.72	1.29	0.038		0.21	1.72	1.29	0.038
Graders	2	8	5	8		80	2,560	320	563	4,794	3,270	90	0.28	2.40	1.64	0.045		0.28	2.40	1.64	0.045
Scrapers	3	8	5	3		120	1,440	180	655	5,573	3,802	104	0.33	2.79	1.90	0.052		0.33	2.79	1.90	0.052
Excavators	2	8	5	5		80	1,600	200	368	3,128	2,134	58	0.18	1.56	1.07	0.029		0.18	1.56	1.07	0.029
Compactor sheep foot	2	8	5	3		80	960	120	103	881	601	17	0.052	0.44	0.30	0.0084		0.052	0.44	0.30	0.0084
		NE = Not Estimated																			
Control Structure Excavation Annual Average Emissions (All in 2011)																	2011	1.95	15.16	13.09	0.49
Total Control Structure 2011 Emissions (Excavation plus Concrete Placement)																	2011	2.30	17.96	15.19	0.55
CONTROL STRUCTURE - Gate Installation (9 months)			December 2013 through July 2014																		
Track driven cranes	2	8	5	5		80	1,600	200	288	2,454	1,674	46	0.144	1.23	0.84	0.0230		0.144	1.227	0.837	0.023
Flat bed trucks										Off-site Haul Truck calculations								Off-site Haul Truck calculations			
Control Structure Gate Installation Annual Average Emissions (Assume in 2014)																		0.144	1.227	0.837	0.023
CHUTE AND STILLING BASIN - Concrete Placement and Batch Plant (36 months)					Late 2013 through 2016																
Semi-trailer truck	20	4	5	36		400	57,600	7,200		Off-site Haul Truck calculations								Off-site Haul Truck calculations			
Belly dump truck	8	4	3	36		96	13,824	1,728		Off-site Haul Truck calculations								Off-site Haul Truck calculations			
Tanker trucks	2	4	3	36		24	3,456	432	192	957	1,165	67	0.096	0.48	0.58	0.0337		0.03	0.16	0.19	0.011
Chiller	1	10	5	36		50	7,200	900	1,872	15,399	11,556	351	0.936	7.70	5.78	0.1755		0.31	2.57	1.93	0.059
Stationary Cranes - electric	2	8	5	36		80	11,520	1,440	0	0	0	0	0	0	0	0		0	0	0	0
Forklifts	2	4	5	36		40	5,760	720	569	4,824	3,290	94	0.284	2.41	1.65	0.0468		0.095	0.804	0.548	0.016
Man lift/scissor lift - electric	2	8	5	36		80	11,520	1,440	0	0	0	0	0	0	0	0		0	0	0	0
Water truck	1	4	5	36		20	2,880	360	160	798	971	56	0.080	0.40	0.49	0.0281		0.03	0.13	0.16	0.009
Street sweeper	1	8	1	36		8	1,152	144	300	2,464	1,849	56	0.150	1.23	0.92	0.0281		0.050	0.411	0.31	0.0094
Jackhammers	2	8	1	36		16	2,304	288	599	4,928	3,698	112	0.300	2.46	1.85	0.0562		0.10	0.82	0.62	0.019
Cement mixers (transit)	0	4	5	36		0	0	0	0	0	0	0	0.000	0.00	0.00	0.0000		0.00	0.00	0.00	0.00
Front end loaders	2	8	5	36		80	11,520	1,440	936	7,718	5,789	173	0.468	3.86	2.89	0.0864		0.16	1.29	0.96	0.029
Flatbed delivery truck	1		5							Off-site Haul Truck calculations								Off-site Haul Truck calculations			
CHUTE AND STILLING BASIN - Foundation Preparation/Backfill (36 months)					Late 2013 through 2016																
Fuel truck	1	2	5	36		10	1,440	180	80	399	485	28	0.040	0.20	0.24	0.0140		0.013	0.066	0.081	0.005
Water truck	1	4	5	36		20	2,880	360	160	798	971	56	0.080	0.40	0.49	0.0281		0.027	0.133	0.162	0.009
Front end loader	1	4	5	36		20	2,880	360	234	1,930	1,447	43	0.117	0.96	0.72	0.0216		0.039	0.322	0.241	0.0072
Pickup trucks	5	4	5	36		100	14,400	1,800	121	1,145	132	10	0.060	0.57	0.07	0.0049		0.020	0.191	0.022	0.002
Track driven cranes	2	4	5	24		40	3,840	480	691	5,890	4,018	110	0.346	2.94	2.01	0.0552		0.173	1.472	1.004	0.028
Drills for grouting - electric	6	8	5	24		240	23,040	2,880	0	0	0	0	0.000	0.00	0.00	0.0000		0.000	0.000	0.000	0.00
Portable cement mixers	2	4	5	12		40	1,920	240	499	4,106	3,082	94	0.250	2.05	1.54	0.0468		0.250	2.053	1.541	0.047
Chute and Stilling Basin Annual Average Emissions (Assume emissions in 2014, 2015, 2016)																		1.29	10.42	7.77	0.25

BORINGS FOR APPROACH CHANNEL COFFERDAM (4 months) Late 2010 - Early 2011

Diesel & Hydraulic drill rig	1	10	5	4		50	800	100	97	603	919	47	0.048	0.30	0.46	0.0235	0.048	0.30	0.46	0.023
Flat bed trucks	2	4	5	4					Off-site Haul Truck calculations								Off-site Haul Truck calculations			
Borings for Approach Channel Annual Average Emissions (Assume in 2010)																	0.048	0.30	0.46	0.023
TOTAL EMISSIONS									12,076	95,928	75,625	2,576	6.0	48.0	37.8	1.3				

Approximate 2010 annual unmitigated emissions:	0.05	0.30	0.46	0.023
Approximate 2011 annual unmitigated emissions:	2.30	17.96	15.19	0.55
Approximate 2012 annual unmitigated emissions:	0.69	5.59	4.20	0.13
Approximate 2013 annual unmitigated emissions:	0.34	2.80	2.10	0.07
Approximate 2014 annual unmitigated emissions:	1.44	11.65	8.61	0.27
Approximate 2015 annual unmitigated emissions:	1.29	10.42	7.77	0.25
Approximate 2016 annual unmitigated emissions:	1.29	10.42	7.77	0.25

Construction Equipment Emission Rates (pounds per day) from Reclamation 2007

Equipment Type	ROG	CO	NO_x	PM_{10}
Bore/Drill Rigs				
2009	2.38	20.21	16.41	0.38
2010-2016	2.26	19.23	15.61	0.36
Paving Equipment				
2009	1.04	8.23	6.78	0.22
2010-2016	1.04	8.52	6.39	0.19
Rollers				
2009	0.86	7.34	5.01	0.14
2010-2016	0.86	7.34	5.01	0.14
Cranes				
2009	1.44	12.27	8.37	0.23
2010-2016	1.44	12.27	8.37	0.23
Crawler Tractors				
2009	1.45	11.55	9.5	0.31
2010-2016	1.45	11.95	8.96	0.27
Crushing/Proc Equipment				
2009	2.12	16.86	13.88	0.45
2010-2016	2.12	17.45	13.09	0.4
Rough Terrain Forklifts				
2009	0.79	6.7	4.57	0.13
2010-2016	0.79	6.7	4.57	0.13
Rubber Tired Dozers				
2009	3.66	29.13	23.97	0.78
2010-2016	3.66	30.14	22.61	0.68
Rubber Tired Loaders				
2009	1.35	11.52	7.86	0.22
2010-2016	1.35	11.52	7.86	0.22
Excavators				
2009	1.84	15.64	10.67	0.29
2010-2016	1.84	15.64	10.67	0.29
Graders				
2009	1.76	14.98	10.22	0.28
2010-2016	1.76	14.98	10.22	0.28
Off-Highway Tractors/Compactors				
2009	1.84	14.65	12.05	0.39
2010-2016	1.84	15.16	11.37	0.34
Scrapers				
2009	3.64	30.96	21.12	0.58
2010-2016	3.64	30.96	21.12	0.58
Skid Steer Loaders				
2009	0.56	4.78	3.26	0.09
2010-2016	0.56	4.78	3.26	0.09
Off-Highway Trucks/Water Trucks				
2009	3.6	30.62	20.89	0.58
2010-2016	3.6	30.62	20.89	0.58
Other Construction Equipment				
2009	2.08	16.54	13.61	0.44
2010-2016	2.08	17.11	12.84	0.39
Pavers				
2009	1.37	11.62	7.93	0.22
2010-2016	1.37	11.62	7.93	0.22
Surfacing Equipment				
2009	3.77	29.99	24.68	0.8
2010-2016	3.77	31.03	23.28	0.7
Tractors/Loaders/Backhoes				
2009	0.65	5.18	4.26	0.14
2010-2016	0.65	5.36	4.02	0.12
Trenchers				
2009	1.00	8.53	5.82	0.16
2010-2016	1.00	8.53	5.82	0.16

Emission factors for ROG, CO, NOx, PM10 from (Reclamation 2007)

Assume: Emission rates from 2011 to 2016 are equal to 2010
Eight hour work day

Construction Equipment Emission Rates (pounds per day) from Corps 2009

Equipment Type	ROG	CO	NO_x	PM_{10}
Bore/Drill Rigs				
175 Horsepower	0.966	6.033	9.19	0.469
Pickups[1]				
Pounds/1,000 miles	1.12	10.6	1.22	0.0905
Pounds/day	0.0672	0.636	0.0732	0.00543
Heavy-heavy duty diesel truck 2009[2]				
Pounds per mile	0.00739	0.03694	0.04495	0.0026
Pounds/day	0.4434	2.2164	2.697	0.156

Project will use 140 hp drills

[1] Assume: Pickups in use 4 hours per day, maximum speed is 15 mph, maximum distance per day is 60 miles.
[2] Assume: Trucks in use 4 hours per day, maximum speed is 15 mph, maximum distance per day is 60 miles.

Emissions: On-Site and Off-Site Haul Trucks Exhaust (Based on Vehicle Miles Traveled)

Assumptions and Emission Factors from: Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009)

ON-SITE HAUL TRUCKS

EMISSION FACTORS

	Emission Rate in grams per mile						
Vehicle Description	**CO**	**CO_2**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG**
Heavy-Heavy Duty Diesel Truck 2009	16.75	2,516.08	20.39	1.18	1.05	0.02	3.35

Emission Factor from (Corps 2009) Appendix A: On-site Truck Emissions

	Emission Rate in pounds per mile						
Vehicle Description	**CO**	**CO_2**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG**
Heavy-Heavy Duty Diesel Truck 2009	0.03693	5.5469	0.04495	0.00260	0.00231	0.0000441	0.00739

Emission Factor calculated based on conversion factor of 0.0022046 to convert from grams to pounds

CONTROL STRUCTURE - Excavation (9 months) Jan - Sept 2011

				Emissions in pounds							Emissions in tons						
Vehicle	**Miles per round trip**	**Number of trips**	**Total Miles**	**CO**	**CO_2**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG**	**CO**	**CO_2**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG**
"Super" dump truck (hauling to MIAD)	3	6,400	19,200	709	106,501	863	50	44	0.85	142	0.35	53.25	0.43	0.025	0.022	0.00042	0.071

Miles: 19,200

	Total Emissions in tons						
	CO	**CO_2**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG**
TOTAL ON-SITE HAUL TRUCK EMISSIONS	0.35	53.25	0.43	0.025	0.022	0.00042	0.071
Average annual on-site haul truck emissions (9 months):	0.35	53.25	0.43	0.025	0.022	0.00042	0.071

OFF-SITE HAUL TRUCKS

EMISSION FACTORS

	Emission Rate in pounds per mile						
Vehicle Description	**CO**	**CO_2**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG**
Heavy-Heavy Duty Diesel Truck 2009	0.010	4.21	0.040	0.00153	0.00132	0.0000301	0.00268

Emission Factor from (Corps 2009) Appendix A: Off-site Truck Emissions

CONTROL STRUCTURE - Concrete Placement and Batch Plant (24 months) and Gate Intallation (9 months) Concrete Placement and Batch Plant - July 2011 through July 2013; Gate Installation - December 2013 through July 2014

				Emissions in pounds							Emissions in tons						
Vehicle	**Miles per trip**	**Number of trips**	**Total Miles**	**CO**	**CO_2**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG**	**CO**	**CO_2**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG**
Off-site deliveries of material	10	230	2,300	23.0	9,683	92	3.5	3.0	0.069	6.16	0.0115	4.84	0.046	0.0018	0.0015	0.000035	0.0031
Aggregate delivery for concrete	36	9,700	349,200	3,492.0	1,470,132	13,968	534	460.9	10.511	935.86	1.7460	735.07	6.98	0.2671	0.2305	0.0053	0.47
Delivery of reinforcing bars	10	66	660	6.6	2,779	26	1.0	0.9	0.020	1.77	0.0033	1.39	0.0132	0.0005	0.0004	0.000010	0.0009
Delivery of Bulkhead gates	30	6	180	1.8	758	7	0.3	0.2	0.005	0.48	0.0009	0.38	0.0036	0.00014	0.00012	0.000003	0.0002
Delivery of Taintor gates	30	6	180	1.8	758	7	0.3	0.2	0.005	0.48	0.0009	0.38	0.0036	0.00014	0.00012	0.000003	0.0002
Delivery of Trunion girders	30	6	180	1.8	758	7	0.28	0.24	0.005	0.48	0.0009	0.38	0.0036	0.00014	0.00012	0.0000027	0.00024
Delivery of stairs and handrails	30	3	90	0.90	379	4	0.14	0.12	0.0027	0.24	0.0005	0.19	0.0018	0.000069	0.000059	0.0000014	0.00012
Delivery of walkways, steel grating	30	5	150	1.5	632	6	0.23	0.20	0.0045	0.40	0.0008	0.32	0.0030	0.00011	0.00010	0.0000023	0.00020
Delivery of trunnion and guides	30	12	360	3.6	1,516	14	0.55	0.48	0.011	0.96	0.0018	0.76	0.0072	0.00028	0.00024	0.0000054	0.00048
Delivery of misc. electrical, HVAC	10	1,200	12,000	120.0	50,520	480	18.4	15.8	0.361	32.16	0.0600	25.26	0.2400	0.0092	0.0079	0.00018	0.016
Delivery for construction of batch plant	20	10	200	2.0	842	8	0.3	0.3	0.006	0.54	0.0010	0.42	0.0040	0.0002	0.0001	0.00000	0.000
Delivery of concrete from off-site source	20	41	820	8.2	3,452	33	1.3	1.1	0.025	2.20	0.0041	1.73	0.0164	0.0006	0.0005	0.00001	0.001
Total				3,663.2	1,542,207.2	14,652.8	560.5	483.5	11.0	981.7	1.83	771.10	7.33	0.28	0.24	0.0055	0.49
Average Annual emissions (based on 33 months)				1,332.1	560,802.6	5,328.3	203.8	175.8	4.0	357.0	0.67	280.40	2.66	0.10	0.088	0.0020	0.18

Miles: 366,320

CHUTE AND STILLING BASIN - Concrete Placement and Batch Plant/Foundation Preparation/Backfill (36 months) Late 2013 through 2016

				Emissions in pounds							Emissions in tons						
Vehicle	**Miles per trip**	**Number of trips**	**Total Miles**	**CO**	**CO_2**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG**	**CO**	**CO_2**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG**
Off-site deliveries of material	10	230	2,300	23.0	9,683	92	3.5	3.0	0.069	6.16	0.0115	4.84	0.046	0.0018	0.0015	0.000035	0.0031
Aggregate delivery for concrete	36	13,000	468,000	4,680.0	1,970,280	18,720	716	617.8	14.087	1,254.24	2.3400	985.14	9.36	0.3580	0.3089	0.0070	0.63
Delivery of reinforcing bars	10	169	1,690	16.9	7,115	68	2.6	2.2	0.051	4.53	0.0085	3.56	0.0338	0.0013	0.0011	0.000025	0.0023
Delivery of misc. electrical, HVAC	10	100	1,000	10.0	4,210	40	1.5	1.3	0.030	2.68	0.0050	2.11	0.0200	0.0008	0.0007	0.00002	0.001
Delivery of concrete from off-site source	20	40	800	8.0	3,368	32	1.2	1.1	0.024	2.14	0.0040	1.68	0.0160	0.0006	0.0005	0.00001	0.001
Total				4,737.9	1,994,655.9	18,951.6	724.9	625.4	14.3	1,269.8	2.37	997.33	9.48	0.36	0.31	0.0071	0.63
Average Annual emissions (based on 36 months)				1,579.3	664,885.3	6,317.2	241.6	208.5	4.8	423.3	0.79	332.44	3.16	0.12	0.10	0.0024	0.21

Miles: 473,790

TOTAL PROJECT OFF-SITE MILES (69 months) July 2011 through 2016

TOTAL OFF-SITE MILES:	840,110
Average annual off-site truck miles (based on 69 months, or 5.75 years)	146,106

	Total Emissions in tons						
	CO	**CO_2**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_x**	**ROG**
TOTAL OFF-SITE HAUL TRUCK EMISSIONS:	4.2	1,768.4	16.8	0.64	0.55	0.0126	1.13
Average annual off-site haul truck emissions (69 months, or 5.75 years):	0.73	307.55	2.92	0.11	0.10	0.0022	0.20

Emissions - Worker Commute Exhaust

Assumptions and Emission Factors from: Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009)
Emission Factor from (Corps 2009)

Vehicle Description	Emission Rate in Pounds Per 1000 Miles						
	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Light Duty Automobile (LDA)	8.87	832	0.756	0.0694	0.0393	0.00786	0.991
Light Duty Truck (LDT)	10.6	1020	1.22	0.0905	0.0566	0.0131	1.12
Average based on 50 percent LDA and 50 percent LDT	9.75	927	0.99	0.08	0.0479	0.00959	1.06

Control Structure

		(Jan 2011 through July 2014)	
Workers	70	Period of Operation (months)	42
Workers per vehicle	2	Workdays per week	5
Commuter vehicles per day	35	Workdays per month	20
Vehicles from Sacramtento (80%)	28	Workdays in period	840
Vehicles from Folsom (20%)	7		
Roundtrip to Sacramento (miles)	60	Operation (months)[1]	
Roundtrip to Folsom (miles)	10	Excavation	9
		Aggregate and concrete	24
Daily Miles:	1,750	Gate installation	9
Annual Miles:	420,000		42
COMMUTER MILES (42 months)	1,470,000	[1] Assume no overlap	
COMMUTER MILES (42 months)/1000	1470		

Emissions	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Total Pounds	14,332.50	1,362,690.00	1,455.30	117.60	70.41	14.10	1,558.20
Total Tons	7.17	681.35	0.73	0.059	0.035	0.0070	0.78
Average annual pounds	4,095.00	389,340.00	415.80	33.60	20.12	4.03	445.20
Average annual tons	2.05	194.67	0.21	0.017	0.010	0.0020	0.22

Chute and Stilling Basin

		(late 2013 through 2016)	
Workers	70	Period of Operation (months)	36
Workers per vehicle	2	Workdays per week	5
Commuter vehicles per day	35	Workdays per month	20
Vehicles from Sacramtento (80%)	28	Workdays in period	720
Vehicles from Folsom (20%)	7		
Roundtrip to Sacramento (miles)	60		
Roundtrip to Folsom (miles)	10		
Daily Miles:	1,750		
Annual Miles:	420,000		
COMMUTER MILES (36 months)	1,260,000		
COMMUTER MILES (36 months)/1000	1,260		

Emissions	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Total Pounds	12,285.00	1,168,020.00	1,247.40	100.80	60.35	12.08	1,335.60
Total Tons	6.14	584.01	0.62	0.050	0.030	0.0060	0.67
Average annual pounds	4,095.00	389,340.00	415.80	33.60	20.12	4.03	445.20
Average annual tons	2.05	194.67	0.21	0.017	0.010	0.0020	0.22

Borings for Approach Channel Cofferdam

		(Oct 2010 through Jan 2011)	
Workers	4	Period of Operation (months)	4
Workers per vehicle	1	Workdays per week	5
Commuter vehicles per day	4	Workdays per month	20
Vehicles from Sacramtento (100%)	4	Workdays in period	80
Vehicles from Folsom (0%)	0		
Roundtrip to Sacramento (miles)	60		
Roundtrip to Folsom (miles)	10		
Daily Miles:	240		
Annual Miles:	19,200		
COMMUTER MILES (4 months)	19,200		
COMMUTER MILES (4 months)/1000	19.2		

Emissions	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
Pounds	187.20	17,798.40	19.01	1.54	0.92	0.18	20.35
Tons	0.094	8.90	0.010	0.00077	0.00046	0.000092	0.010

Total Commuter Emissions	CO	CO_2	NO_x	PM_{10}	$PM_{2.5}$	SO_x	ROG
	26,804.70	2,548,508.40	2,721.71	219.94	131.69	26.36	2,914.15
	13.40	1,274.25	1.36	0.110	0.066	0.013	1.46

Total Commuter Vehicle Miles Traveled 2,749,200

Fugitive Dust - Cumulative Activities

PM_{10} and Fugitive Dust Pollutants

Borings for Approach Channel Cofferdam

(Oct 2010 through Jan 2011)
Period of Operation (months) 4

Based on AP-42 Table 11.9-4
TSP Emissions = 1.3 pounds per hole
Assume: 100% TSP = PM_{10}; 15 borings -

	Unmitigated PM_{10}	Unmitigated $PM_{2.5}$	Mitigated PM_{10}	Mitigated $PM_{2.5}$	
Tons per year	0.00975	0.00975	0.00975	0.00975	No mitigations
Total annual average tons	0.010	0.010	0.010	0.010	

Control Structure

(Jan 2011 through July 2014)
Period of Operation (months) 42
Excavation: 9 months - January through September, 2011
Aggregate and Concrete: 24 months - July 2011 through July 2013
Gate Installation: 9 months - December 2013 through July 2014

Activity (Tons per year)	Unmitigated PM_{10}	Unmitigated $PM_{2.5}$	Mitigated	Mitigated PM_{10}	Mitigated $PM_{2.5}$
Excavation Cut and Fill (Urbemis 2007)	18.36	3.8	Mitigated (55 % reduction) (Basic Construction Emission Control Practices)	8.3	1.7
Paved Road - Haul Truck	2.54	0.35	Mitigated (no mitigations)	2.54	0.35
Paved Road - Worker Commuter Travel	0.084	0.0060	Mitigated (no mitigations)	0.084	0.0060
Unpaved Road - Haul Truck	20.0	2.0	Mitigated (55 % reduction)	9.0	0.91
Material Storage Pile Handling - Excavation	0.025	0.0038	Mitigated (90% reduction)	0.0025	0.00038
Material Storage Pile Handling - Aggregate	0.0038	0.00057	Mitigated (90% reduction)	0.00038	0.000057
Stockpile Wind Erosion - Excavation	17.9	2.7	Mitigated (90% reduction)	1.79	0.27
Stockpile Wind Erosion - Aggregate	3.6	0.54	Mitigated (90% reduction)	0.36	0.054
Blasting (with Drilling)	20.4	0.00	Mitigated	11.0	0.00
Concrete Batch Plant	97.0	0.00	Mitigated	1.6	0.00
Total Avg Tons per year (Control Structure)	179.8	9.4		34.7	3.3

Chute and Stilling Basin

(late 2013 through 2016)
Period of Operation (months) 36

Activity (Tons per year)	Unmitigated PM_{10}	Unmitigated $PM_{2.5}$	Mitigated	Mitigated PM_{10}	Mitigated $PM_{2.5}$
Paved Road - Haul Truck	3.02	0.42	Mitigated (no mitigations)	3.02	0.42
Paved Road - Worker Commuter Travel	0.084	0.0060	Mitigated (no mitigations)	0.084	0.0060
Material Storage Pile Handling - Excavation[1]	0.025	0.0038	Mitigated (90% reduction)	0.0025	0.00038
Material Storage Pile Handling - Aggregate	0.0055	0.00083	Mitigated (90% reduction)	0.00055	0.000083
Stockpile Wind Erosion - Aggregate	5.2	0.79	Mitigated (90% reduction)	0.52	0.079
Concrete Batch Plant	84.9	0.00	Mitigated	1.4	0.00
Total Avg Tons per year (Chute and Stilling Basin)	93.23	1.22		5.03	0.51

[1] Although excavation is not planned during the chute and stilling basin construction phase, PM_{10} emissions are listed to give the most conservative estimate.

FUGITIVE DUST Emissions: Paved Roads

Methodology from AP-42 , Fifth Edition, Volume 1 Chapter 13.2.1: Paved Roads
Assumptions and Emission Factors from Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009)
VMT = Vehicle Miles Traveled

Assumptions for Worker Commuter Travel based on Corps 2009.

Worker commuter fleet is 50 percent light duty automobile (LDA) and 50 percent light duty truck (LDT).
Average Vehicle Weight (W) is 1.75 tons.

Roadway Surface Type	Travel Fraction	PM_{10} Particulate Emission Factor (lb/VMT)	PM_{10} Long-Term Particulate Emission Factor (lb/VMT)	$PM_{2.5}$ Particulate Emission Factor (lb/VMT)	$PM_{2.5}$ Long-Term Particulate Emission Factor (lb/VMT)
Freeway	0.235	<0	<0	<0	<0
Arterial/Major street	0.587	0.000044	0.0000413	<0	<0
Collector Road	0.072	0.000044	0.0000413	<0	<0
Local Road	0.052	0.0017	0.00159	<0	<0
Rural Road	0.054	0.0057	0.00534	0.000565	0.00053

Note: AP-42 , Fifth Edition, Volume 1 Chapter 13.2.1, page 13.2.1-5 states "There may be situations where low silt loading and/or low average weight will yield calculated negative emisions. If this occurs, the emissions calculated from the equation should be set to zero.

Assumptions for Heavy Heavy Diesel Truck Travel based on Corps 2009.

Average Vehicle Weight (W) is 23.25 tons.

Roadway Surface Type	Travel Fraction	PM_{10} Particulate Emission Factor (lb/VMT)	PM_{10} Long-Term Particulate Emission Factor (lb/VMT)	$PM_{2.5}$ Particulate Emission Factor (lb/VMT)	$PM_{2.5}$ Long-Term Particulate Emission Factor (lb/VMT)
Freeway	0.235	0.02	0.02	0.00224	0.0021
Arterial/Major street	0.587	0.02	0.02	0.00337	0.00317
Collector Road	0.072	0.02	0.02	0.00337	0.00317
Local Road	0.052	0.1	0.1	0.02	0.01
Rural Road	0.054	0.3	0.28	0.04	0.04

Note: Long-term particulate emission factor considers natural mitigation with precipitation.

Fugitive Dust Annual Emission Calculations for Worker Commuter Travel.

Maximum annual commuter miles traveled: 420,000
*Both **Control Structure** and **Chute and Stilling Basin**
*January 2011 through 2016
Total commuter miles traveled for entire project: 2,749,200

Roadway surface	Annual VMT (miles)	Annual PM_{10} Emissions (ton/year)	Annual PM_{10} Annual Long-Term Emissions (ton/year)	Annual $PM_{2.5}$ Emissions (ton/year)	Annual $PM_{2.5}$ Annual Long-Term Emissions (ton/year)
Freeway	98,700	0	0	0	0
Arterial/Major street	246,540	0.0054	0.0051	0	0
Collector Road	30,240	0.00067	0.00062	0	0
Local Road	21,840	0.019	0.017	0	0
Rural Road	22,680	0.065	0.061	0.0064	0.0060
Totals:		0.089	0.084	0.006	0.0060

CONTROL STRUCTURE - Fugitive Dust Annual Emission Calculations for Off-Site Truck Travel

Total off-site truck miles: 366,320 Months: 33
Average annual off-site truck miles: 133,207

Roadway surface	Annual VMT (miles)	Annual PM_{10} Emissions (ton/year)	Annual PM_{10} Annual Long-Term Emissions (ton/year)	Annual $PM_{2.5}$ Emissions (ton/year)	Annual $PM_{2.5}$ Annual Long-Term Emissions (ton/year)
Freeway	31,304	0.31	0.31	0.035	0.033
Arterial/Major street	78,193	0.78	0.78	0.13	0.12
Collector Road	9,591	0.10	0.10	0.016	0.015
Local Road	6,927	0.35	0.35	0.07	0.035
Rural Road	7,193	1.08	1.01	0.14	0.144
		2.62	2.54	0.40	0.35

Notes: Total off-site truck miles calculated on "On-Site and Off-Site Haul Trucks Exhaust" page
Assumes 24 months for concrete placement and 9 months for gate installation.

CHUTE and STILLING BASIN - Fugitive Dust Annual Emission Calculations for Off-Site Truck Travel

Total off-site truck miles: 473,790 Months: 36
Average annual off-site truck miles: 157,930

Roadway surface	Annual VMT (miles)	Annual PM_{10} Emissions (ton/year)	Annual PM_{10} Annual Long-Term Emissions (ton/year)	Annual $PM_{2.5}$ Emissions (ton/year)	Annual $PM_{2.5}$ Annual Long-Term Emissions (ton/year)
Freeway	37,114	0.37	0.37	0.042	0.039
Arterial/Major street	92,705	0.93	0.93	0.16	0.15
Collector Road	11,371	0.11	0.11	0.019	0.018
Local Road	8,212	0.41	0.41	0.08	0.041
Rural Road	8,528	1.28	1.19	0.17	0.17
		3.10	3.02	0.47	0.42

Notes: Total off-site truck miles calculated on "On-Site and Off-Site Haul Trucks Exhaust" page

FUGITIVE DUST Emissions: Unpaved Roads

Methodology from AP-42 , Fifth Edition, Volume 1 Chapter 13.2.2: Unpaved Roads
Assumptions and Emission Factors from: Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009)
VMT = Vehicle Miles Traveled

Assumptions for Heavy Heavy Diesel Truck Travel based on Corps 2009.

Average Vehicle Weight (W) is 23.25 tons.

	PM_{10} Particulate Emission Factor (lb/VMT)	PM_{10} Long-Term Particulate Emission Factor [Naturally Mitigated] (lb/VMT)	$PM_{2.5}$ Particulate Emission Factor (lb/VMT)	$PM_{2.5}$ Long-Term Particulate Emission Factor [Naturally Mitigated] (lb/VMT)
Unpaved Road	2.76	2.08	0.28	0.21

Note: Long-term particulate emission factor considers natural mitigation with precipitation.

Fugitive Dust Annual Emission Calculations for On-Site Truck Travel during excavation.

Nine months on-site truck miles: 19,200
(excavation hauling to MIAD)

Roadway surface	Annual VMT (miles)	Unmitigated Annual PM_{10} Emissions (ton/year)	Annual PM_{10} Annual Long-Term Emissions [Naturally Mitigated] (ton/year)	Unmitigated Annual $PM_{2.5}$ Emissions (ton/year)	Annual $PM_{2.5}$ Annual Long-Term Emissions [Naturally Mitigated] (ton/year)
Unpaved Road	19,200	26.50	19.97	2.69	2.02
55 percent control factor for road dust for watering twice a day.			8.9856	Mitigated emission:	0.9072

MIAD Mormon Island Auxiliary Dam (disposal and course material stockpiling for U.S. Army Corps of Engineers).

FUGITIVE DUST Emissions: Excavated Material Storage Piles

Methodology from AP-42 , Fifth Edition, Volume 1 Chapter 13.2.4: Aggregate Handling and Storage Piles
Assumptions and Emission Factors from: Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009)

Assumptions for Excavation Stockpile Handling Emissions based on Corps 2009.

Mean wind speed (mph)	5.1
Material moisture content (%)	7.9
Density of weathered granite (lb/cy)	1,850
Wet suppression controls (%)	90

Emission factor for PM_{10} stockpile emissions (lb/ton):	0.000168
Emission factor for $PM_{2.5}$ stockpile emissions (lb/ton):	0.0000254

mph = miles per hour
% = percent
lb/cy = pounds per cubic yard
lb/ton = pounds per ton

Fugitive Dust Emission Calculations for Excavation Stockpile Handling

Period of Excavation (months):	9
Common Excavation (cy)[1]:	20,000
Rock Excavation (cy)[1]:	300,000
Total Excavation (cy)[1]:	320,000

Stockpile amount (tons):	296,000

Parameter	Stockpile Amount (tons)	Emission Factor (lb/ton)	Emission Controls (percent)	Unmitigated emissions (tons/year)	Mitigated emissions (tons/year)
PM_{10}	296,000	0.000168	90	0.025	0.0025
$PM_{2.5}$	296,000	0.0000254	90	0.0038	0.00038

[1] Based on Folsom Dam JFP Teleconference Notes, Air Analysis Revisions, June 8, 2010

Assumptions: The excavated material will be added to the storage pile during construction of the Control Structure.
The excavated material will still be in place during the Chute and Stilling Basin construction phase.

FUGITIVE DUST Emissions: Aggregate Material Storage Piles (for concrete batch plants)

Methodology from AP-42 , Fifth Edition, Volume 1 Chapter 13.2.4: Aggregate Handling and Storage Piles
Assumptions and Emission Factors from: Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009)

Assumptions for Excavation Stockpile Handling Emissions based on Corps 2009.

Mean wind speed (mph)	5.1
Material moisture content (%)	7.9
Density of weathered granite (lb/cy)	1,850
Wet suppression controls (%)	90
Emission factor for PM_{10} stockpile emissions (lb/ton):	0.000168
Emission factor for $PM_{2.5}$ stockpile emissions (lb/ton):	0.0000254

Fugitive Dust Emission Calculations for Aggregate Stockpile Handling

Control Structure Concrete Emplacement (months):	24
Chute and Stilling Basin Concrete Emplacement (months):	36
Total Control Structure Aggregate (cy)[1]:	97,000
Total Chute and Stilling Basin Aggregate (cy)[2]:	211,068
Entire Project Length - Total Aggregate (cy):	308,068
Entire Project Length - Total Aggregate (tons):	284,963

Annual Control Structure Aggregate (cy):	48,500
Annual Chute and Stilling Basin Aggregate (cy):	70,356
Annual Control Structure Aggregate (tons):	44,863
Annual Chute and Stilling Basin Aggregate (tons):	65,079

	Control Structure					Chute and Stilling Basin				
Parameter	Annual Stockpile Amount (tons)	Emission Factor (lb/ton)	Emission Controls (percent)	Unmitigated emissions (tons/year)	Mitigated emissions (tons/year)	Annual Stockpile Amount (tons)	Emission Factor (lb/ton)	Emission Controls (percent)	Unmitigated emissions (tons/year)	Mitigated emissions (tons/year)
PM_{10}	44,863	0.000168	90	0.0038	0.00038	65,079	0.000168	90	0.0055	0.00055
$PM_{2.5}$	44,863	0.0000254	90	0.00057	0.000057	65,079	0.0000254	90	0.00083	0.000083

mph = miles per hour
% = percent
lb/cy = pounds per cubic yard
lb/ton = pounds per ton

[1] Based on March 5, 2010, equipment list spreadsheet (equipmentjfrMarch 5.xls)
[2] Based on June 15, 2010, email attachment from Jane Rinck to Garrett Smith and Leroy Shaser (commentary.docx).

FUGITIVE DUST Emissions: Excavated Stockpile Wind Erosion

Methodology from AP-42 , Fifth Edition, Volume 1 Chapter 13.2.5: Industrial Wind Erosion
Assumptions and Emission Factors from: Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009)

Emission Factor (EF) in g/m^2 = $k \sum_{i=1}^{N} P_i$

Where:

k = Particle Size Multiplier (dimensionless)
N = Number of Disturbances per Year
P_i = Erosion Potential Corresponding to the Observed Fasted Mile of Wind for the ith Period Between Disturbances

Assumptions for Stockpile Wind Erosion Emissions based on Corps 2009.

k for PM_{10}	0.5
k for $PM_{2.5}$	0.075
P_i: Erosion Potential (g/m^2)	7.37
Wet suppression controls (%)	90

Fugitive Dust Emission Calculations for Stockpile Wind Erosion

Period of Excavation (months):	9
Workdays per Month:	20
Total workdays:	180
N = Number of Disturbances (assume one per workday)	180
Total Material Excavated and Stored: (cy)[1]:	320,000
Total Material Excavated and Stored: (cubic m)[2]:	244,659

PM_{10} EF (g/m^2) =	663.3
$PM_{2.5}$ EF (g/m^2) =	99.495
Stockpile Area (sq m)[3]:	24,465.9

Parameter	Emission Factor (g/m^2)	Stockpile Area (m^2)	Emission Controls (percent)	Unmitigated emissions (g/year)	Mitigated emissions (g/year)	Unmitigated emissions[4] (tons/year)	Mitigated emissions[4] (tons/year)
PM_{10}	663.3	24,465.9	90	16,228,245	1,622,824	17.9	1.79
$PM_{2.5}$	99.50	24,465.9	90	2,434,237	243,424	2.68	0.27

cy = cubic yards
g = gram
m = meter
% = percent

[1] Based on Project Description
[2] Conversion Factor: Cubic Yard * 0.76456 = Cubic Meter
[3] Assume Stockpile is 10 Meters Deep
[4] Conversion Factor: Grams*0.0000011023 = Ton

FUGITIVE DUST Emissions: Aggregate Stockpile Wind Erosion (for concrete batch plants)

Methodology from AP-42 , Fifth Edition, Volume 1 Chapter 13.2.5: Industrial Wind Erosion
Assumptions and Emission Factors from: Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009)

$$\text{Emission Factor (EF) in g/m}^2 = k \sum_{i=1}^{N} P_i$$

Where:

k = Particle Size Multiplier (dimensionless)
N = Number of Disturbances per Year
P_i = Erosion Potential Corresponding to the Observed Fasted Mile of Wind for the ith Period Between Disturbances

Assumptions for Stockpile Wind Erosion Emissions based on Corps 2009.

k for PM_{10}	0.5
k for $PM_{2.5}$	0.075
P_i: Erosion Potential (g/m^2)	7.37
Wet suppression controls (%)	90

Fugitive Dust Emission Calculations for Stockpile Wind Erosion

Control Stucture Concrete Placement (months):	24
Chute and Stilling Basin Concrete Placement (months):	36
Total Control Structure Aggregate (cy)[a]	97,000
Annual - Control Structure Aggregate (cy)	48,500
Annual - Control Structure Aggregate (cubic m)[1]	37,081
Total Chute and Stilling Basin Aggregate (cy)[b]	211,068
Annual - Chute and Stilling Basin Aggregate (cy)	70,356
Annual - Chute and Stilling Basin Aggregate (cubic m)[1]	53,791

Annual Workdays:	240
Annual Workdays:	240
N = Assume one disturbance per workday	
PM_{10} EF (g/m^2) =	884.4
$PM_{2.5}$ EF (g/m^2) =	132.7

Annual Control Structure Stockpile Area[2]: 3,708 square meter
Annual Chute and Stilling Basin Stockpile Area[2]: 5,379 square meter

Control Structure							
Parameter	Emission Factor (g/m^2)	Annual Stockpile Area (m^2)	Emission Controls (percent)	Unmitigated emissions (g/year)	Mitigated emissions (g/year)	Unmitigated emissions[4] (tons/year)	Mitigated emissions[4] (tons/year)
PM_{10}	884.4	3,708.1	90	3,279,458	327,946	3.6	0.36
$PM_{2.5}$	132.66	3,708.1	90	491,919	49,192	0.54	0.054

Chute and Spilling Basin							
Parameter	Emission Factor (g/m^2)	Annual Stockpile Area (m^2)	Emission Controls (percent)	Unmitigated emissions (g/year)	Mitigated emissions (g/year)	Unmitigated emissions[4] (tons/year)	Mitigated emissions[4] (tons/year)
PM_{10}	884.4	5,379.1	90	4,757,310	475,731	5.2	0.52
$PM_{2.5}$	132.66	5,379.1	90	713,596	71,360	0.79	0.079

cy = cubic yards
g = gram
m = meter
% = percent

[1] Conversion Factor: Cubic Yard * 0.76456 = Cubic Meter
[2] Assume Stockpile is 10 Meters Deep
[3] Conversion Factor: Grams*0.0000011023 = Ton

[a] Based on March 5, 2010, equipment list spreadsheet (equipmentjfrMarch 5.xls)
[b] Based on June 15, 2010, email attachment from Jane Rinck to Garrett Smith and Leroy Shaser (commentary.docx)

FUGITIVE DUST Emissions: Concrete Batch Plant

Methodology and Assumptions from AP-42 , Fifth Edition, Volume 1 Chapter 11.12: Concrete Batching

Emission Factors from AP-42 11.12 Concrete Batching

PM_{10} emissions in pounds per ton of concrete:

Batch Plant Source	Uncontrolled	Controlled
Aggregate transfer	0.0033	ND
Sand transfer	0.00099	ND
Cement unloading to elevated storage silo (pneumatic)	0.46	0.00034
Cement supplement unloading to elevated storage silo (pneumatic)	1.10	0.0049
Weigh hopper loading	0.0024	ND
Mixer loading (central mix)	0.134	0.0048
Truck loading (truck mix)	0.278	0.016
Total	1.98	0.033

Note: Controlled Total is calculated by adding data from "Controlled" column with data from "Uncontrolled" column when "Controlled" is ND.

One cubic yard of concrete (lbs) 4,024

ND = No Data
cy = cubic yards

Fugitive Dust Emission Calculations for Control Structure

Period of Batch Plant Operation (months):	24
Aggregate (cy)	97,000
Concrete Placement (cy)[1]:	97,234
Concrete Placement (tons):	195,635

Parameter	Annual Concrete Placement (tons)	Unmitigated emissions (pounds/year)	Controlled emissions (pounds/year)	Unmitigated emissions (tons/year)	Controlled emissions (tons/year)
PM_{10}	97,817	193,550	3,202	97	1.6

[1] Based on Project Description

Fugitive Dust Emission Calculations for Chute and Stilling Basin

Period of Batch Plant Operation (months):	36
Aggregate (cy)	211,068
Concrete Placement -Chute (cy):	99,625
Concrete Placement -Stilling Basin (cy):	28,295
Concrete Placement -Total (cy):	127,920
Concrete Placement (tons):	257,375

Parameter	Annual Concrete Placement (tons)	Unmitigated emissions (pounds/year)	Controlled emissions (pounds/year)	Unmitigated emissions (tons/year)	Controlled emissions (tons/year)
PM_{10}	85,792	169,755	2,808	84.9	1.4

Urbemis 2007 Version 9.2.4

Detail Report for Annual Construction Unmitigated Emissions (Tons/Year)

File Name: F:\I-drive\G018 Sacramento\Workfiles\Urbemis\Folsom_Control_Structure1_06-11-10.urb924

Project Name: Folsom Dam Control Structure Excavation

Project Location: Sacramento County AQMD

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

Off-Road Vehicle Emissions Based on: OFFROAD2007

CONSTRUCTION EMISSION ESTIMATES (Annual Tons Per Year, Unmitigated)

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10 Total	PM2.5 Dust	PM2.5 Exhaust	PM2.5 Total	CO2
2011	0.00	0.00	0.00	0.00	18.36	0.00	18.36	3.83	0.00	3.83	0.00
Mass Grading 01/17/2011-	0.00	0.00	0.00	0.00	18.36	0.00	18.36	3.83	0.00	3.83	0.00
Mass Grading Dust	0.00	0.00	0.00	0.00	18.36	0.00	18.36	3.83	0.00	3.83	0.00
Mass Grading Off Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mass Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mass Grading Worker Trips	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Phase Assumptions

Phase: Mass Grading 1/17/2011 - 9/16/2011 - Folsom Dam Control Structure Excavation

Total Acres Disturbed: 0

Maximum Daily Acreage Disturbed: 0

Fugitive Dust Level of Detail: Low

Onsite Cut/Fill: 1777.78 cubic yards/day; Offsite Cut/Fill: 0 cubic yards/day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

FUGITIVE DUST Emissions: Blasting and Associated Drilling

Blasting Methodology from Blue Rock Quarry Draft Environmental Impact Report (Sonoma County 2005)

Equation:

$EF = 0.2 * 961 (A)^{0.8} / [(D)^{1.8} (M)^{1.9}]$

Where:

EF = Emission Factor
A= Blast Area
D= Depth of Blast
M= Moisture Content

Two blast sizes would be used during excavation: 50% of excavation with a blast volume of 2,778 cubic yards and 50% of excavation with a blast volume of 1,389 cubic yards. Assume 300,000 total cubic yards of excavation.

Information: Blasting dimensions provided by Kim Jorgensen in email to Garrett Smith (March 18, 2010)

Blast size #1 (2,778 cubic yards)

Cubic yards: 150,012

Fugitive Dust from Blast

Depth of Blast (ft)	20	Depth of approximately 20 feet
Moisture content of material (%)	2	Moisture content from (Corps 2009) Appendix A: Blasting Emissions
Blast Area (sq ft)	3,750	Assumes 75 feet wide (wall) by 50 feet burden
Number of blasts:	54	
Number of holes per blast:	150	Total number of holes: 8,100
Emission Factor=	169.50	pounds per blast
Total Emissions (lbs)	9,152.95	PM_{10}
Total Emissions (tons)	4.58	PM_{10}

Fugitive Dust from Drilling

Emission factor (lbs/hole)	1.3	TSP: Methodology from AP-42, Table 11.9-4
Total Emissions (lbs)	10,530.0	TSP
Total Emissions (tons)	5.27	TSP (Most Conservative Assumption: Assume 100% TSP is PM_{10})

Blast size #2 (1,389cubic yards)

Cubic yards: 150,012

Fugitive Dust from Blast

Depth of Blast (ft)	20	Depth of approximately 20 feet
Moisture content of material (%)	2	Moisture content from (Corps 2009) Appendix A: Blasting Emissions
Blast Area (sq ft)	1,875	Assumes 75 feet wide (wall) by 25 feet burden
Number of blasts:	108	
Number of holes per blast:	75	Total number of holes: 8,100
Emission Factor=	97.35	pounds per blast
Total Emissions (lbs)	10,513.98	PM_{10}
Total Emissions (tons)	5.26	PM_{10}

Fugitive Dust from Drilling

Emission factor (lbs/hole)	1.3	TSP: Methodology from AP-42, Table 11.9-4
Total Emissions (lbs)	10,530.0	TSP
Total Emissions (tons)	5.27	TSP (Most Conservative Assumption: Assume 100% TSP is PM_{10})

Unmitigated Total PM_{10} from Blasting (tons)	9.83	
Mitigated Total PM_{10} from Blasting(tons)	6.3	Assume 36% control efficiency (Folsom Dam Safety and Flood Damage Reduction Early Approach Channel Excavation Final EA/IS (Corps 2009))
Unmitigated Total PM_{10} from Drilling (tons)	10.53	
Mitigated Total PM_{10} from Drilling (tons)	4.7	Assume 55% reduction from soil disturbance activities (SMAQMD, 2009))
Unmitigated Total PM_{10} from Blasting and Drilling (tons)	20.36	
Mitigated Total PM_{10} from Blasting and Drilling (tons)	11.03	

GHG Emissions - Cumulative Summary from all Activities

Unmitigated Carbon Dioxide Emissions

Borings for Approach Channel Cofferdam

(Oct 2010 through Jan 2011)
Period of Operation (months) 4

Worker Commute Emissions

CO_2	
Average annual tons	Average annual metric tons
8.9	8.1

Construction Equipment Exhaust

CO_2	
Average annual tons	Average annual metric tons
56	51

Summation	65	59

Control Structure

(Jan 2011 through July 2014)
Period of Operation (months) 42

Worker Commute Emissions (Both Excavation and Concrete Emplacement)

CO_2	
Average annual tons	Average annual metric tons
195	177

Construction Equipment Exhaust

	CO_2	
	Average annual tons	Average annual metric tons
Excavation	3,382	3,068
Concrete Placement and Batch Plant	1,064	965
Gate Installation	90	81

On-Site Haul Truck

	CO_2	
	Average annual tons	Average annual metric tons
Excavation	53	48

Off-Site Haul Truck

CO_2	
Average annual tons	Average annual metric tons
280	254

Concrete Batch Plant

CO_2	
Average annual tons	Average annual metric tons
13,111	11,895

Summation: Maximum average annual emissions	17,021	15,441

Value calculated using Control Structure Excavation CO_2 emissions for construction equipment exhaust.

Chute and Stilling Basin

(late 2013 through 2016)
Period of Operation (months) 36

Worker Commute Emissions

CO_2	
Average annual tons	Average annual metric tons
195	177

Construction Equipment Exhaust

CO_2	
Average annual tons	Average annual metric tons
2,591	2,351

Off-Site Haul Truck

CO_2	
Average annual tons	Average annual metric tons
332	301

Concrete Batch Plant

CO_2	
Average annual tons	Average annual metric tons
11,499	10,432

Summation	14,617	13,260

Carbon dioxide emission values derived from other calculation spreadsheets and copied to this summary sheet.

GHG Emissions: Concrete Batch Plant

Emission Factor from Flowers and Sanjayan, 2007 (Abstract): "Green House Gas Emissions Due to Concrete Manufacture,
The International Journal of Life Cycle Assessment. Vol 12, Number 5, July 2007. Landsberg, Germany: Ecomed.

CO_2 emissions in kilograms per cubic meter of concrete:	320
CO_2 emissions in kilograms per cubic yard of concrete:	244.7
CO_2 emissions in kilograms per ton of concrete:	121.6

To convert cubic meter to cubic yard (multiply by): 1.3079
To convert cubic yard to cubic meter (multiply by): 0.76456

One cubic yard of concrete (lbs) 4,024

cy = cubic yards

Carbon Dioxide Emission Calculations for Control Structure

Period of Batch Plant Operation (months):	24
Aggregate (cy)	97,000
Concrete Placement (cy)[1]:	97,234
Concrete Placement (tons):	195,635

Parameter	Annual Concrete Placement (tons)	Emission Factor (kg/ton)	CO_2 emissions (kg/year)	CO_2 emissions (metric tons/year)	CO_2 emissions (tons/year)
CO_2	97,817	121.6	11,894,596	11,895	13,111

[1] Based on Project Description

Carbon Dioxide Emission Calculations for Chute and Stilling Basin

Period of Batch Plant Operation (months):	36
Aggregate (cy)	211,068
Concrete Placement -Chute (cy):	99,625
Concrete Placement -Stilling Basin (cy):	28,295
Concrete Placement -Total (cy)[2]:	127,920
Concrete Placement (tons):	257,375

Parameter	Annual Concrete Placement (tons)	Emission Factor (kg/ton)	CO_2 emissions (kg/year)	CO_2 emissions (metric tons/year)	CO_2 emissions (tons/year)
CO_2	85,792	121.6	10,432,268	10,432	11,499

[2] Based on June 15, 2010, email attachment from Jane Rinck to Garrett Smith and Leroy Shaser (commentary.docx).

GHG Emissions - Construction Equipment Exhaust

Equipment

Type	Number	Hours per day	Days per week	Months		Hours per week	Hours per Project	Calculated 8-hour days per Project	CO_2 Emission Factor (g/hr)	Unmitigated Emissions (grams) CO_2	Total Unmitigated CO_2 Emissions Kilograms	Metric Tons	Tons	**Unmitigated Estimated Annual Emissions*** Kilograms	Metric Tons	Tons
CONTROL STRUCTURE - Concrete Placement and Batch Plant				**24 Months**		July 2011 through July 2013								*Assume emissions spread out over 24 months		
Semi-trailer truck	20	4	5	12		400	19,200	2,400		Off-site Haul Truck calculations						
Belly dump truck	8	4	3	16		96	6,144	768		Off-site Haul Truck calculations						
Tanker trucks	2	4	3	16		24	1,536	192		Off-site Haul Truck calculations						
Chiller	1	10	5	12		50	2,400	300	115,321	276,769,560	276,770	276.77	305.08	138,385	138	153
Stationary Cranes - electric	2	8	5	12		80	3,840	480	0	0	0	0	0	0	0	0
Forklifts	2	4	5	12		40	1,920	240	116,379	223,447,085	223,447	223.45	246.31	111,724	112	123
Man lift/scissor lift - electric	2	8	5	12		80	3,840	480	0	0	0	0	0	0	0	0
Water truck	1	4	5	12		20	960	120	283,370	272,035,238	272,035	272.04	299.86	136,018	136	150
Street sweeper	1	8	1	12		8	384	48	115,321	44,283,130	44,283	44.28	48.81	22,142	22	24
Jackhammers	2	8	1	12		16	768	96	115,321	88,566,259	88,566	88.57	97.63	44,283	44	49
Cement mixers (transit)	0	4	5	12		0	0	0	115,321	0	0	0.00	0.00	0	0	0
Front end loaders	2	8	5	8		80	2,560	320	23,463	60,066,381	60,066	60.07	66.21	30,033	30	33
Flatbed delivery truck	1		5							Off-site Haul Truck calculations						
Control Structure Concrete Placement Emissions											965,168	965	1,064	482,584	483	532
CONTROL STRUCTURE - Excavation (9 months)			Jan - Sept 2011													
"Super" dump trucks	5	8	5	6		200	4,800	600		On-site Haul Truck calculations						
Water trucks	1	4	5	6		20	480	60	283,370	136,017,619	136,018	136.02	149.93	136,018	136	150
Fuel truck	1	2	5	8		10	320	40	115,321	36,902,608	36,903	36.90	40.68	36,903	37	41
Maintenance truck	4	4	5	8		80	2,560	320	115,321	295,220,864	295,221	295.22	325.42	295,221	295	325
Pickup trucks	10	4	5	8		200	6,400	800	115,321	738,052,160	738,052	738.05	813.55	738,052	738	814
Drills for grouting - electric	6	8	5	9		240	8,640	1,080	0	0	0	0.00	0.00	0	0	0
Rock drills for setting charges	NE	NE	NE	NE	NE	NE	7,353	919	63,991	470,527,220	470,527	470.53	518.66	470,527	471	519
Front end loaders	2	8	5	8		80	2,560	320	23,463	60,066,381	60,066	60.07	66.21	60,066	60	66
Dozers with rippers	2	8	5	8		80	2,560	320	210,778	539,592,653	539,593	539.59	594.79	539,593	540	595
Backhoes	4	8	5	8		160	5,120	640	23,463	120,132,762	120,133	120.13	132.42	120,133	120	132
Graders	2	8	5	8		80	2,560	320	104,092	266,476,442	266,476	266.48	293.74	266,476	266	294
Scrapers	3	8	5	3		120	1,440	180	145,798	209,948,472	209,948	209.95	231.43	209,948	210	231
Excavators	2	8	5	5		80	1,600	200	106,021	169,632,960	169,633	169.63	186.99	169,633	170	187
Compactor sheep foot	2	8	5	3		80	960	120	26,757	25,686,566	25,687	25.69	28.31	25,687	26	28
		NE = Not Estimated														
Control Structure Excavation Emissions											3,068,257	3,068	3,382	3,068,257	3,068	3,382
CONTROL STRUCTURE - Gate Installation (9 months)			December 2013 through July 2014													
Track driven cranes	2	8	5	5		80	1,600	200	50,874	81,399,088	81,399	81.40	89.73	81,399	81	90
Flat bed trucks										Off-site Haul Truck calculations						
Control Structure Gate Installation Emissions											81,399	81	90	81,399	81	90
CHUTE AND STILLING BASIN - Concrete Placement and Batch Plant (36 months)				Late 2013 through 2016												
Semi-trailer truck	20	4	5	36		400	57,600	7,200		Off-site Haul Truck calculations						
Belly dump truck	8	4	3	36		96	13,824	1,728		Off-site Haul Truck calculations						
Tanker trucks	2	4	3	36		24	3,456	432	115,321	398,548,166	398,548	398.55	439.32	132,849	133	146
Chiller	1	10	5	36		50	7,200	900	115,321	830,308,680	830,309	830.31	915.25	276,770	277	305
Stationary Cranes - electric	2	8	5	36		80	11,520	1,440	0	0	0	0.00	0.00	0	0	0
Forklifts	2	4	5	36		40	5,760	720	116,379	670,341,254	670,341	670.34	738.92	223,447	223	246
Man lift/scissor lift - electric	2	8	5	36		80	11,520	1,440	0	0	0	0.00	0.00	0	0	0
Water truck	1	4	5	36		20	2,880	360	283,370	816,105,715	816,106	816.11	899.59	272,035	272	300
Street sweeper	1	8	1	36		8	1,152	144	115,321	132,849,389	132,849	132.85	146.44	44,283	44	49
Jackhammers	2	8	1	36		16	2,304	288	115,321	265,698,778	265,699	265.70	292.88	88,566	89	98
Cement mixers (transit)	0	4	5	36		0	0	0	115,321	0	0	0.00	0.00	0	0	0
Front end loaders	2	8	5	36		80	11,520	1,440	23,463	270,298,714	270,299	270.30	297.95	90,100	90	99
Flatbed delivery truck	1		5							Off-site Haul Truck calculations						
CHUTE AND STILLING BASIN - Foundation Preparation/Backfill (36 months)				Late 2013 through 2016												
Fuel truck	1	2	5	36		10	1,440	180	115,321	166,061,736	166,062	166.06	183.05	55,354	55	61
Water truck	1	4	5	36		20	2,880	360	283,370	816,105,715	816,106	816.11	899.59	272,035	272	300
Front end loader	1	4	5	36		20	2,880	360	23,463	67,574,678	67,575	67.57	74.49	22,525	23	25
Pickup trucks	5	4	5	36		100	14,400	1,800	115,321	1,660,617,360	1,660,617	1,660.62	1,830.50	553,539	554	610
Track driven cranes	2	4	5	24		40	3,840	480	50,874	195,357,811	195,358	195.36	215.34	97,679	98	108
Drills for grouting - electric	6	8	5	24		240	23,040	2,880	0	0	0	0.00	0.00	0	0	0
Portable cement mixers	2	4	5	12		40	1,920	240	115,321	221,415,648	221,416	221.42	244.07	221,416	221	244
Chute and Stilling Basin Emissions											6,511,284	6,511	7,177	2,350,598	2,351	2,591
BORINGS FOR APPROACH CHANNEL COFFERDAM (4 months)				Late 2010 - Early 2011												
Diesel & Hydraulic drill rig	1	10	5	4		50	800	100	63,991	51,192,952	51,193	51.19	56.43	51,193	51	56
Flat bed trucks	2	4	5	4						Off-site Haul Truck calculations						
Borings for Approach Channel Emissions											51,193	51	56	51,193	51	56
										TOTAL EMISSIONS	10,677,300.0	10,677.3	11,769.6			

<u>Construction Equipment GHG Emission Rate (grams per hour) from Corps 2009</u>

Equipment Type (2009)	Max HP	CO_2	
Bore/Drill Rigs	175	63,991.19	Project will use 140 hp drills
Paving Equipment	250	55,470.42	
Rollers	120	26,756.84	
Cranes	250	50,874.43	
Crawler Tractors	750	210,778.38	
Crushing/Proc Equipment	750	267,090.67	
Rough Terrain Forklifts	500	116,378.69	
Rubber Tired Dozers	750	180,887.50	
Rubber Tired Loaders	750	220,232.06	
Excavators	500	106,020.60	
Graders	500	104,092.36	
Off-Highway Tractors/Compactors	750	257,699.59	
Scrapers	500	145,797.55	
Skid Steer Loaders	120	19,396.44	
Off-Highway Trucks/Water Trucks	1,000	283,370.04	
Other Construction Equipment	500	115,320.65	
Pavers	500	105,798.73	
Surfacing Equipment	750	157,418.36	
Tractors/Loaders/Backhoes	120	23,463.43	
Trenchers	500	141,207.16	

Emission factors for CO_2 from (Corps 2009)

TECHNICAL NOISE REPORT

JOINT FEDERAL PROJECT
CONSTRUCTION OF THE CONTROL STRUCTURE AND LINING OF THE SPILLWAY CHUTE AND STILLING BASING SUPPLEMENTAL EA/IS

Folsom Dam, Folsom, California

Prepared for:

US Army Corps of Engineers
Sacramento District, South Pacific Region

Prepared by:

AGEISS INC.

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GRANT VISUAL TECHNOLOGY GVT

MAY 2010 **CONTRACT: W91238-09-D-0032-0001**

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ACRONYMS AND ABBREVIATIONS

˚F	degrees Fahrenheit
ADT	average daily trips
ANFO	ammonium nitrate fuel oil
ANSI	American National Standards Institute

BACT	best available control technologies
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CNEL	Community Noise Equivalent Level
dB	decibel
dBA	decibels, A-weighted scale
DNL	day-night noise level (also L_{dn})
DoD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DPR	California Department of Parks and Recreation
DS/FDR	Folsom Dam Safety/Flood Damage Reduction
EA	Early Approach
EA/IS	environmental assessment/impact statement
EIS/EIR	environmental impact statement/environmental impact report
FHWA	Federal Highway Administration
HT	heavy trucks
Hz	Hertz
ISO	International Standard of Organization
JTF	Joint Task Force
kHz	kiloHertz
$L_{10\text{-}90}$	percentile sound levels ($L_{1.7}$, $L_{8.3}$, L_{10}, L_{50}, and L_{90})
L_{dn}	day-night equivalent noise level (also DNL)
L_{eq}	time-averaged integrated equivalent noise level
L_{max}	maximum sound level
L_{min}	minimum sound level
L_p	sound pressure level (also SPL)
L_w	sound power level
LOR	local ordinances and regulations
LT	light trucks or long-term
LUT	lookup table
msl	mean sea level
MIAD	Mormon Island Auxiliary Dam
MT	medium trucks
NEPA	National Environmental Policy Act
OPR	Governor's Office of Planning and Research
P_{K15}	Peak Noise Level
RCNM	Road Construction Noise Model
SEL	single event level
SP7	SoundPLAN™ Version 7
SPL	sound pressure level (also L_p)
STG	submerged tainter gates
TNM	Traffic Noise Model
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

This Technical Noise Impact Report (Report) was prepared in support of the Supplemental EA/IS – Folsom Dam Safety/Flood Damage Reduction (DS/FDR) Project (Project). The Report was prepared in general accordance the United States Army Corps of Engineers (USACE) Sacramento District's Performance Statement of Work issued on 14 January 2010, Task Order TO No. 1, Contract No. W91238-09-D-0032-0001, contract and scope modifications made during the kickoff telephone conference on 2 February, 2010, site visit on 17 February, 2010, and our Scope of Work and Proposal dated 29 December 2009.

1.1 Project Description

The federal Joint Task Force (JTF) consists of both the U.S. Bureau of Reclamation and the USACE. Reclamation is responsible for excavating the Stilling Basin and Spillway Chute, and partial excavation of the Auxiliary Spillway Control Structure. The USACE is responsible for lining the excavated Spillway Chute and Stilling Basin, final excavation and construction of the Control Structure, Approach Channel, and other concrete structures.

The auxiliary spillway adjacent to Folsom Dam was selected as the alternative plan to meet the objectives of the Folsom Dam Modification authorized project. The spillway site is located on the left abutment of the main dam, immediately downstream of the existing Left Wing Dam.

The proposed spillway consists of a 1,100-foot-long approach channel into Folsom reservoir, a spur dike, a gated control structure including six submerged tainter gates, a 3,000-foot-long spillway chute, and a stilling basin. Flows from the auxiliary spillway empty into the American River about 1,500 feet downstream of the main dam.

The proposed auxiliary spillway control structure is a reinforced concrete gravity structure about 150 feet high. The control structure is founded on bedrock and comprised of 2 independent flow-through monoliths each 89 feet, 9 inches wide which are flanked by 3 non-flow-through monoliths also keyed into the adjacent rock. Each flow-through monolith houses 3 submerged tainter gate (STG), each 23 feet wide by 34 feet, 0 inches high. Each of the six STGs will have its own dedicated steel bulkhead gate and hoist assembly. Construction elements include excavation, preparation of the foundation, drainage and seepage controls, mass concrete placement, procurement, delivery and installation of the STGs and bulkhead gates, internal and external access, mechanical, electrical and instrumentation controls.

The project will be completed in sequential order as follows:

1. Control Structure Excavation
2. Control Structure Foundation and Concrete Work
3. Installation of the Control Structure Gates
4. Stilling Basin and Spillway Chute Foundation and Backfill
5. Stilling Basin and Spillway Lining and Concrete Work

1.2 Previous Studies

Previous environmental studies prepared for the Folsom Dam Safety and Upgrades include the following:

2003: Draft Resource Inventory, Folsom Lake State Recreation Area

2006: Folsom DS/FDR Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR)

2006: Draft Noise Analysis Report, Folsom Bridge Project, Folsom, California

2008: Finding of No Significant Impact and Final Supplemental Environmental Assessment to the Folsom Dam Safety and Flood Damage Reduction Final Environmental Impact Statement/Environmental Impact Report

2009: Final Joint Federal Project Early Approach Channel Excavation Noise Analysis

Relevant elements of the documents listed above were incorporated into this evaluation in part and referenced. The methodologies used in this evaluation are consistent with, and in some cases improve upon, methods used in these previous documents.

1.3 Objectives and Methodology

The primary objective of this technical noise evaluation is to determine if project operations have the potential to cause significant noise impacts to sensitive receptors within the affected area. This determination is presented for each of the project elements listed previously. Secondary objectives, performed as part of the overall analysis included the following:

1. Discussion of the physical and environmental properties of noise.
2. Identification of sensitive receptors within the affected area.
3. Review ambient noise data collected during the recent Joint Federal Project Early Approach (EA) Channel Excavation Noise Analysis and evaluate applicability to the Project.
4. Evaluate coverage and completeness of the previous noise analysis and ambient noise data collected during preparation of the Folsom DS/FDR EIS/EIR and evaluate applicability to the Project.
5. If required, collect supplemental ambient noise data in the vicinity of previously identified sensitive receptors and newly identified sensitive receptors.
6. Evaluate construction and traffic noise sources identified in construction plans, specifications, and schedules provided by the USACE that may contribute to the calculated day and night average sound level (L_{dn}) baseline using the equivalent noise levels (L_{eq}) in accordance with CNEL periods (day, evening, and night).
7. Classify potential noise impacts to sensitive receptors.
8. Prepare mitigative measures to lessen noise impacts to less than significant levels as defined in the California Environmental Protection Act (CEQA) and National Environmental Policy Act (NEPA).

The methodology used to prepare this report is as follows:

1. Reviewed previously prepared noise impact documents pertaining to the area of work and adjacent areas of work.

2. Obtained via public sources, data and information on the Control Structure, Spillway Chute, and Stilling Basin.
3. Obtained and modeled existing terrain and new topographic features based on #1 and #2 above.
4. Created a 3D model approximation of the Spillway Chute and Stilling Basin prior to lining.
5. Created terrain models of the areas of work by project phase.
6. Prepared Haul Road grading contours to approximately match current construction including the road cut beneath the Boat Launch.
7. Conducted a site visit and area reconnaissance on February 17, 2010 to evaluate:
8. Previously identified sensitive receptors.
9. Any new sensitive receptors that may be potentially impacted by operations for this project.
10. Ground cover, current topography, and mitigative features such as landscaping, tree lines, and ridge lines.
11. Project site conditions and equipment types in use.
12. Human activity in areas adjacent to the project site and farther areas where potential noise impacts should be modeled.
13. Prepared noise models using SoundPLAN 7 (SP7), BNOISE2, TNM 2.5, and RCNM.
14. Compared modeled noise levels to existing ambient noise monitoring data.
15. Determined potential noise impacts.
16. Prepared recommended mitigative measures for project activities.

2.0 FUNDAMENTALS OF SOUND

Perceptible acoustical sensations can be generally classified into two broad categories; sound and vibration.

Sound and Noise

Sound is a disturbance in an elastic medium resulting in an audible sensation. Sound is also defined as mechanical energy transmitted from a vibrating or flowing source by longitudinal (or compression) waves through a compressible medium such as air. The term “noise” is both qualitative and quantitative, and is typically referred to as "unwanted” sound.

Vibration

Vibration is a disturbance in a solid elastic medium, which may produce a detectable motion. This differentiation between sound and vibration is most relevant for environmental noise studies when industrial or construction noise sources produce high energy waves at low frequencies that are below human audible thresholds but match the frequency response of nearby structures. These frequencies are typically less than 31 Hertz (Hz). This energy causes vibrations similar to earthquakes. Sources with audible components in addition to the vibration-producing low-frequency energy are typically heard after initial vibrations start and sometimes end depending on distance from the source.

2.1 Physiological and Physical Parameters

Sound can be further characterized by both physiological and physical parameters. These parameters include the following:

- Loudness, as a subjective or perceived noise level that is a qualitative physiological sensation
- Loudness as a numerical scale, using “A-weighted” decibels and by sones (units of perceived loudness)
- Annoyance from high-energy low-frequency single events. This events have well-documented annoyance factors on nearby human receptors. The percentage of annoyed listeners is dependent on the following conditions (U.S. Army, 2005):
    - Intensity
    - Duration
    - Repetition
    - Abruptness of onset or cessation
    - Background or ambient noise levels
    - Interference with activity
    - Previous experiences within the community
    - Time of day
    - Fear of personal danger from the noise sources
    - Socioeconomic status and education level of the community
    - The extent people believe that the noise could be controlled
- Sound intensity, the average flow of sound energy through a unit area in a sound field. Sound intensity is a vector quantity with both magnitude and direction.
- Frequency spectrum - the rate of oscillation in cycles per second.
- Wavelength, the distance between successive wave compressions and expansions.

- Energy content as sound pressure level, L_p (also written as SPL). The ear responds to sound pressure as sound waves represent oscillations of pressure just below atmospheric pressure (expansion of longitudinal wave) and just above atmospheric pressure (compression). These pressure oscillations cause the inner ear to vibrate. Sound level meters are also sensitive to these oscillations.

In particular, the SPL has become the most common descriptor used to characterize the loudness of an ambient or environmental sound level. Sound pressure is affected by geophysical properties such as air temperature, pressure, humidity, rain or snow, and wind, as well as physical barriers such as terrain, and the walls of structures. Sound energy dissipates with increasing distance from the source due to absorptive surfaces such as grass, trees, and water. Due to these factors, the noise level perceived by a receptor at a certain location depends on the following parameters:

- Distance between the noise source and the receptor.
- Presence or absence of absorptive surfaces.
- The amount of mitigative noise features between the receptor and noise source including intervening terrain, structures, foliage, and ground cover.
- Cumulative noise impacts from reflective surfaces such as building facades, concrete, asphalt, water bodies, etc.
- Current weather conditions (snow, wind, rain) and weather-related ground cover (snow, mud, wet or dry ground).

2.2 Physical Properties of Sound

Sound levels are affected by distance from the source to receiver (propagation) and by localized atmospheric conditions. These are further described below.

2.2.1 Sound Propagation

In an ideal atmosphere without wind, temperature gradients, humidity or ground effects sound levels decay as 6 dB per doubling of distance from a stationary source due to geometrical spreading. If a source generates a level of 90 dBA at 50 feet then geometrical spreading implies a level of 70 dBA at a distance of 500 feet from the source. If the source is moving, then the maximum level will obey the same relationship, but the exposure time is also a function of sideline distance. For a moving source the time averaged integrated level (L_{eq}) will decay as 3 dB per doubling of sideline distance (cylindrical spreading), providing the integration time is the constant and extends until the sound level has decayed to 10 dB below its peak level. In this case, if a source generates a L_{eq} of 70 dBA during a drive by in which the source passes 50 feet from the observer at its closest point, then the L_{eq} at 500 feet will be 60 dBA. These simple scaling laws are modified in reality by local atmospheric propagation effects. At low wind speeds and at distances of less than 100 feet atmospheric propagation effects are small and can be ignored. At larger distances atmospheric propagation will modify the decay of the sound level with distance. In addition, ground effects can be important at small distances from the source and will depend on the ground cover and the height of the source and receiver above the ground.

Figure 2-1 provides a range of noise levels in the ideal atmosphere. Additionally, color shading delineates the threshold of pain (purple), noise levels that would typically exceed regulatory thresholds (red) and noise levels that may exceed regulatory thresholds depending on time of day and time-weighting (yellow). Noise levels are typically within (white) or below (green) regulatory thresholds.

Figure 2-1: Noise Level Attenuation Due to Geometric Spreading in an Ideal Atmosphere

Sound Power Level (L_w) of Noise Source (dB*)	Distance from Noise Source to Outdoor Receiver (Feet)											
	1	2	4	8	16	32	64	125	250	500	1000	2000
	Sound Pressure Level (Lp)											
150	144	138	132	126	120	114	108	102	96	90	84	78
140	134	128	122	116	110	104	98	92	86	80	74	68
130	124	118	112	106	100	94	88	82	76	70	64	58
120	114	108	102	96	90	84	78	72	66	60	54	48
110	104	98	92	86	80	74	68	62	56	50	44	38
108	102	96	90	84	78	72	66	60	54	48	42	36
106	100	94	88	82	76	70	64	58	52	46	40	34
104	98	92	86	80	74	68	62	56	50	44	38	32
102	96	90	84	78	72	66	60	54	48	42	36	30
100	94	88	82	76	70	64	58	52	46	40	34	28
98	92	86	80	74	68	62	56	50	44	38	32	26
96	90	84	78	72	66	60	54	48	42	36	30	24
94	88	82	76	70	64	58	52	46	40	34	28	22
93	87	81	75	69	63	57	51	45	39	33	27	21
92	86	80	74	68	62	56	50	44	38	32	26	20
91	85	79	73	67	61	55	49	43	37	31	25	19
90	84	78	72	66	60	54	48	42	36	30	24	18
89	83	77	71	65	59	53	47	41	35	29	23	17
88	82	76	70	64	58	52	46	40	34	28	22	16
87	81	75	69	63	57	51	45	39	33	27	21	15
86	80	74	68	62	56	50	44	38	32	26	20	14
85	79	73	67	61	55	49	43	37	31	25	19	13
84	78	72	66	60	54	48	42	36	30	24	18	12
83	77	71	65	59	53	47	41	35	29	23	17	11
82	76	70	64	58	52	46	40	34	28	22	16	10
81	75	69	63	57	51	45	39	33	27	21	15	9
80	74	68	62	56	50	44	38	32	26	20	14	8
79	73	67	61	55	49	43	37	31	25	19	13	7
78	72	66	60	54	48	42	36	30	24	18	12	6
77	71	65	59	53	47	41	35	29	23	17	11	5
76	70	64	58	52	46	40	34	28	22	16	10	4
75	69	63	57	51	45	39	33	27	21	15	9	3
74	68	62	56	50	44	38	32	26	20	14	8	2
73	67	61	55	49	43	37	31	25	19	13	7	1
72	66	60	54	48	42	36	30	24	18	12	6	0
71	65	59	53	47	41	35	29	23	17	11	5	
70	64	58	52	46	40	34	28	22	16	10	4	
69	63	57	51	45	39	33	27	21	15	9	3	
68	62	56	50	44	38	32	26	20	14	8	2	
67	61	55	49	43	37	31	25	19	13	7	1	
66	60	54	48	42	36	30	24	18	12	6	0	
65	59	53	47	41	35	29	23	17	11	5		
64	58	52	46	40	34	28	22	16	10	4		
63	57	51	45	39	33	27	21	15	9	3		
62	56	50	44	38	32	26	20	14	8	2		
61	55	49	43	37	31	25	19	13	7	1		
60	54	48	42	36	30	24	18	12	6	0		

Notes: *Lw Reference of 10E-12 Watts

2.2.2 Effects of Local Atmospheric Conditions

During periods of strong sunshine the ground surface temperature is increased and this causes heating of the lower atmosphere. These conditions cause the air temperature to decrease with height which is referred to as a temperature lapse. When a temperature lapse exists sound rays are refracted upwards and a shadow zone is formed a few hundred feet from the source (Glegg 2005). In contrast during the night time hours there is significant cooling of the ground and the atmospheric temperature increases with height, causing a temperature inversion. This causes sound to be trapped in the lower atmosphere and sound levels can exceed those expected from spherical spreading. Furthermore, focusing effects can occur from temperature inversions and higher sound levels may be observed in a local area at relatively large distances from the source (Hubbard 1995).

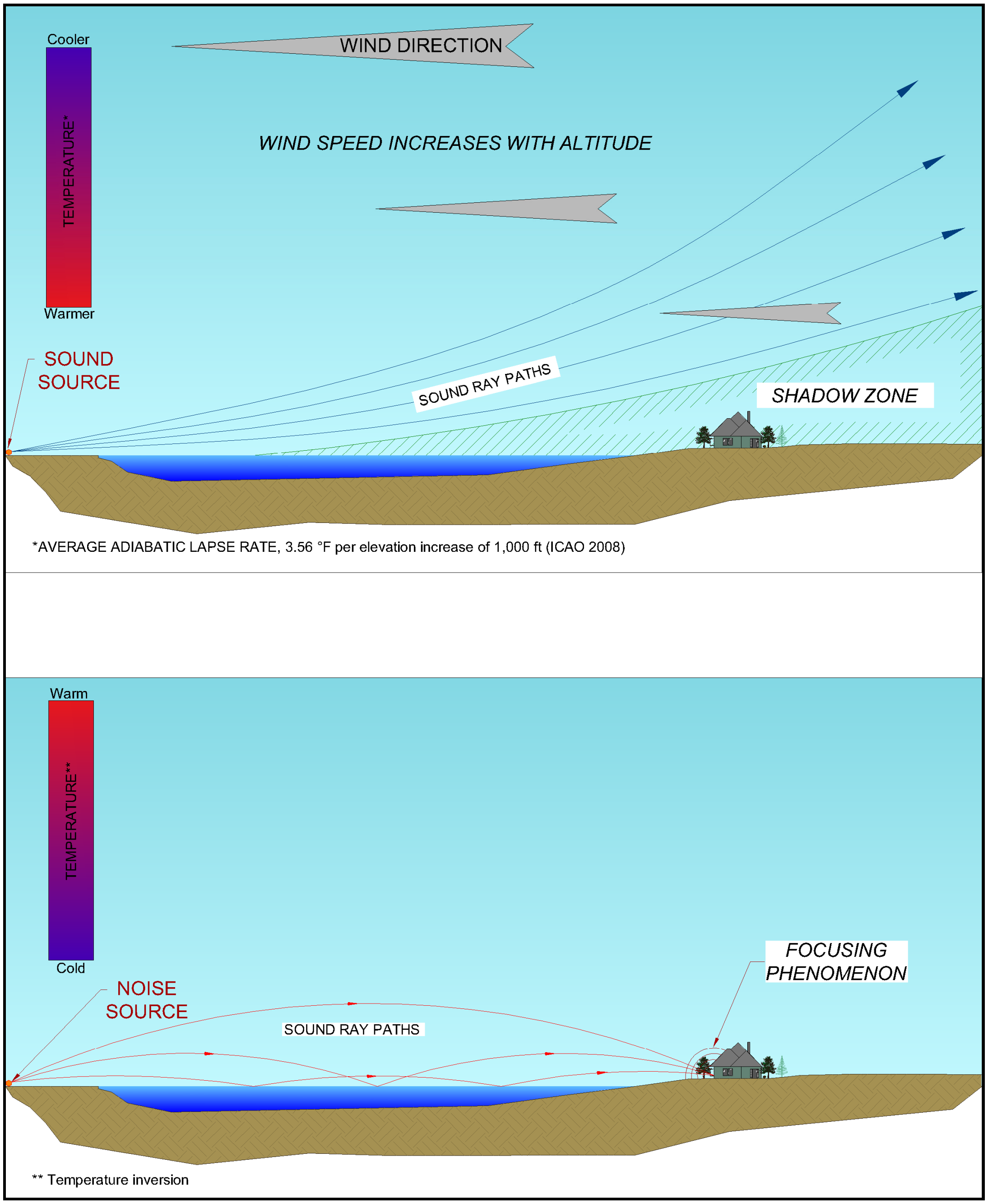
Wind gradients close to the ground can cause the same effects as temperature gradients. Sound propagating upwind is refracted upwards and forms a shadow zone. Sound propagating downwind is refracted downwards and is louder than expected (Hubbard 1995). Sound is also attenuated by molecular absorption as it propagates. This is a strong function of humidity and frequency and standard curves are available to make corrections for atmospheric absorption of this type. Typically excess attenuations of 5 dB per 1,000 feet of propagation can be expected at 2 kiloHertz (kHz) for a relative humidity of 50-90 percent and temperatures over 60 degrees Fahrenheit (˚F) (Beranek 1971).

An example of excess attenuation over a lake in Europe shows an additional 2-5 dB of attenuation per kilometer over and above atmospheric absorption. Sound level measurements from this study also show that a shadow zone can be formed by a temperature lapse. At a distance of 650 feet in the downwind direction sound levels exceed expected values at 250 Hz by 1 dB, but in the upwind direction the levels are 10 dB lower than expected (Beranek 1971).

2.2.3 Ground Effects

When a source and/or receiver are placed aboveground an interference effect takes place that modifies the measured sound level. At very low frequencies the spectral levels are increased by 6 dB (at all distances) and at higher frequencies a series of interference dips occur where the spectral level is reduced to zero. When the source and receiver are 4 feet above ground and separated by 50 feet over a hard surface, the first interference dip occurs at 439 Hz. At a source and receiver separation of 300 feet the first separation dip occurs at 2,636 Hz. The ground effect increases the dBA level by 3 dB over a free field level (i.e., the level that would occur if the ground were not present) for a broadband source when the interference dip is at a frequency of approximately 1,000 Hz or less. When the frequency of the first ground interference dip exceeds 20 kHz, then the dBA level is increased by 6 dB relative to the free field level. For propagation over hard surfaces the ground effect, therefore, reduces the geometrical spreading loss of the dBA level when the source and receiver are less than 2,400 feet apart. This effect is relatively small unless propagation takes place over soft ground cover, in which case the effect of ground absorption can be significant. Figure 2-2 illustrates the shadow zone created by a downwind noise source (upper portion), and also illustrates the focusing phenomena created by temperature inversion, upwind noise source, and ground/water surfaces (lower portion).

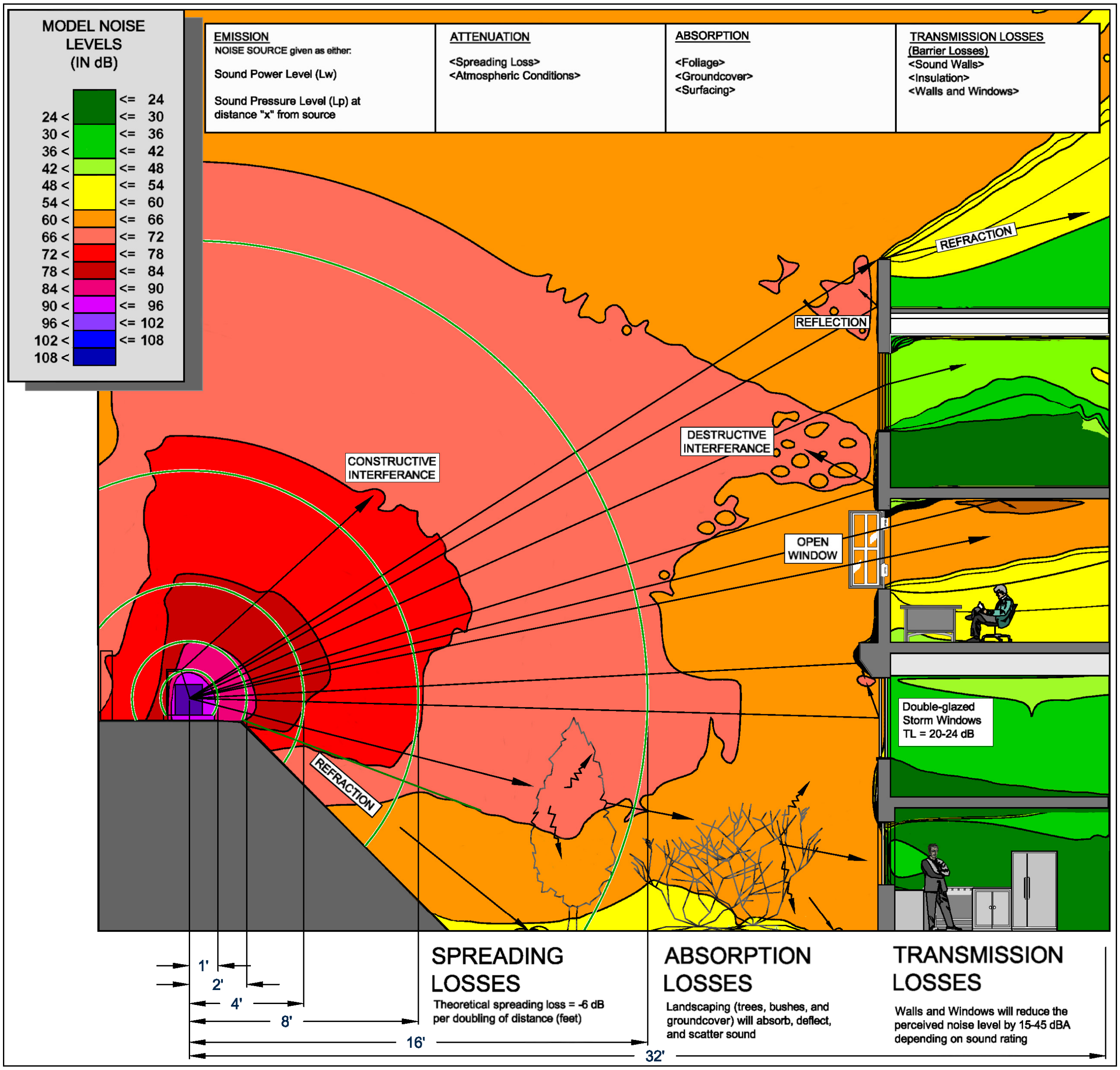
Figure 2-2: Ground Effect, Wind and Temperature Inversion Graphic



2.2.4 Reflection, Refraction, Absorption, and Transmission Losses

The sound level measured at a specific location at a discrete time is the sum of all noise source SPLs that converge at that point. Sound will refract around hard edges, be absorbed by foliage, structural materials, and the various atmospheric conditions previously described. Reflection will occur at hard surfaces where sound is not completely absorbed and/or scattered. Sound that reflects back to a source is called an echo. Transmission loss through structural materials such as walls and windows reduce sound pressure the most. Figure 2-3 illustrates these concepts.

Figure 2-3: Emission, Attenuation, Absorption, and Transmission Loss Graphic



2.2.5 High-Energy Impulsive and Low Frequency Noise

A set of guidelines developed by the Naval Surface Warfare Center, Dahlgren, Virginia, is used to evaluate the complaint potential from low-frequency sound (impulsive noise) that is caused by activities such as detonating explosives and artillery firing (Pater, 1976).

2.2.6 Sound Level Measurement

The dB scale is used to quantify sound intensity. Because SPLs can vary by over 1 million times within the range of human hearing, a logarithmic loudness scale (similar to the Richter Scale used for earthquake intensity) is used to keep sound intensity numbers within a manageable range. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, noise measurements are weighted more heavily within those frequencies of maximum human sensitivity (middle A and its higher harmonics) in a process called "A-weighting," written as dBA.

Noise measurement metrics used for this analysis are as follows:

- Equivalent sound level (L_{eq}), the average sound level calculated from instantaneous measurements recorded over a specific period of time.
- Maximum sound level (L_{max}) reached during a sampling period. The L_{max} value is the peak noise level that occurred during the measurement period.
- Minimum sound level (L_{min}) reached during a sampling period. The L_{min} value obtained for a particular monitoring location typically reflects ambient conditions.
- Percentile sound levels (L_{90}, L_{50}, and L_{10}) are sound levels that exceed the percentile value during the measurement period.
- Community Noise Equivalent (CNEL): the average of the daytime measurement, evening measurement +5 dBA, and the night measurement +10 dBA.
- Single Event Level (SEL): Used for blasting events that are less than a minute in duration, when energy average noise values do not provide accurate depiction of the maximum noise levels produced by the single event.
- Peak Noise Level (P_{K15}): Unweighted peak sound levels or maximum sound levels that assess maximum noise levels during single-noise events. This is necessary when the DNL (average) noise measurements might understate the severity of a single-noise event. Sometimes annoying noise peaks can be "averaged out." Unweighted peak measurements, with no time averaging, are a good predictor of complaints.
- Day Night Level (L_{dn}): The day-night sound level (DNL) evaluator is recommended by the Environmental Protection Agency and used by most federal agencies as a land-use planning tool. It describes the average daily acoustic energy over the period of one year—meaning that moments of quiet are averaged together with moments where loud noises can be heard. The Department of Defense (DoD) uses DNL because it incorporates a "penalty" for nighttime noise (normally 10:00 p.m. to 7:00 a.m.) when loud sounds are typically more annoying.

2.2.7 Community Noise Levels

Community noise levels depend on the intensity of nearby human activity. Noise levels are generally considered low when ambient levels are below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In rural and undeveloped areas, L_{dn} can be below 35 dBA. Levels above 75 to 80 dBA are more common near major freeways and airports. Although people often accept the higher levels associated with very noisy urban areas, they nevertheless are considered to be adverse to public health. California uses a stricter equivalent sound level definition, which uses the L_{dn} and adds a 5-dB penalty to sound measurements between 10:00 PM and 7:00 AM.

2.2.8 Noise Level Acceptance Criteria

The surrounding land uses dictate what noise levels would be considered acceptable or unacceptable. In rural and undeveloped areas away from roads and other human activity, the day-to-night difference is normally small. Because of diurnal activity, nighttime ambient levels in urban environments are about 7 dB lower than the corresponding daytime levels. Nighttime noise is a concern because of the likelihood of disrupting sleep. Noise levels above 45 dBA at night can result in the onset of sleep interference. At 70 dBA, sleep interference effects become considerable (USEPA 1974).

2.3 Noise Sources

Environmental noise sources are segregated into four categories: single event, mobile, stationary-temporary, and stationary-permanent. Examples of noise sources in each of the two categories with A-weighted sound levels are presented in Table 2-1 below. Construction noise sources are always temporary, and are typically mobile, but may be stationary or single event. Construction noise sources are provided in more detail in Table 2-2. Acoustical terminology definitions are provided in Appendix A.

Table 2-1: Typical Stationary and Mobile Noise Source Sound Levels in dBA

Noise Source	Sound Level in dBA	Category
Noise at ear level from rustling leaves	20	STATIONARY-TEMPORARY
Room in a quiet dwelling at midnight	32	STATIONARY
Soft whisper at 5 feet	34	STATIONARY-TEMPORARY
Large Department Store	50 to 65	STATIONARY-TEMPORARY*
Room with window air conditioner	55	STATIONARY-PERMANENT
Conversational Speech	60 to 75	STATIONARY
Pump Station Equip. with Noise Abatement	62	STATIONARY-PERMANENT
Passenger Car at 50 feet	69	MOBILE
Vacuum cleaner in private home at 10 feet	69	STATIONARY
Ringing alarm at 2 feet	80	STATIONARY
Roof-top Air Conditioner	85	STATIONARY-PERMANENT
Bulldozer at 50 feet	87	MOBILE
Heavy city traffic	90	MOBILE
Home lawn mower	98	MOBILE
Jet aircraft at 500 feet overhead	115	MOBILE
Human pain threshold	120	NA
Construction Blast**	120 to 145 at 50 feet	SINGLE EVENT

Notes and References:
* Time-of-day dependent
Reference: Noise Control Reference Handbook, Industrial Acoustics Company

2.3.1 Construction Noise

Construction noise sources and corresponding noise levels in the project area will greatly fluctuate depending on the purpose of construction and the particular type, number, and duration of use of various types of construction equipment involved. The effect of construction noise on nearby receptors depends upon how much noise is generated by each individual piece of equipment, the distance between construction activities and the nearest noise-sensitive receptors, the frequency, type, and duration of noise produced, and the ambient noise levels at the receptors. Typical construction equipment noise levels at 50 feet are summarized in Table 2-2. Construction noise modeling is discussed in the next section.

At a distance of 50 feet, noise levels would be between 68 to 96 L_{eq}. Noise levels would be correspondingly higher at receptor sites located closer to construction activities. Noise levels in this range would be substantially higher than the ambient noise levels experienced by sensitive receptors in typical rural commercial, recreational, and residential environments. In many areas along the proposed project transportation routes, staging areas, and potential construction zones, intervening topography, trees, and foliage may provide some noise attenuation.

Table 2-2: Construction Noise Sources by Octave Band Spectra

Noise Source	Sound Power Levels (dB) by Octave Band Center Frequency (Hertz)								
	63	125	250	500	1000	2000	4000	8000	A-Weighted Total Sound Power (dBA)
Large Dozer	110	122	113	114	110	108	104	94	116
Large Motor Grader	99	105	103	98	97	94	88	79	102
Large Excavator	107	114	107	106	103	101	94	88	109
80-Ton Crane	104	110	108	103	102	99	93	84	107
Large Dozer-Ripper	110	122	113	114	110	108	104	94	116
40 TN Articulated Trucks	102	108	106	101	100	97	91	82	105
Dozer	110	122	113	114	110	108	104	94	116
Rock Drills	109	118	113	113	113	112	110	104	118
Powder Truck	102	108	106	101	100	97	91	82	116
Drill Rig	100	106	104	99	98	95	89	80	103
Diesel Generator Exhaust Discharge	109	114	109	104	94	84	81	71	105
Diesel Generator Gas Discharge	97	99	102	103	102	104	99	100	109
Large Front End Loader	112	124	114	110	108	106	102	90	115
Self-Propelled Vibratory Roller	102	108	110	106	102	100	98	90	109
On-Highway Transportation Trucks and Trailers	102	108	106	101	100	97	91	82	105

Notes: Source: DS/FDR Early Excavation Supplement EA/IS. 2009

2.3.2 Traffic Noise Sources

Traffic noise predictions are based on vehicle classification, the number of each vehicle per day as average daily trips (ADT), or by hour, and the speed of each vehicle type. These parameters are defined by the Federal Highway Administration (FHWA). Vehicle classification includes heavy trucks (HT), medium trucks (MT), light trucks (LT), automobiles, buses, and motorcycles.

2.3.3 Critical and Sensitive Receptors

Some land uses are generally regarded as being more sensitive to noise than others due to the types of population groups or activities involved. The definition of critical and sensitive receptors varies by jurisdiction, but in general, critical receptors are those that cannot be interrupted or disturbed by project noise. This include, but are not limited to, police and fire stations, high security operations, noise-sensitive industry, hospitals, nursing homes, and other long-term medical care facilities. Sensitive population groups include children and the elderly and sensitive land uses. These include residential (single- and multi-family, mobile homes, dormitories, and similar uses), guest lodging, parks and outdoor recreation areas, schools, libraries, churches, and places of public assembly. No critical receptors were identified. The sensitive receptors identified for this project are listed by general area on Table 2-3 below. Additional specific locations within each area that were evaluated are shown in the noise modeling results section. Corresponding construction phases of potential concern and the distance from each sensitive receptor to the long-term ambient monitoring points are also listed. Sensitive receptors and the long-term monitoring locations are also illustrated on Figure 2-4.

Table 2-3: Sensitive Receptors

Receptor Type	Map ID (Figure 2-3)	Receptor Name, Location, and/or Address	Project Phase and Operation of Potential Concern	Long-Term Ambient Noise Monitoring Location ID
RESIDENTIAL	R-1	Lake Pointe Apartments	Phase 1 and 5	LT-6
RESIDENTIAL	R-2	Folsom Prison – North Buildings	All Phases	LT-1
RESIDENTIAL	R-3	Mountain View Drive Residences	All Phases	LT-3
RESIDENTIAL	R-4	Christina Court Residence	Phase 1, 2, and 5	LT-2 and LT-3
RESIDENTIAL	R-5	Lorna Lane Residences	Phase 1, 2, and 5	LT-2 and LT-3
RESIDENTIAL	R-6	Amaya Drive Residence	Phase 1, 2, and 5	LT-2
RESIDENTIAL	R-7	East Natoma Drive Residences	MIAD only	LT-4
RESIDENTIAL	R-8	Singer Lane Residences	MIAD only	NA
RESIDENTIAL	R-9	Ballau Circle Residences	MIAD only	LT-4
RESIDENTIAL	R-10	Church Grounds north of East Natoma Drive	MIAD only	NA
COMMERCIAL / RETAIL	CR-1	East Natoma and Blue Ravine Road	MIAD only	NA
COMMERCIAL / RETAIL	CR-2	North of intersection of East Natoma Drive and Green Valley Road	MIAD only	NA
COMMERICAL / UTILITIES	CU-1	Commercial – Utilities north of Folsom Lake Crossing	Phase 1 and 5	LT-6
RECREATION AREAS	RA-1	Boat Launch	Phase 1, 2, and 5	LT-8
INDUSTRIAL	I-1	Power Plant	Reference only	NA

Notes: NA = Reference only – no long-term monitoring conducted in these areas.

Receptor Type	Map ID (Figure 2-3)	Receptor Name, Location, and/or Address	Project Phase and Operation of Potential Concern	Long-Term Ambient Noise Monitoring Location ID
RESIDENTIAL	R-1	Lake Pointe Apartments	Phase 1 and 5	LT-6
RESIDENTIAL	R-2	Folsom Prison – North Buildings	All Phases	LT-1
RESIDENTIAL	R-3	Mountain View Drive Residences	All Phases	LT-3
RESIDENTIAL	R-4	Christina Court Residence	Phase 1, 2, and 5	LT-2 and LT-3
RESIDENTIAL	R-5	Lorna Lane Residences	Phase 1, 2, and 5	LT-2 and LT-3
RESIDENTIAL	R-6	Amaya Drive Residence	Phase 1, 2, and 5	LT-2
RESIDENTIAL	R-7	East Natoma Drive Residences	MIAD only	LT-4
RESIDENTIAL	R-8	Singer Lane Residences	MIAD only	NA
RESIDENTIAL	R-9	Ballau Circle Residences	MIAD only	LT-4
RESIDENTIAL	R-10	Church Grounds north of East Natoma Drive	MIAD only	NA
COMMERCIAL / RETAIL	CR-1	East Natoma and Blue Ravine Road	MIAD only	NA
COMMERCIAL / RETAIL	CR-2	North of intersection of East Natoma Drive and Green Valley Road	MIAD only	NA
COMMERICAL / UTILITIES	CU-1	Commercial – Utilities north of Folsom Lake Crossing	Phase 1 and 5	LT-6
RECREATION AREAS	RA-1	Boat Launch	Phase 1, 2, and 5	LT-8
INDUSTRIAL	I-1	Power Plant	Reference only	NA

EXPLANATION:

APPROXIMATE AREAS OF WORK (REFER TO MAIN DOCUMENT)

HAUL ROAD

R-10 SENSITIVE (RESIDENTIAL) RECEPTOR

CR-1 COMMERCIAL, INDUSTRIAL, OR RECREATIONAL RECEPTOR

GRAPHIC SCALE
1:15,000
100 0 100 200 500 1,000m
0 500 1,000 3,000 FT

US Army Corps of Engineers
Sacramento District

JOINT FEDERAL PROJECT
CONSTRUCTION OF THE CONTROL STRUCTURE AND LINING OF THE SPILLWAY CHUTE AND STILLING BASIN
SUPPLEMENTAL EA/IS

FIGURE 2-4
SITE MAP - SENSITIVE RECEPTORS AND PROPOSED AREAS OF WORK

W92138-09-D-0032 MAY 2010

DOUGLAS GRANT, P.G. FIG 2-3_Ver05MAY10

3.0 NOISE MODELING

Prediction of potential noise impacts within a specific area requires a series of interrelated calculations. The results of these calculations may be useful in determining the magnitude and extent of noise sources on ambient noise levels and environmental receptors. Computer-aided simulation programs have been developed to assist in the calculation process and properly assess complex systems of multiple noise sources, receptors, mitigating factors such as dense vegetation and terrain, ground absorption and reflection and other environmental factors. This methodology used is representative of engineering design projects and environmental studies routinely performed in California.

3.1 Noise Simulation Models

Four noise model applications were used for this analysis. These include simple screening-level noise modeling applications such as the Road Construction Noise Model (RCNM) and Traffic Noise Model (TNM) lookup tables used for predicting noise levels at various distances from construction equipment and traffic. For the proposed construction blasting, BNOISE2 was used. Modeling blast noise requires very different calculation algorithms specifically for high-energy, short-term or single-event noise sources. The USACE Construction Engineering Laboratory provided BNOISE2 for this project. BNOISE2 predicts peak noise levels associated with hundreds of types of explosives, charge size, depth of burial, and weather conditions.

For the majority of complex modeling required to accurately assess potential noise impacts related to this project SP7 was used. SoundPLAN 7™ has the ability to accurately calculate noise levels over a wide area while considering:

- Multiple noise sources and source type (point, area, and/or line).
- Sound power over multiple frequencies.
- Averaging predicted SPL over time using various assessment types.
- Atmospheric effects.
- Sound reflection from ground surfaces such as rock, asphalt, concrete and water.
- Sound absorption due to soft ground cover, dense foliage, and human-made structures.
- Effects of elevation and topographic features (3D terrain).
- Sound directivity and corrections based on impulsiveness, tonality, and hemispheric spreading.
- Sensitive receptor elevation and multi-story receptors.

Results from RCNM and BNOISE2 were used as noise source model input for SP7 in addition to SP7's extensive library of noise sources. Sound isopleth maps and cross-sections were then generated for the different construction activities proposed.

3.1.1 Noise Propagation and Model Input

SoundPLAN™ provides a choice of industrial propagation calculation standards and methodology. Each calculation method is internationally recognized and offers unique computer simulation techniques. International Standard of Organization (ISO) 9613-2006 was used for the simulations in this evaluation. ISO 9613 is a general purpose standard for outdoor noise propagation from “industrial” noise sources. Construction vehicles fall within this designation.

The model allows for site-specific and generalized development of the source, receptor, and environmental features. Individual noise source emissions are modeled as sound power levels and can be represented as a single center frequency (500 Hz), up to 30 one-third octave bands or 10 octave-band frequencies (31, 63, 125, 250, 500, 1,000, 2,000, 4,000, 8,000, 16,000 Hz).

Noise database libraries consist of emission sources with full or partial sound power spectra, absorption, and transmission loss by structural material type and attenuation. Geo-Data files allow for layering and reuse source types, time of use, and receptor geospatial locations (x, y, z coordinates), digital terrain models, buildings, structural acoustic characteristics (absorptive or reflective), and special features (terrain, ground cover, berms, sound walls, etc.). Use of the databases ensures consistent model input when evaluating multiple scenarios.

3.1.2 BNOISE2

The use of average noise levels over a protracted time period generally does not adequately assess the probability of community noise complaints. BNOISE2 was used to assess the risk of noise complaints from impulsive noise resulting from construction blasting, in terms of single event metrics. The metrics used were the peak sound pressure level [$P_{K\ 15}$(met)] and SEL using ANSI 12.9/4. The metric P_{K15} (met) accounts for statistical variation in received single event peak noise level that is due to weather. It is the calculated peak noise level, without frequency weighting, expected to be exceeded by 15 percent of all events that might occur. To account for normal (average) weather conditions the BN3.3 Weather Emulation was selected for the BNOISE2 calculations.

3.1.3 Road Construction Noise Model

The RCNM is a national model based on the noise calculations and extensive construction noise data compiled for the CA/T Project. The basis for the national model is a spreadsheet tool developed in support of the CA/T project. The CA/T predictions originated from U.S. Environmental Protection Agency (USEPA) noise level work and an Empire State Electric Energy Research Corporation Guide which utilizes an "acoustical usage factor" to estimate the fraction of time each piece of construction equipment is operating at full power (i.e., its loudest condition) during a construction operation. The noise levels listed represent the A-weighted L_{max}, measured at a distance of 50 feet from the construction equipment.

The RCNM was utilized to initially screen project construction noise for two phases; the phase with the greatest potential to generate noise, and the phase with the least potential. Due to the complexity of the large construction area, use of haul roads to off-site disposal/stockpile areas, variety of noise sources, severity of terrain, and the presence of elevated sensitive receptors located in the center of a majority of the proposed work, RCNM was found not suitable for accurate predictions of noise. Construction equipment sound power levels by octave-band frequency were used for noise sources in SP7.

For non-Type I projects, selective use of TNM 2.5 elements can be used to prepare a screening level assessment of existing traffic noise and the incremental increase in traffic noise due to project traffic additions to various road segments. Traffic noise is calculated over a 24-hour period (CNEL) or over hourly periods. To properly assess potential traffic increases due to time of day/night, the TNM 2.5 Lookup Table (LUT) was used. The methodology and results of the traffic noise are provided in Section 6.0.

4.0 NOISE CRITERION

The noise nuisance criterion is derived from local noise ordinances, state laws, and/or federal regulations/standards. These criteria and a description of the noise simulation model and the assumptions applied to determine noise levels at critical receptors are presented in these sections.

4.1 Regulatory setting

Federal regulations, standards, and guidelines, California state law, and local ordinances and regulations (LOR) pertaining to environmental noise are cited in this section. The LOR citations include all county ordinances and select city ordinances within the immediate Program Area. In addition, a representative selection of counties and cities throughout California that may be potentially treated are cited. Counties that do not have specific noise ordinances are either referenced as deferring to state or federal regulations, or if a noise element exists in a specific general plan, that element is cited.

4.2 Federal Standards

The federal noise standards or guidelines discussed in this section are applicable and relevant or to-be-considered during implementation of Program alternatives. Noise regulations and standards are provided for the following agencies:

- Department of Defense (DoD)
- U.S. Department of Transportation (DOT) – Federal Highway Administration (FHWA)
- U.S. Environmental Protection Agency (USEPA)
- National Environmental Policy Act (NEPA)

4.2.1 Department of Defense

The DoD has conducted extensive noise studies over the last 50 years. Noise Policy and Directives include "Being a Good Neighbor", complying with NEPA and the Federal Noise Act of 1972, monitoring noise exposure of threatened and endangered species, and avoiding Federal Tort Claims (DoD 2005). The emphasis of DoD noise policy relates to firing ranges, military training routes, and aircraft operations; however, blasting and heavy construction equipment operation by the USACE is relevant to this noise impact evaluation. The following table provides a guideline to predict complaints based on peak sound levels associated with blast noise.

Table 4-1: Peak Noise Level vs. Complaint Prediction Guidelines

Predicted Sound Level, dB_{Peak}	Risk of Complaints	Action
< 115	Low	No Restrictions
115 - 130	Moderate	Fire important tests. Postpone non-critical testing, if feasible.
130 - 140	High, possibility of damage.	Only extremely important tests should be fired.
> 140	Threshold for permanent physiological damage to unprotected human ears. High risk of physiological and structural damage claims.	Postpone all explosive operations.

4.2.2 U.S. Environmental Protection Agency (USEPA)

The USEPA has developed guidelines on recommended maximum noise levels to protect public health and welfare (EPA 1974). The USEPA does not enforce these regulations, but rather offers them as a planning tool for state and local agencies. The table below provides examples of protective noise levels recommended by the USEPA.

Table 4-2: USEPA Designated Noise Safety Levels

EFFECT	NOISE LEVEL	AREA
Hearing Loss	Leq (24)<70 dB	All areas
Outdoor Activity Interference and Annoyance	Ldn <55 dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	Leq (24)<55 dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor Activity Interference and Annoyance	Ldn <45 dB	Indoor residential areas
	Leq (24)<45 dB	Other indoor areas with human activities such as schools, etc.

Notes:
L_{eq} (24) = Represents the sound energy averaged over a 24-hour period.
L_{dn} = Represents the Leq with a 10 dB nighttime weighting.
Source: USEPA, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974.

4.3 State Noise Standards and Guidelines

State noise standards and guideline include CEQA, the California Department of Parks and Recreation General Plan, land use compatibility regulations and the California Vehicle Code. Elements of these are summarized below.

4.3.1 California Environmental Quality Act (CEQA)

Under CEQA, a substantial noise increase may result in a significant adverse environmental effect and, if so, must be mitigated or identified as a noise impact for which it is likely that no, or only partial abatement measures are available. Specified economic, social, environmental, legal, and technological conditions may make additional noise attenuation measures infeasible.

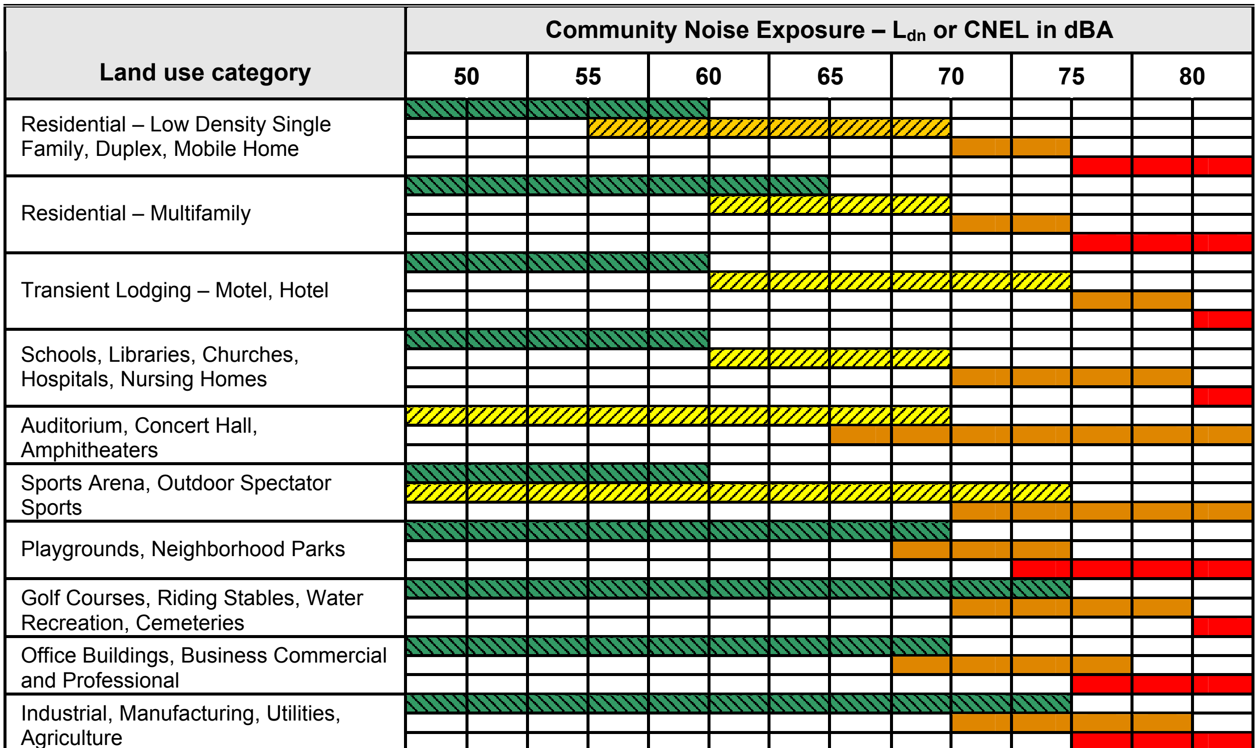
4.3.2 Department of Parks and Recreation General Plan

Statewide guidelines for General Plans published in 1998 indicate that levels under 70 L_{dn} should be acceptable to receptors in parks (OPR, 1998).

4.3.3 Land Use Compatibility

The California Government Code § 65302(f) encourages each local government entity to conduct noise studies and implement a noise element as part of their General Plan. In addition, the California Office of Planning and Research published guidelines for evaluating the compatibility of various land uses as a function of community noise exposure, and these are listed in Table 4-3 below. In general, noise levels less than 60 dBA L_{dn} are acceptable for all land uses, including residences, schools, and other noise-sensitive receptors. The State considers noise levels less than 70 dBA L_{dn} to be normally acceptable for playgrounds and neighborhood parks (OPR, 1998).

Table 4-3: Land Use Compatibility for Community Noise Environment



LEGEND

Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design.

Normally Unacceptable: New construction or development should be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirement must be made and needed noise insulation features included in the design.

Clearly Unacceptable: New construction or development generally should not be undertaken.

Source: State of California General Plan Guidelines, Office of Planning and Research, June 1998.'

CNEL= Community Noise Equivalent Level

dBA = A-weighted decibel(s)

Ldn = Day-Night Noise Level

4.3.4 California Vehicle Code

Noise from highway vehicles and off-highway equipment is regulated by the Department of Motor Vehicles with cooperation from the California Highway Patrol. Off-highway motor vehicles manufactured between 1975 and 1986 must not exceed 86 dBA, and those manufactured after 1986 must not exceed 82 dBA when measured at 50 feet from the centerline of travel (Vehicle Code Section 38370). Heavy highway vehicles manufactured after 1987 must emit less than 80 dBA (Vehicle Code Sections 27204 and 27206).

For traffic noise, a change in noise levels of less than 3 dBA is not discernable to the general population. An increase in average noise levels of 3 dBA is considered barely perceptible, while an increase of 5 dBA is considered readily perceptible to most people (Caltrans 1998).

4.4 Municipal Noise Ordinance Requirements

The proposed project is located in the City of Folsom. Some traffic is expected through Sacramento County, Placer County, and El Dorado County, but noise impacts due to the expected traffic are not significant. The noise impact evaluation with respect to traffic will use the City of Folsom requirements as they are the strictest. Municipal ordinances for the three counties are provided in both the primary EA/IS and the previous Supplemental EA/IS for Early Excavation. All construction noise from the project will occur in the City of Folsom and Sacramento County. Therefore, noise ordinances pertaining to these municipalities are described below.

4.4.1 Sacramento County

The Sacramento County Noise Ordinance specifies noise levels in terms of L_{50}. Construction noise levels are exempt from 6:00 AM to 8:00 PM on weekdays and 7:00 AM to 8:00 PM on weekends. If construction were to occur outside of these periods, activities would be required to comply with exterior and interior noise limits at residential receptors, as summarized in Table 3-4. For impulse noise (such as impact pile driving or blasting), the limits are reduced by 5 dBA.

Section 6.68.120 of the Sacramento County Noise Ordinance states that, "it is unlawful for any person to operate any mechanical equipment installed after July 1, 1976 if the maximum noise level exceeds 60 dBA at any point at least one foot inside the property line of the affected residential property and 3 to 5 feet above ground level." Furthermore, equipment installed 5 years after July 1, 1976 must comply with a maximum limit of 55 dBA at the same distances within the property from the sound source. When measured from a distance of 50 feet, waste disposal vehicles and other similar vehicles or equipment cannot exceed 80 dBA on or after 5 years from July 1, 1976. Noise levels can not exceed the ambient level by 10 dBA or more at schools, churches or hospitals.

Table 4-4: Noise Ordinance Standards (Sacramento County)

			Noise Levels Not To Be Exceeded In Residential Zone**	
EXTERIOR NOISE STANDARDS	**Maximum Time of Exposure**	**Noise Metric**	**7 a.m. to 10 p.m. (daytime)**	**10 p.m. to 7 a.m. (nighttime)**
	30 Minutes/Hour	L_{50}	55 dBA	50 dBA
	15 Minutes/Hour	L_{25}	60 dBA	55 dBA
	5 Minutes/Hour	$L_{8.3}$	65 dBA	60 dBA
	1 Minute/Hour	$L_{1.7}$	70 dBA	65 dBA
	Any period of time	L_{max}	75 dBA	70 dBA
INTERIOR NOISE STANDARDS				
	5 Minutes/Hour	$L_{8.3}$	-	-
	1 Minute/Hour	$L_{1.7}$	-	-
	Any period of time	L_{max}	-	-

*Construction Noise Exemption Times: 6:00 a.m. - 8:00 p.m. Weekdays and 7:00 a.m. - 8:00 p.m. Weekends
**5 dBA reduction for impact noise during non-exempt times
Source: Sacramento County Municipal Code, Chapter 6.68.070.

4.4.2 City of Folsom

The City of Folsom uses L_{50} as the baseline criterion level. Construction noise is exempt from these regulations during the periods of 7:00 AM to 6:00 PM on weekdays and 8:00 AM to 5:00 PM on weekends. If construction were to occur outside of these periods, activities would be required to comply with exterior and interior noise limits at residential receptors, as summarized in Table 3-3. For impulse noise (such as impact pile driving or blasting), the limits are reduced by 5 dBA.

Table 4-5: Noise Ordinance Standards (City of Folsom)

			Noise Levels Not To Be Exceeded In Residential Zone**	
EXTERIOR NOISE STANDARDS	**Maximum Time of Exposure**	**Noise Metric**	**7:00 AM to 10:00 PM (day)**	**10:00 PM to 7:00 AM (night)**
	30 Minutes/Hour	L_{50}	50 dBA	45 dBA
	15 Minutes/Hour	L_{25}	55 dBA	50 dBA
	5 Minutes/Hour	$L_{8.3}$	60 dBA	55 dBA
	1 Minute/Hour	$L_{1.7}$	65 dBA	60 dBA
	Any period of time	L_{max}	70 dBA	65 dBA
INTERIOR NOISE STANDARDS				
	5 Minutes/Hour	$L_{8.3}$	45 dBA	35 dBA
	1 Minute/Hour	$L_{1.7}$	50 dBA	40 dBA
	Any period of time	L_{max}	55 dBA	45 dBA

*Construction Noise Exemption Times: 7:00 AM - 6:00 PM Weekdays and 8:00 AM - 5:00 PM Weekends
**5 dBA reduction for impact noise during non-exempt times
Source: City of Folsom, CA Municipal Code. Chapter 8.42, Table 8.42.040

4.4.3 Summary of LORs

The closest jurisdiction with the most restrictive noise level guidelines must be abided by. For the purpose of this project, the City of Folsom's standards will be followed because it is the closest jurisdiction with the most restrictive noise ordinance. The baseline criterion level (L_{50}) is 50 dBA during daytime and 45 dBA during nighttime. If this criterion is met within the City of Folsom, noise standards for other nearby jurisdictions will also be achieved. If the ambient noise level is above 50 dBA, then this becomes the new standard at each individual noise-sensitive receptor. For the City of Folsom, construction noise exemptions allow for noise generated by construction would not be subject to the exterior noise standard limits. These exempt times last from 7:00 AM to 7:00 PM during weekdays and 8:00 AM to 5:00 PM on weekends.

5.0 AMBIENT NOISE SURVEY

Ambient noise values are used in the impacts analysis to compare to noise sources and sound levels associated with the proposed project and to federal, state, and local ordinances and regulations (LOR) to determine whether proposed project activities would exceed established noise criteria

Extensive ambient noise data were obtained by URS in March 2009 to characterize existing noise conditions as part of the Early Excavation Supplemental EA/IS. The coverage of the ambient data monitoring encompasses the Control Structure and includes the Spillway Chute, Stilling Basin, Dike 7, Mormon Island Auxiliary Dam (MIAD), and the various import haul routes. The recency, completeness, quality, and overall coverage of these monitoring data make them applicable to this addendum. These data are included in this noise evaluation are considered baseline ambient noise conditions. The remainder of this section is directly quoted from the Early Excavation Supplemental EA/IS (2009).

The survey consisted of short-term (10 minutes) and long-term measurements (24 hours) at noise-sensitive receptors. Weather conditions were very consistent over the 3 days of noise monitoring. The temperature ranged from 55 degrees Fahrenheit at night to 75 degrees Fahrenheit during the day. Winds were mild and gusted to 6 or 7 miles per hour during noise monitoring. The long-term measurements were conducted using three Larson Davis Model 820 American National Standards Institute (ANSI) Type 1 integrating sound level meters (serial numbers 1527, 1528 and 1598). The sound level meters were bolted to trees, telephone poles or fences approximately 5 feet above the ground in order to approximate the height of the human ear. Short-term monitoring was conducted using an ANSI Type 1 integrating sound level meter (serial number 2672071). All sound level meters were calibrated before and after the measurement periods with a Larson Davis Model CAL200 calibrator (serial number 2794). All sound level measurements conducted by URS were in accordance with ISO 1996a, b, c.

The long-term and short-term measurement sites for human sensitive receptors are summarized in Table 5-1 and Table 5-2, respectively.

Table 5-1: Long-Term Measurement Sites

Location ID (1)	Location and Description	Modeled Receptor Equivalents
LT-1	Folsom State Prison	Folsom Prison Buildings
LT-2	Tacana Drive and East Natoma Street	R-4 (DIKE7-R-04) (2)
LT-3	Mountain View Drive	R-3 (DIKE7-R-01 to 06)
LT-4	East Natoma Street and Green Valley Road	R-9 and R-10 (MIAD-R-08 and 09)
LT-5	Shadowfax Court	Not Used
LT-6	East of Folsom Auburn Road and Pierpoint Circle	Lake Point Apartments 1-5 (R-1) Commercial-Utility Buildings 1-5 (CU-1)

Notes:
(1) No ambient measurements were recorded at LT-1 for security reasons.
(2) Figures may indicate either short-from receptor labels or the longer labels)

Long-Term Site Monitoring

Five long-term measurements were conducted. Long-term data was not collected at the Folsom State Prison for security reasons. The table below summarizes the long-term measurement site data. The raw data for each long-term measurement site are provided in Appendix A of the DS/FDR Early Excavation Supplemental EA/IS (2009).

Table 5-2: Long-Term Measurement Site Data

Site ID	Location	Start Date	Start Time	Hourly L_{eq} Range (dBA)	CNEL (dBA)
LT-1	Folsom State Prison	N/A	N/A	N/A	N/A
LT-2	Tacana Drive and East Natoma Street	3/25/2009	17:00:00	51.5 - 69.4	71
LT-3	Mountain View Drive	3/25/2009	15:00:00	32.8 - 50.9	50
LT-4	East Natoma Street and Green Valley Road	3/24/2009	14:00:00	58.0 - 75.2	76
LT-5	Shadowfax Court	3/24/2009	13:00:00	34.1 - 57.5	51
LT-6	East of Folsom Auburn Road. and Pierpoint Circle	3/24/2009	15:00:00	31.7 - 56.8	50

Notes:
Leq Equivalent noise level
CNEL Community Noise Equivalent Level
dBA A-weighted Decibel

EXPLANATION:

LT-8 — LONG-TERM AMBIENT NOISE MONITORING LOCATION

APPROXIMATE AREA OF WORK (REFER TO MAIN DOCUMENT)

GRAPHIC SCALE
1:15,000

100 0 100 200 500 1,000m

0 500 1,000 3,000 FT

US Army Corps of Engineers
Sacramento District

JOINT FEDERAL PROJECT
CONSTRUCTION OF THE CONTROL STRUCTURE AND LINING OF THE SPILLWAY CHUTE AND STILLING BASIN
SUPPLEMENTAL EA/IS

FIGURE 5-1
NOISE MONITORING LOCATION MAP

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DOUGLAS GRANT, P.G. FIG 5-1_Ver05MAY10

6.0 IMPACTS ANALYSIS AND MITIGATION MEASURES

The noise impacts analysis compares predicted noise levels against the impact significance criteria presented in Section 6.2 below. Significant impacts are summarized for each project phase where one or more impacts were identified. A "no project alternative" was not evaluated due to the necessity of completing the current project.

For the purposes of this noise evaluation, the overall project was divided into specific phases. The phases are specific to probable and significant variations in noise model input and output. This is primarily due to terrain elevation changes, variable equipment types proposed, and the modeled locations of each piece of equipment. These phases may differ slightly from the project description, but adhere to major construction phases provided by the USACE.

Table 6-1: Construction Phase Activities and Figure Reference

Construction Phase	Description	Comments	Figure Reference
Off-Site Haul Routes (1)	Traffic Noise on Folsom Lake Crossing and Folsom Auburn Road (2)	80 Heavy Truck ADT and 70 Auto ADT	NA
Phase 1	Control Structure Excavation	See sub phases below	
Phase 1a	Blasting at Elevation 475'	Elevations vary between 470' and 480'	6-1, 6-1a
Phase 1b	Blasting at Elevation 350'	Approximately 25-30 feet above assumed final cut elevation of 325'	6-1, 6-1b
Phase 1c	Excavation after Blasting	After Phase 1a - Noisiest due to higher elevations compared to Phase 1b and 1c. Includes Haul Road and rock disposal at Dike 7 and MIAD	6-1c
Phase 2	Control Structure Foundation Work	Haul Road and coarse rock loading at Dike 7 and MIAD Stockpiling and Batch Plant operation at El. 480' on existing Overlook	6-2
Phase 3	Control Structure Gate Installation	Limited noise sources – single point sound (SPS) and RCNM screening used	6-3
Phase 4	Stilling Basin and Spillway Chute Foundation Preparation and Backfill	Modeled noise sources in and around the Stilling Basin (Worst Case)	6-4
Phase 5	Stilling Basin and Spillway Chute Concrete Placement	Haul Road and coarse rock loading at Dike 7 and MIAD Stockpiling and Batch Plant operation in the Spillway Chute at El. 340-345'	6-5
Phases 2 & 5	Batch Plant Locations	Comparison of Batch Plant located on peninsula and located in the Spillway Chute	6-6

Notes:
(1) Off-site Haul Routes for imported fill, aggregate, and rebar for foundation and other concrete work, and structural, mechanical, and electrical building components for the Control Structure (Phase 2, 3, 4, and 5).
(2) North of Folsom Lake Crossing.
MIAD Mormon Island Auxiliary Dam (disposal and course material stockpiling for USACE).

6.1 Noise Evaluation Assumptions

Elevations of the Spillway Chute and Stilling Basin are currently in final design modification, therefore the elevations used for modeled terrain and structures in this evaluation are conservative and provide "worst case" predicted noise levels at nearby receptors.

Noise impact modeling for blasting was based on an initial configuration that was relatively shallow, did not incorporate blast mats or blocking terrain between the blast area and sensitive receptors. The specifications were later refined to include blocking terrain, blast mats, and deeper borings. The total amount of explosive charge was increased due to closer spacing, but the initial modeling is considered a "worst case" scenario primarily due to the direct line-of-sight between the blast pattern and sensitive receptors along Mountain View Drive. The impacts and the mitigation measures remain the same for both blasting configurations.

The blasting configurations are as follows:

Modeled Configuration: Ammonium nitrate and fuel oil (ANFO) charges with a weight of 55- to 65-pounds per 5- to 10-foot deep hole on a 3-by-3-foot grid. A total of 9 charges with 30-foot spacing between each charge. No blast mats or blocking terrain between the blast grid and sensitive receptors. Two elevations were modeled; at approximate elevations 475-480 feet and 350 feet mean sea level (msl).

Refined Configuration: Charge weight of 44 pounds packed in 20-foot deep borings on 5-foot centers on a 20-foot-wide bench with no larger than a 75-foot wall. The wall serves as shielding terrain from a noise perspective. No more than 75 charges will be used. Blast mats will be placed over the charges.

Existing construction noise monitoring data were not available during the preparation of this report. Blasting and heavy construction work is currently in progress at the Spillway Chute and Stilling Basin, and dumping at Dike 7 is being conducted during construction-exempt hours between 7:00 AM and 7:00 PM.

Future operations will be conducted primarily during exempt hours. On limited occasions operations may begin before exempt hours and end in the evening after 7:00 PM. Comparing modeled construction noise to noise criteria during exempt hours is irrelevant, so evening and nighttime LORs were used for comparison. Therefore, references to predicted noise impacts will be limited to non-exempt hours.

6.2 Impact Significance Criteria

Impacts are considered adverse and significant if the project noise levels exceed field-monitored ambient noise levels and any of the following:

- LOR: City of Folsom and Sacramento County
- State of California: CEQA
- Federal: FHWA, NEPA, or USEPA

6.2.1 CEQA Significance Threshold

According to the CEQA Guidelines a project may be deemed to have a significant adverse impact on the environment if it would:

Expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. Impacts to the proposed project would be significant if the new project elements exceed the existing standards.

Expose persons to or generate excessive ground-borne vibration or ground-borne noise levels. Impacts to the proposed project would be significant if the new project elements would create excessive ground vibration either by construction methods, blasting, or redistribution of heavy truck traffic.

Permanently and substantially increase ambient noise levels in the project vicinity above existing without the project. Impacts to the proposed project would be significant if the new project elements exceed the "substantial increase" criteria as set forth by Caltrans.

Temporarily or periodically increase ambient noise levels in the project vicinity above levels existing without the project. Impacts to the proposed project would be significant if the new project elements exceeded the construction noise ordinance or be considered "substantial" by Caltrans.

For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels. Impacts to the proposed project would be significant if the project places additional noise receptors within the existing flight operations area of adjacent airport.

6.2.2 LOR Significance Thresholds

For construction activities that will occur during non-exempt hours, the following City of Folsom and Sacramento County thresholds are applicable:

- From 10:00 PM to 7:00 AM: L_{50} of 45 dBA and L_{max} of 65 dBA.
- From 7:00 PM to 10:00 PM: L_{50} of 50 dBA and L_{max} of 70 dBA.
- L_{max} of 70-85 dBA in areas outside of City of Folsom jurisdiction.
- For traffic noise within the City of Folsom: L_{dn}/CNEL of 65 dBA.

6.3 Off-Site Traffic Noise Impacts and Mitigation

Projected traffic increases were evaluated for the project. Average Daily Trips were calculated and rounded up. The ADT used for traffic noise prediction are consistent with the traffic analysis. These values are 70 ADT for heavy trucks and 80 ADT for automobiles. The TNM 2.5 Look up Table was used as screening tool. The LUT calculates noise based on hourly traffic, so the ADT and percentage of daytime traffic by vehicle type were used to calculate hourly values. Four scenarios were modeled:

1. Current traffic noise during a daytime (i.e. "exempt") hour (Table 6-2).
2. Existing traffic and half of the project auto and heavy truck traffic occurring within a daytime hour (Table 6-2).
3. Existing traffic, all project autos and heavy truck traffic occurring within a daytime hour (Table 6-3).
4. Existing traffic, half of the project auto and heavy truck traffic occurring within a nighttime (i.e. "non-exempt") hour (Table 6-4).
5. Existing traffic, all project auto and heavy truck traffic occurring within a nighttime hour ("worst case") (Table 6-4).

Traffic data from the Early Excavation EA/IS study for Folsom Auburn Road and Folsom Lake Crossing were updated using a 3-percent yearly increase in ADT. Current heavy truck ADT counts correspond to the Early Excavation work currently in progress. The input parameters and results are provided in the table below:

Table 6-2: Traffic Noise, Current Daytime Hourly Traffic + Half of Project Traffic in a Daytime Hour

Road Segment	Current ADT and Hourly Daytime Traffic (1)	Current A-Weighted Hourly Equiv. Sound Level at 50'	Project ADT + ½ Current ADT by Daytime Hour	Projected Hourly Equiv. Sound Level at 50' (dBA)	Incremental Increase in dBA
Folsom Lake Crossing	15,250 / 1000	66.5	15,325 / 1,075	68.0	1.5
Folsom Auburn Road	29,700 / 2,550	72.5	29,770 / 2,625	72.9	0.4

Notes: Initial traffic data from DS/FDR Supplemental EA/IS (2009).
Breakdown of vehicle types during a daytime hour at:
Folsom Lake Crossing = 937 Autos, 17 medium trucks, and 45 heavy trucks.
Folsom Auburn Road = 1,931 Autos, 545 medium trucks, and 74 heavy truck.

Table 6-3: Traffic Noise, Current Daytime Hourly Traffic + All Project Traffic in a Daytime Hour

Road Segment	Current ADT and Hourly Daytime Traffic	Current A-Weighted Hourly Equiv. Sound Level at 50'	Project ADT + ½ Current ADT by Daytime Hour	Projected Hourly Equiv. Sound Level at 50' (dBA)	Incremental Increase in dBA
Folsom Lake Crossing	15,250 / 1000	66.5	15,400 / 1,150	69.0	2.5
Folsom Auburn Road	29,700 / 2,550	72.5	29,850 / 2,700	73.3	0.8

Table 6-4: Traffic Noise, Current Nighttime Hourly Traffic + All Project Traffic in a Single Night Hour

Road Segment	Current Hourly Nighttime Traffic (1)	Current A-Weighted Hourly Equiv. Sound Level at 50'	Project Hourly Traffic + Current Hourly Traffic by Nighttime Hour (1/2 / Full) *	Projected Hourly Equiv. Sound Level at 50' (dBA) (1/2 / Full) *	Incremental Increase in dBA
Folsom Lake Crossing	176	57.0	261 / 326	63.3 / 65.6	**6.3 / 8.6**
Folsom Auburn Road	391	63.0	466 / 541	67.2	**4.2**

Notes:
(1) Breakdown of vehicle types during a nighttime hour at:
Folsom Lake Crossing = 172 Autos, 3 medium trucks, and 1 heavy truck.
Folsom Auburn Road = 327 Autos, 63 medium trucks, and 1 heavy truck.
* Current hourly traffic + half of project traffic and current hourly traffic + all project traffic.

INCREASE IN AMBIENT NOISE

Incremental increases in traffic noise from the addition of project noise range from less than 1 dBA to less than 3 dBA. Small increases less than 3 dBA are typically not perceived. Additionally, traffic noise on both roads currently exceeds the City of Folsom's limitation of 65 dBA. Daytime impacts are less than significant. If all heavy trucks were to arrive and depart in a single hour after 10:00 PM and before 7:00 AM, when traffic and ambient noise levels are very low, impacts become significant as indicated on Table 6-4; however, since all project traffic is long-term temporary, no permanent noise increases will occur.

Impact N-1: Transportation of material and equipment from off site would temporarily increase local noise levels near sensitive receptors during nighttime or evening (Class II)

Mitigation Measure N-1a: Provide Advance Notices. Provide residents and businesses near the project advance notices of project activities, schedule, anticipated traffic, and potential noise issues. The advance notice shall describe the potential noise disruption and the steps the USACE or its contractor plans to take to minimize the noise (for example, by enclosing and muffling equipment, limiting idling and engine brake use).

Mitigation Measure N-1b: **Provide Liaison and Hotline for Nuisance Complaints**. In the event of complaints by nearby residents, the construction contractor shall monitor noise from construction activity. Noise shall be measured at the perimeter of the work area or adjacent to sensitive receptors. In the event that construction noise exceeds the specified limits prescribed by the USACE, the offending construction activity shall cease until appropriate measures are implemented. Optional: Noise thresholds shall be included in the construction contractor's contract with USACE.

Mitigation Measures N-1a and N-1b form the basis for public response to all noise impacts related to the proposed project. Both are referenced in the Impacts below.

Mitigation Measure N-1c: Heavy Truck Delivery Hour Planning. Attempt to schedule heavy truck deliveries during exempt working hours and whenever possible, avoid deliveries during a single hour, especially during non-exempt hours.

Mitigation Measure N-1d: Prohibit Engine Brake (Jake Brake) use within City Limits. Many noise complaints arise from heavy truck use of engine brakes to slow the truck down. This type of brake is secondary to the main braking system of a large truck, the air brake. Use of this type of braking can be avoided by proper speed control.

Mitigation Measure N-1e: Properly Maintain Equipment. The application contractor will properly maintain and tune engines of all application equipment and maintain properly functioning mufflers on all internal combustion engines to minimize noise levels. Perform noise reduction maintenance during routine maintenance for each vehicle serviced.

IMPACTS TO SENSITIVE RECEPTORS

Hauling and delivery operations have the potential to temporarily impact sensitive receptors. Quarry trucks and 18-wheel semi tractor trailers could cause short-term and temporary noise level increases if arrival and departure times are during non-exempt morning hours, or if all ADT occur during a single hour.

Significance after Mitigation: Less than Significant

6.4 Construction Noise Impacts and Mitigation Measures

Construction operations were evaluated by the five primary phases determined by USACE as described in the Project Description. Phase 1 was further subdivided for this noise analysis.

6.4.1 Phase 1: Control Structure Excavation

Four sub phases of the Control Structure Excavation were modeled and evaluated. These include blasting at three different elevations and excavation after the highest blast elevation. The phases include:

- Phase 1a – Blasting at Elevation 476 to 480 feet (146-148 meters). A single event within the footprint of the proposed Control Structure. Model is considered the "worst case" blasting scenario with direct line-of-site to sensitive receptors.
- Phase 1b – Blasting at Elevation 350 feet (106 meters). A single event approximately 20 feet above the assumed final grade of the Control Structure. Terrain blocks line-of-sight to nearby sensitive receptors. Based on the latest specifications, this is the more realistic of the two modeled blasting scenarios.
- Phase 1c – Excavation, Hauling, and Disposal. Removal of material after Phase 1a blasting.

Blasting Noise, Phases 1a and 1b:

Blast models were developed using BNOISE2 and SP7. Sound isopleth maps and cross-sections are presented individually and as a single figure for comparison.

INCREASE IN AMBIENT NOISE

Ambient noise levels will increase and then decay rapidly back to ambient levels over a short period of time. This period typically lasts several seconds and is the result of planned sequential firing of multiple charges. Since single-event noise very rarely exceeds the L_{dn} or CNEL, no adverse impacts to ambient noise levels are likely to occur.

No Adverse Impact

IMPACTS TO SENSITIVE RECEPTORS

Modeled L_{max} ranged from 50 to 72 dBA. The highest values predicted were at the closest buildings over looking the reservoir and construction site at Folsom Prison, or immediately north of Folsom Prison property (LT-1). The highest noise level (L_{max}) predicted at specific residences on Mountain View Drive ranged from 58 dBA to 61 dBA. However, since the PK15 unweighted noise level in the blast area is above 140 dB, vibration could cause minor annoyance to residents due to rattling windows or other structural building components.

Impact N-2: **Blasting would cause vibration and noise causing potential startling and annoyance to nearby sensitive receptors (Class II)**

Mitigation Measure N-2a: Notify the City of Folsom, and if necessary, nearby residents at least 72 hours in advance. Review previous noise monitoring results from blasting events during Early Excavation. Modify notification periods as necessary. Conduct blasting during exempt hours.

Mitigation Measure N-2b: Blast Location Planning. Where possible, plan blasting locations so existing terrain will shield blast noise. Blasting and excavating Lamb Chop Hill from west to east would shield nearby sensitive receptors located to the southeast for the majority of blasting operations. The current specifications require this.

Mitigation Measure N-2c: Utilize Blast Mats or other BACT. If the proposed charge size permits use of an available BACT to reduce noise and/or vibration, require the contractor to use them during blasting operations. The current project blasting specifications require this.

Significance after Mitigation: Less than Significant

Construction Noise during Excavation

This phase was selected for modeling as the elevations after initial blasting have a direct line-of-site to most sensitive receptors on all sides of the proposed area of work. Haul road travel by large dump trucks and rock disposal at Dike 7 and MIAD were also modeled as part of Phase 1c.

INCREASE IN AMBIENT NOISE

Ambient noise levels will increase during all excavation operations in Phase 1. Modeled L_{dn} noise levels at LT-3 were 70 dBA for all floors.

IMPACTS TO SENSITIVE RECEPTORS

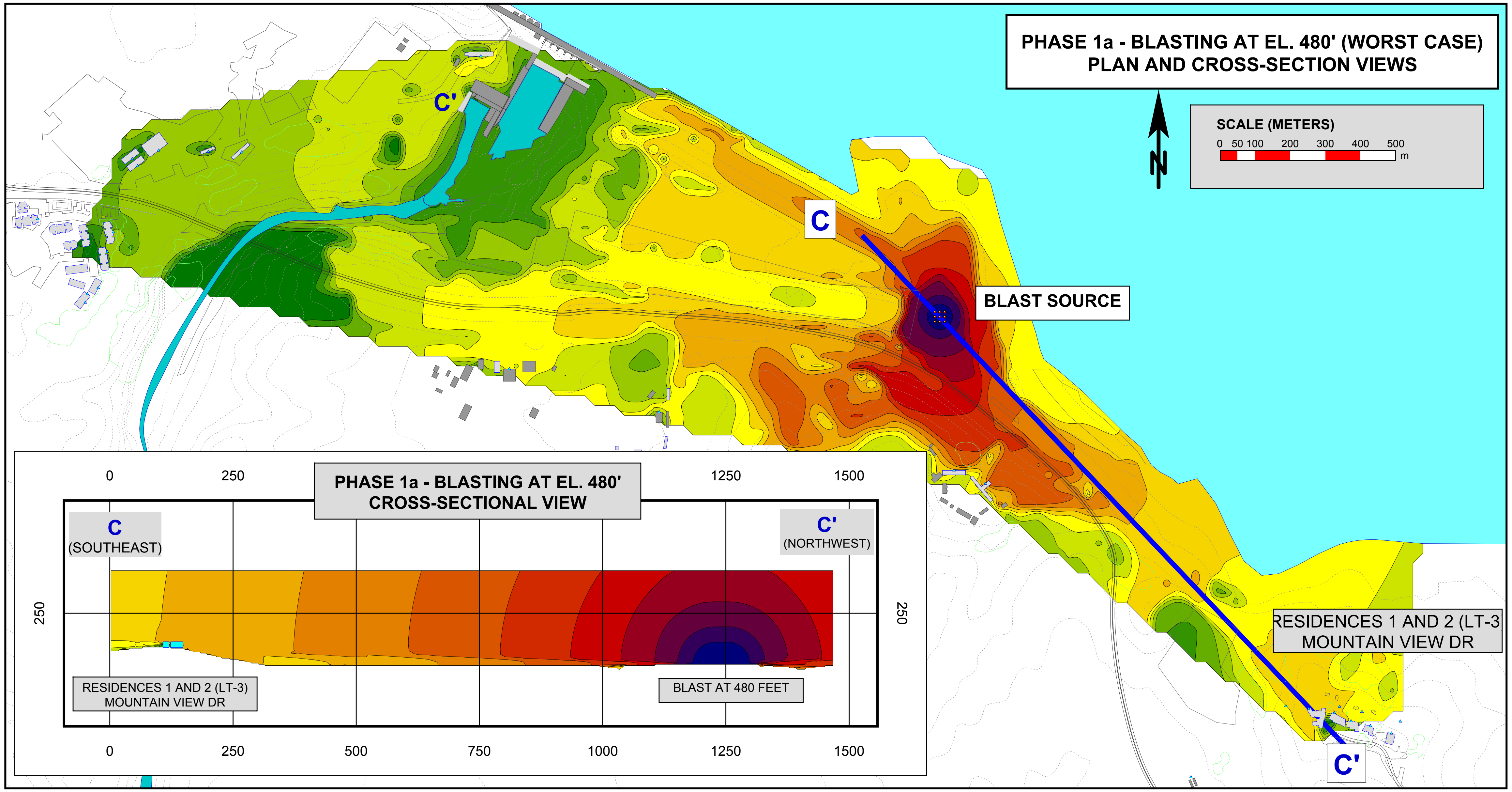
Several residences adjacent to Dike 7 may be significantly impacted by rock disposal in Dike 7. The worst case model used a front-end loader and belly dump truck unloading rock in the southeast corner of this site. Additionally, Haul Road noise was modeled as a line source over an 8-hour day using typical ingress-egress routing into and out of Dike 7. Any work performed during non-exempt hours will likely exceed LORs by up to 20-25 dBA.

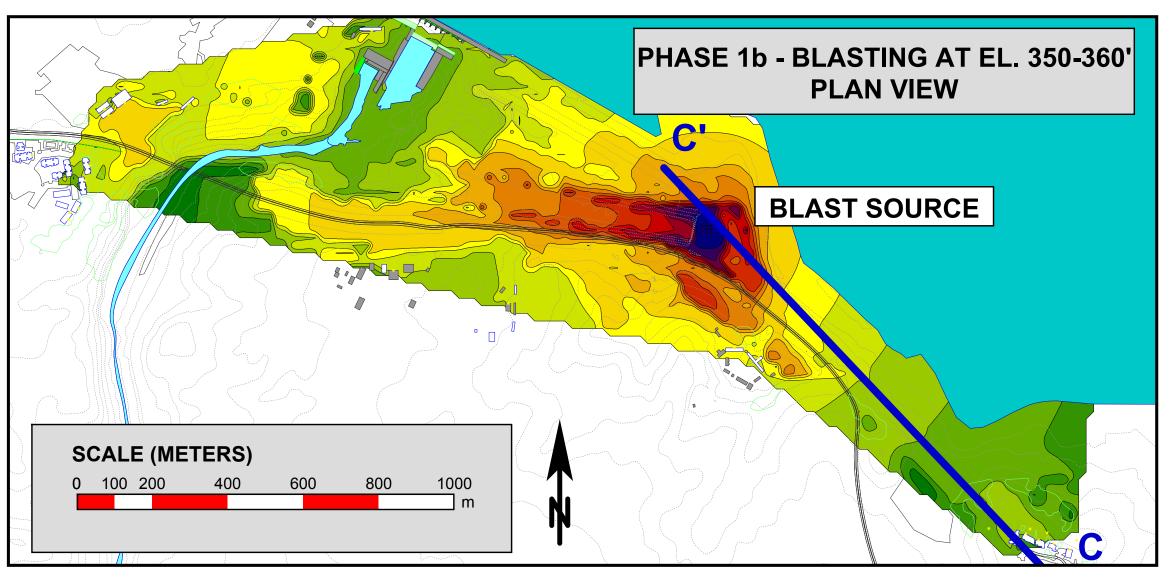
Impact N-3: Dike 7 and MIAD rock disposal would cause loud impulsive noise at nearby sensitive receptors

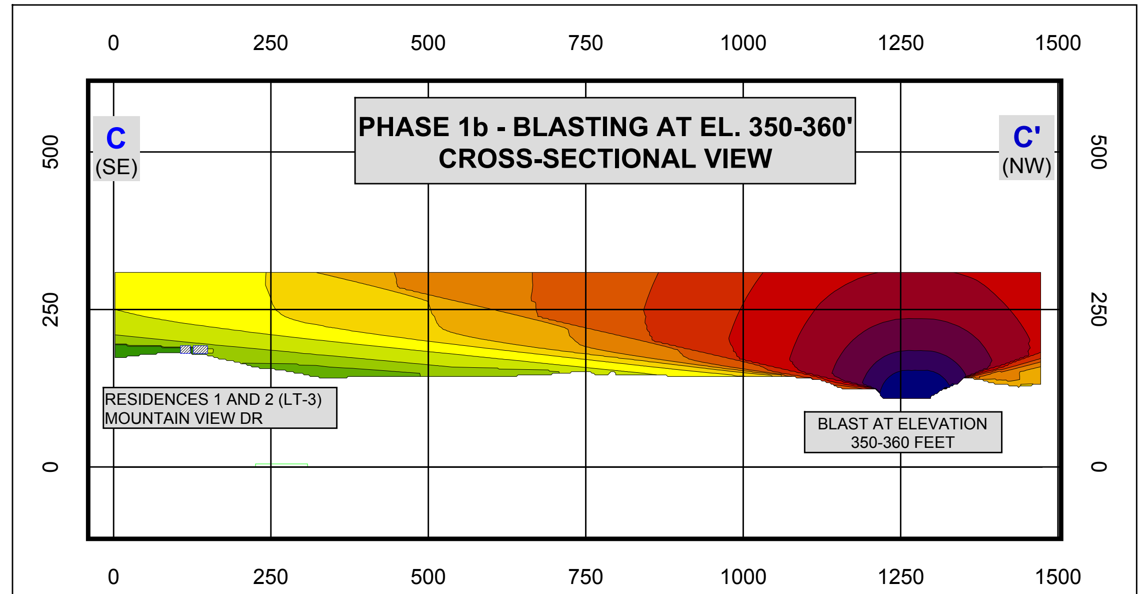
Mitigation Measure N-3: Do not use Dike 7 or MIAD for Disposal during Non-exempt Hours.

See also: Mitigation Measures N-1a, N-1b, N-1d, N-1e, N-2a, and N-2b.

Significance after Mitigation: Significant but Mitigable







LEGEND

- BLAST CHARGE (ANFO 55-LB) x 9
- STRUCTURE
- RECEPTOR BUILDING
- OTHER CONCRETE STRUCTURE
- MITIGATION AREA - TREES/SHRUBS
- BRIDGE
- DAM FACE
- SOUND WALL
- GROUND ABSORPTION (ROCK)
- SENSITIVE RECEIVER
- CROSS-SECTION
- SECTION SUBSURFACE
- ELEVATION CONTOUR

PREDICTED NOISE LEVEL
L_{max}
in dB(A)

- <= 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85
- 85 - 90
- 90 - 95
- 95 - 100
- 100 - 105
- 105 - 110
- > 110

NOTES:

BLASTING PATTERN: 3x3 GRID @ 30' O.C.
CHARGE TYPE: ANFO 55 LB PER HOLE
DEPTH: 5'-10' BGS
NO OTHER NOISE SOURCES

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

JOINT FEDERAL PROJECT
DRAFT DS/FDR SUPPLEMENTAL EA/IS

FIGURE 6-1: SOUND ISOPLETHS IN PLAN AND CROSS-SECTION BLASTING SUMMARY BY PHASE

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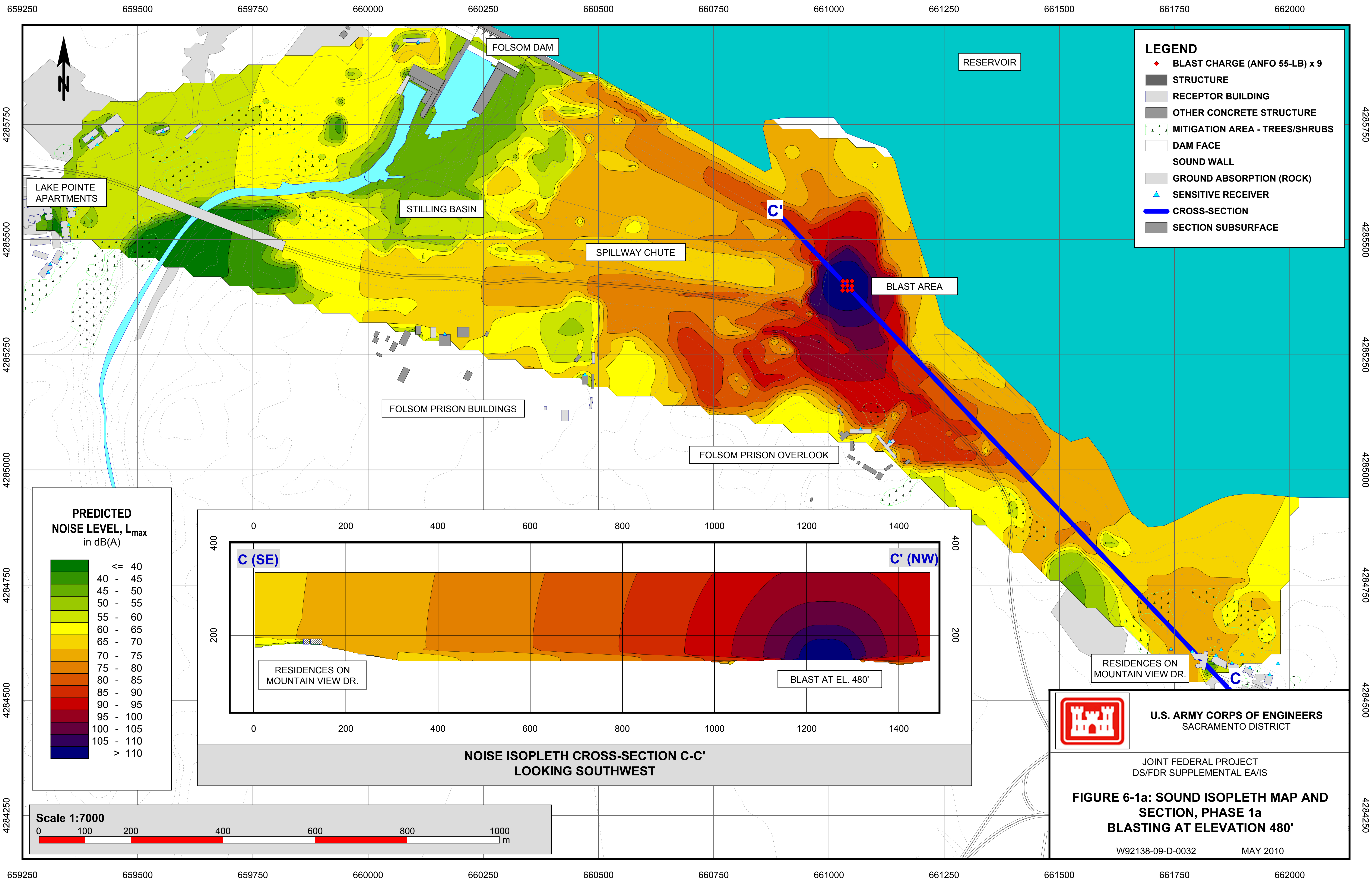
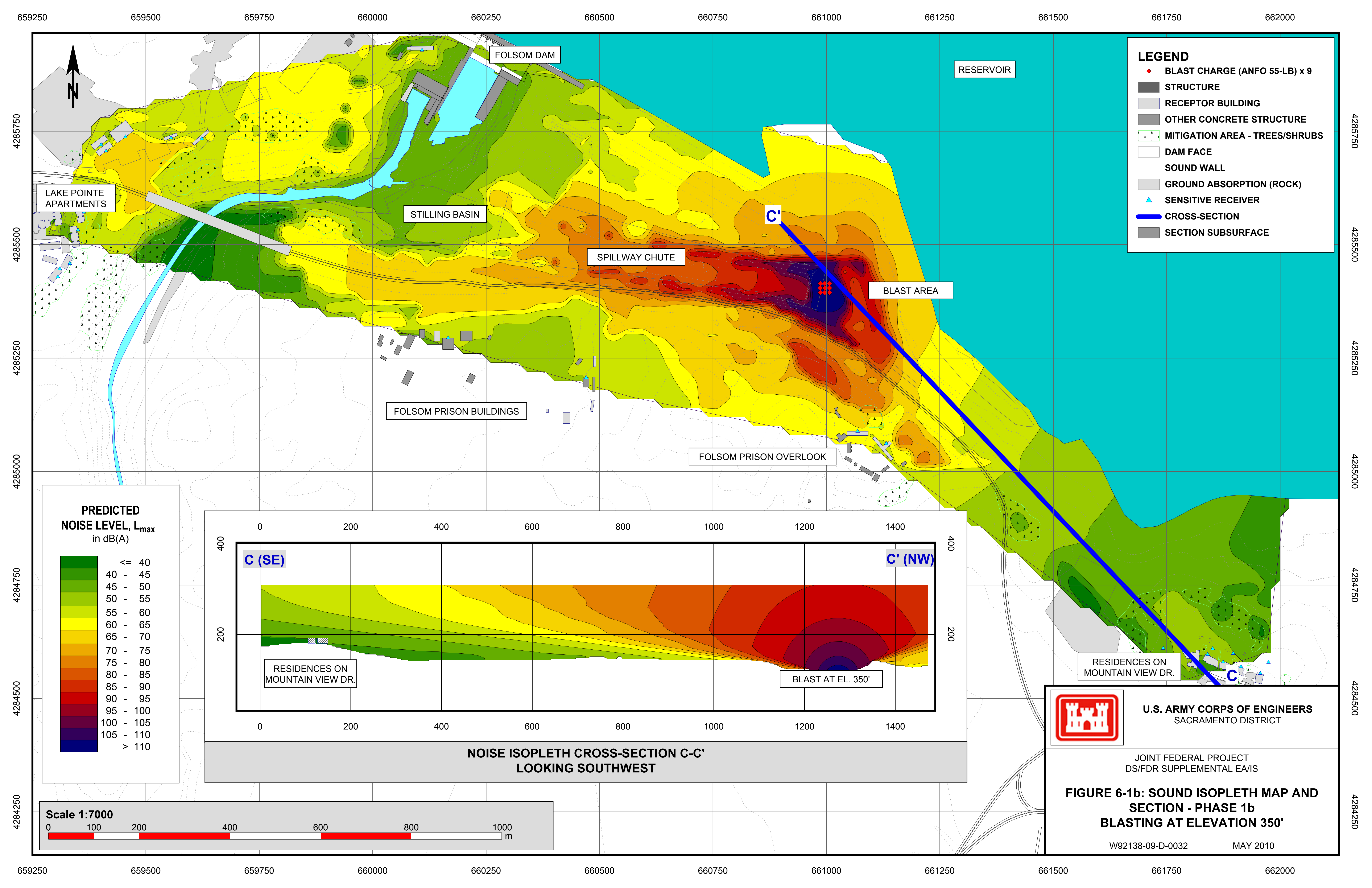


FIGURE 6-1a: SOUND ISOPLETH MAP AND SECTION, PHASE 1a BLASTING AT ELEVATION 480'


FOLSOM DAM
RESERVOIR
LAKE POINTE APARTMENTS
STILLING BASIN
SPILLWAY CHUTE
BLAST AREA
C'
C
FOLSOM PRISON BUILDINGS
FOLSOM PRISON OVERLOOK
RESIDENCES ON MOUNTAIN VIEW DR.
LEGEND
BLAST CHARGE (ANFO 55-LB) x 9
STRUCTURE
RECEPTOR BUILDING
OTHER CONCRETE STRUCTURE
MITIGATION AREA - TREES/SHRUBS
DAM FACE
SOUND WALL
GROUND ABSORPTION (ROCK)
SENSITIVE RECEIVER
CROSS-SECTION
SECTION SUBSURFACE
PREDICTED NOISE LEVEL, L_{max} in dB(A)
<= 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85
85 - 90
90 - 95
95 - 100
100 - 105
105 - 110
> 110
C (SE)
C' (NW)
RESIDENCES ON MOUNTAIN VIEW DR.
BLAST AT EL. 350'
0 200 400 600 800 1000 1200 1400
400 200
NOISE ISOPLETH CROSS-SECTION C-C'
LOOKING SOUTHWEST
Scale 1:7000
0 100 200 400 600 800 1000 m
659250 659500 659750 660000 660250 660500 660750 661000 661250 661500 661750 662000
4285750 4285500 4285250 4285000 4284750 4284500 4284250
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
JOINT FEDERAL PROJECT
DS/FDR SUPPLEMENTAL EA/IS
FIGURE 6-1b: SOUND ISOPLETH MAP AND SECTION - PHASE 1b BLASTING AT ELEVATION 350'
W92138-09-D-0032
MAY 2010

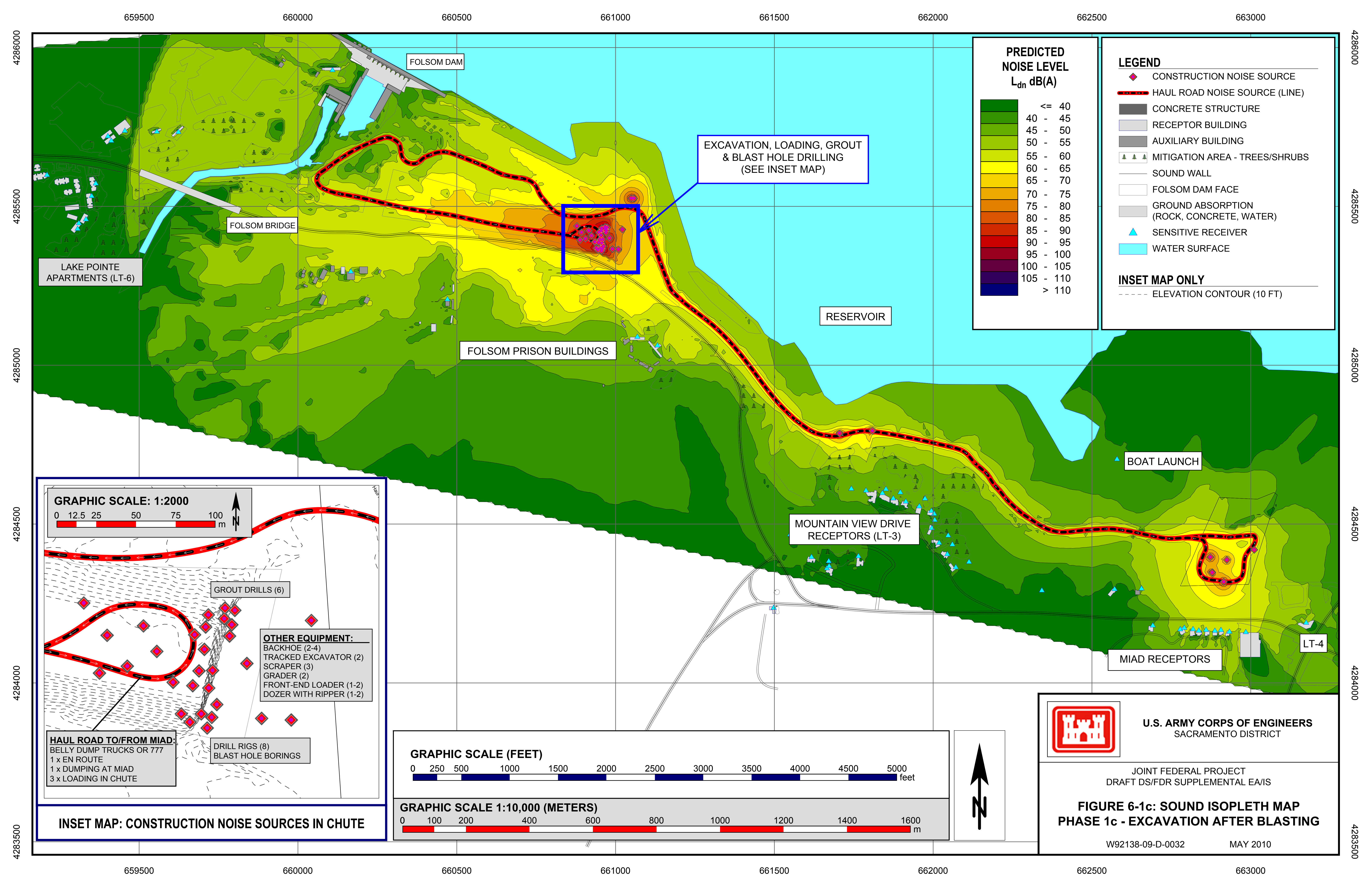


FIGURE 6-1c: SOUND ISOPLETH MAP
PHASE 1c - EXCAVATION AFTER BLASTING

6.4.2 Phase 2: Control Structure Foundation and Concrete Work

Modeled noise sources include the concrete Batch Plant, Haul Road transport of coarse material from Dike 7 and MIAD by super dump trucks (Caterpillar 777 or similar), wheeled front-end loaders loading of coarse material (rock) into the super dump at Dike 7 and MIAD, and various cement mixing, curing, blowing, and pouring equipment/operations. The Batch Plant was modeled both top-side on the peninsula and in the Spillway Chute for comparison.

INCREASE IN AMBIENT NOISE

Ambient noise levels will increase during Phase 2 along the Haul Road, in Dike 7 and MIAD Disposal Areas and in the construction area by up to 10 dBA. See Figure 6-2.

IMPACTS TO SENSITIVE RECEPTORS

Several residences adjacent to Dike 7 may be significantly impacted by coarse material loading in Dike 7 and transport to the Batch Plant or aggregate stockpiles. The modeled situation is similar to that in Phase 1d except the front-end loader noise signature was changed to rock and gravel loading instead of disposal. Modeled L_{max} noise levels exceeded 70 dBA over 24 hours.

Impact N-4: Dike 7 and MIAD rock loading and transport to the Batch Plant would cause impulsive noise and high noise levels at nearby sensitive receptors (Class II)

Mitigation Measure N-4: Avoid using Dike 7 or MIAD for Coarse Material Loading during Non-exempt Hours.

Impact N-5: Stationary and Mobile Construction Equipment Noise would increase noise levels near sensitive receptors (Class II)

Mitigation Measure N-5a: Utilize Best Available Control Technologies. Minimize noise levels using BACT, including installation of temporary noise barriers, acoustical enclosures, and stack silencers

Mitigation Measure N-5b: Utilize terrain features to reduce noise to acceptable levels wherever possible. Locate the concrete batch plant in the Spillway Chute instead of topside

See also: Mitigation Measures N-1a, N-1b, N-1d, N-1e, N-2a, and N-2b.

Significance after Mitigation: Less than Significant.

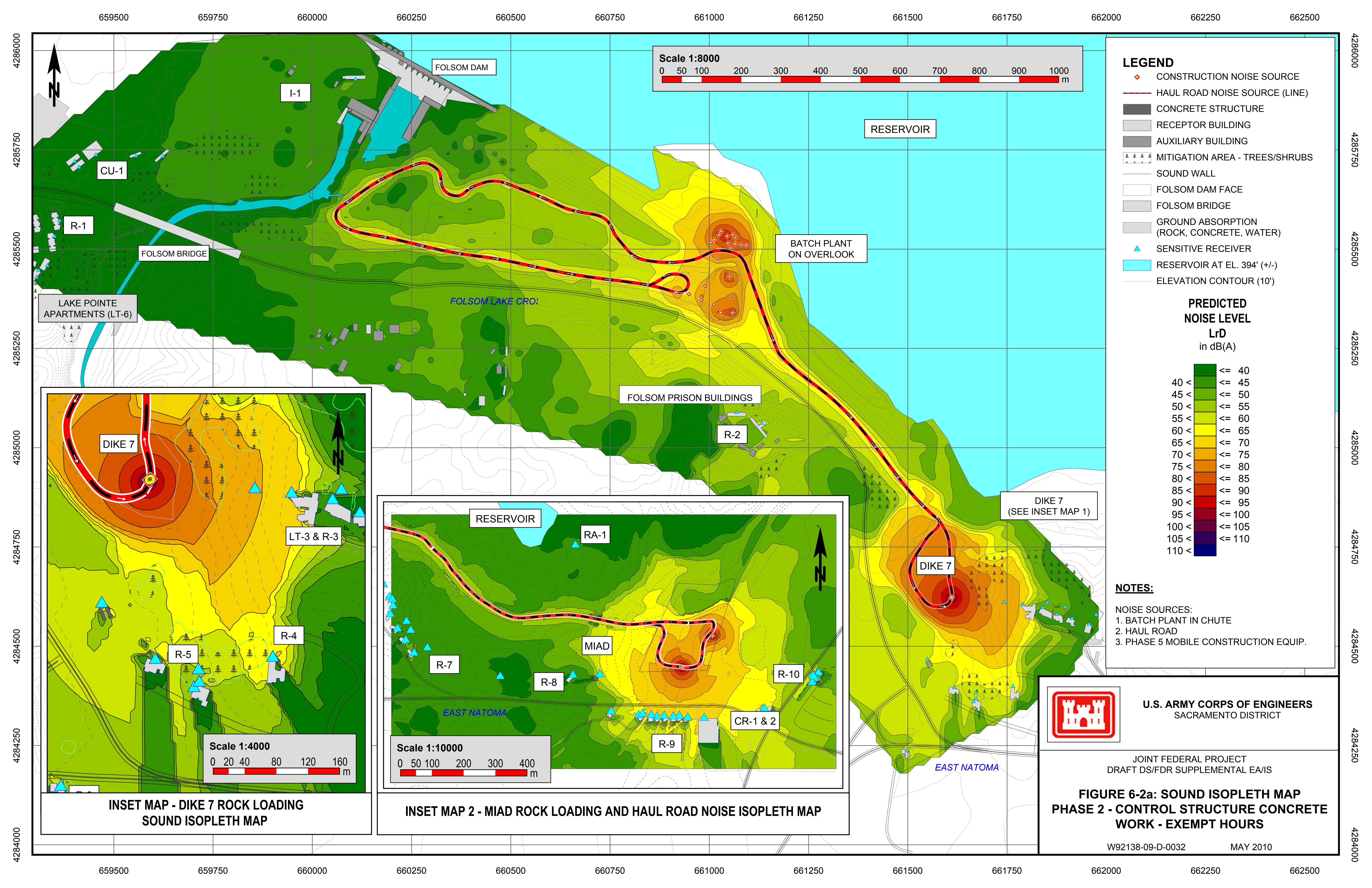


FIGURE 6-2a: SOUND ISOPLETH MAP
PHASE 2 - CONTROL STRUCTURE CONCRETE WORK - EXEMPT HOURS

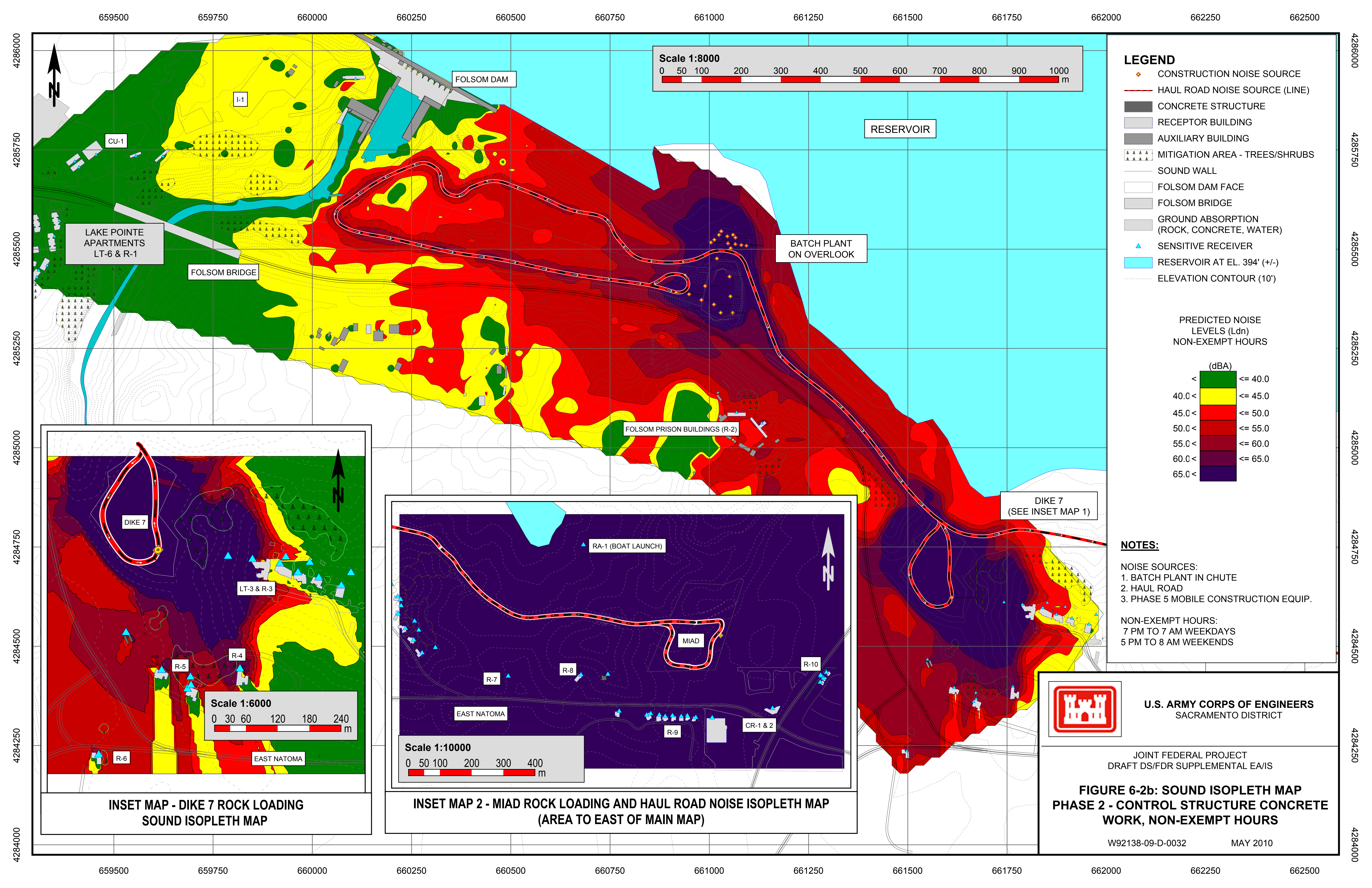


FIGURE 6-2b: SOUND ISOPLETH MAP PHASE 2 - CONTROL STRUCTURE CONCRETE WORK, NON-EXEMPT HOURS

6.4.3 Phase 3: Control Structure Construction and Gate Installation

This phase is relatively quite compared to all other phases. Screening level modeling was performed for the two tracked cranes using RCNM and single-point sound using SP7. Modeled noise levels at all receptors were less than 40 dBA. See Figure 6-3.

No adverse noise impacts.

6.4.4 Phase 4: Stilling Basin and Spillway Chute Foundation Preparation

Front-end Loaders, grout drills, tracked driver cranes portable cement mixers, and (assumed) cement blowers were qualitatively and quantitatively evaluated at the screening level. This phase is not expected to generate significant noise levels; therefore RCNM was used as an initial screening tool. Based on the RCNM results, more detailed modeling was performed for model correlation and to examine the effects of terrain, ground cover, and mitigative features such as dense vegetation and trees. Modeled L_{dn} noise levels at the Lake Pointe Apartment residential receptors ranged from 40 to 52 dBA. Ambient monitoring at LT-6 ranged from 31.7 to 56.8 dBA. Work conducted during non-exempt hours before 7 am may have a significant but mitigable impact on these receptors.

Impact N-5: Stationary and Mobile Construction Equipment Noise would increase noise levels near sensitive receptors (Class II)

Mitigation Measure N-5a: Utilize Best Available Control Technologies. Minimize noise levels using BACT, including installation of temporary noise barriers, acoustical enclosures, and stack silencers

Mitigation Measure N-5b: **Utilize terrain features to reduce noise to acceptable levels wherever possible.** Locate the concrete batch plant in the Spillway Chute instead of topside

See also: Mitigation Measures N-1a, N-1b, N-1d, N-1e, N-2a, and N-2b.

Significance after Mitigation: Less than Significant

6.4.5 Phase 5: Stilling Basin and Spillway Chute Concrete Placement

Potential impacts to all identified sensitive receptors were evaluated using SP7. Operational noise profiles for the Haul Road, Dike 7, and MIAD are identical to Phase 2 (single front-end loader each in Dike 7 and MIAD areas to load coarse material onto 777's for hauling back to aggregate stockpiles adjacent to the Batch Plant). Jack hammers, portable cement mixers and blowers, and equipment/operations similar to Phase 2 were modeled, with the loudest equipment at the Stilling Basin. The Batch Plant was modeled inside of the Spillway Chute. Figure 6-6 provides an illustrative comparison of noise model results for the Batch Plant located in the chute and located topside.

Modeled results for rock and course aggregate loading at Dike 7 and MIAD were the same as Phase 2. Predicted L_{dn} noise levels at the residences around Dike 7 with direct line-of-sight were over 65 dBA and up to 75 dBA. The L_{dn} noise levels were 1 to 2 dBA less than L_{max}, indicating that the noise levels would be consistently high based on the usage factors calculated from data provided by the USACE. Any work performed outside of the exempt hours would significantly increase ambient noise and impact the sensitive receptors around each area.

Impact N-6: Dike 7 and MIAD rock loading and transport to the Batch Plant would cause impulsive noise and high noise levels at nearby sensitive receptors (Class II)

Mitigation Measure N-6: Avoid using Dike 7 or MIAD for Coarse Material Loading during Non-exempt Hours.

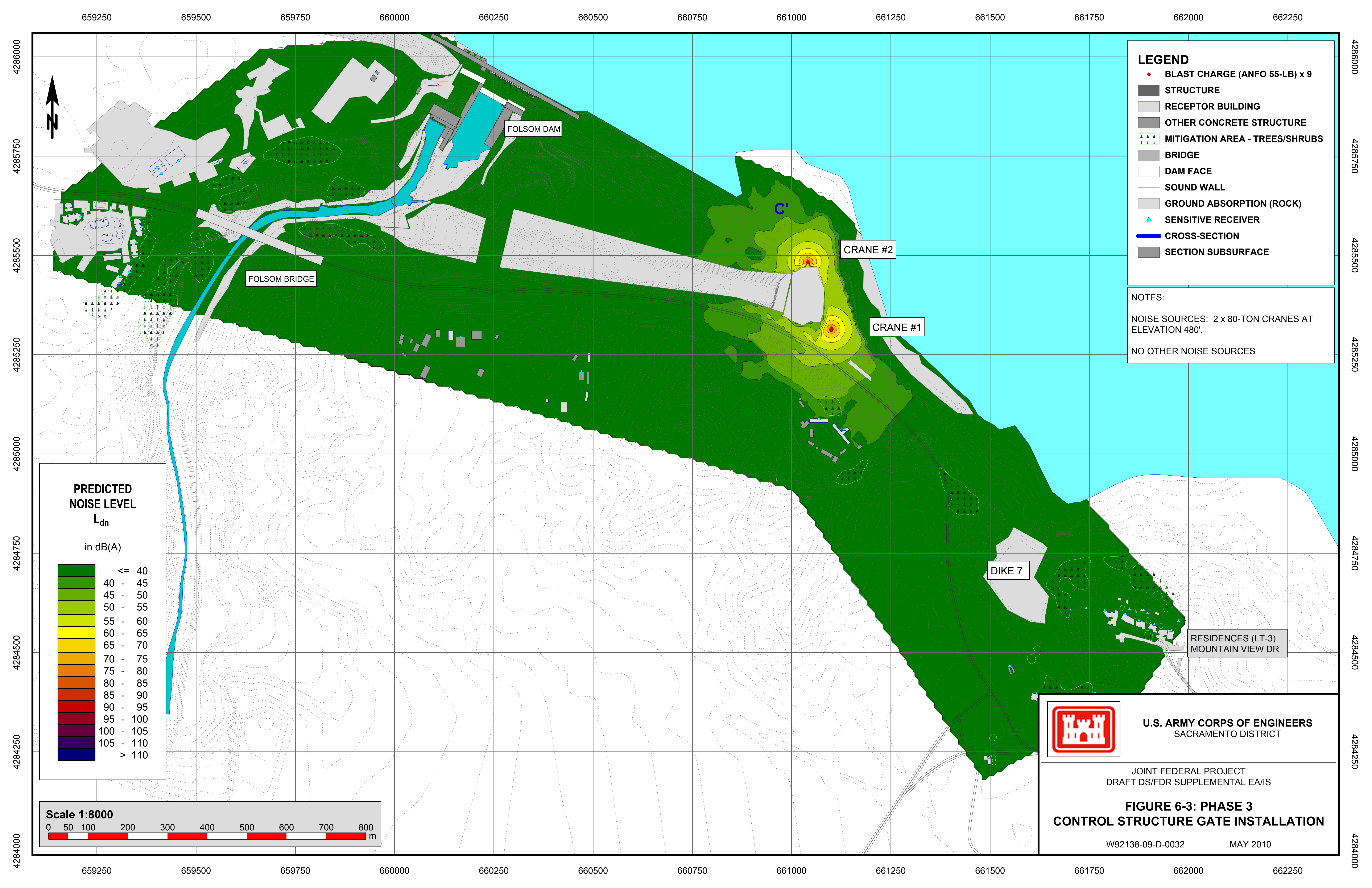
Impact N-7: Stationary and Mobile Construction Equipment Noise would increase noise levels near sensitive receptors (Class II)

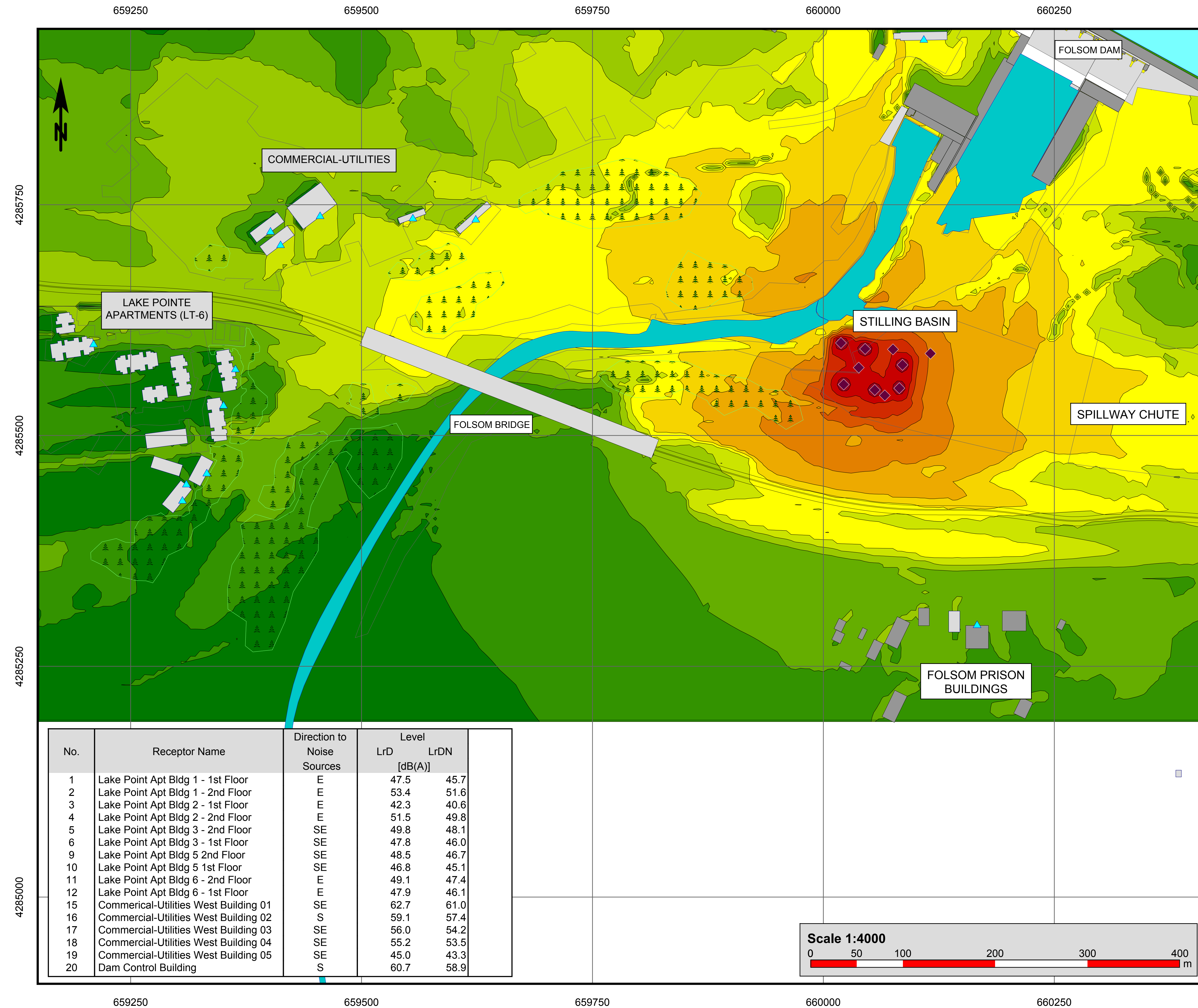
Mitigation Measure N-7a: Utilize Best Available Control Technologies (BACT). Minimize noise levels using BACT, such as installation of temporary noise barriers, acoustical enclosures, and stack silencers

Mitigation Measure N-7b: Utilize terrain features to reduce noise to acceptable levels wherever possible. Locate the concrete batch plant in the Spillway Chute instead of topside

See also: Mitigation Measures N-1a, N-1b, N-1d, N-1e, N-2a, and N-2b.

Significance after Mitigation: Less than Significant.


LEGEND
BLAST CHARGE (ANFO 55-LB) x 9
STRUCTURE
RECEPTOR BUILDING
OTHER CONCRETE STRUCTURE
MITIGATION AREA - TREES/SHRUBS
BRIDGE
DAM FACE
SOUND WALL
GROUND ABSORPTION (ROCK)
SENSITIVE RECEIVER
CROSS-SECTION
SECTION SUBSURFACE
NOTES:
NOISE SOURCES: 2 x 80-TON CRANES AT ELEVATION 480'.
NO OTHER NOISE SOURCES
FOLSOM DAM
FOLSOM BRIDGE
C'
CRANE #2
CRANE #1
DIKE 7
RESIDENCES (LT-3)
MOUNTAIN VIEW DR
PREDICTED NOISE LEVEL
L_{dn}
in dB(A)
<= 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85
85 - 90
90 - 95
95 - 100
100 - 105
105 - 110
> 110
Scale 1:8000
0 50 100 200 300 400 500 600 700 800 m
659250 659500 659750 660000 660250 660500 660750 661000 661250 661500 661750 662000 662250
4286000 4285750 4285500 4285250 4285000 4284750 4284500 4284250 4284000
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
JOINT FEDERAL PROJECT
DRAFT DS/FDR SUPPLEMENTAL EA/IS
FIGURE 6-3: PHASE 3
CONTROL STRUCTURE GATE INSTALLATION
W92138-09-D-0032
MAY 2010



SITE LOCATION AERIAL

NO SCALE

LEGEND

- CONSTRUCTION NOISE SOURCI
- RECEPTOR BUILDING
- CONCRETE STRUCTURE
- DENSE TREES/SHRUBS
- SOUND WALL
- GROUND ABSORPTION (ROCK)
- SENSITIVE RECEIVER

PREDICTED NOISE LEVEL L_{dn}

in dB(A)

	<= 40
40 <	<= 45
45 <	<= 50
50 <	<= 55
55 <	<= 60
60 <	<= 65
65 <	<= 70
70 <	<= 75
75 <	<= 80
80 <	<= 85
85 <	<= 90
90 <	<= 95
95 <	<= 100
100 <	<= 105
105 <	<= 110
110 <	

No.	Receptor Name	Direction to Noise Sources	Level LrD [dB(A)]	LrDN
1	Lake Point Apt Bldg 1 - 1st Floor	E	47.5	45.7
2	Lake Point Apt Bldg 1 - 2nd Floor	E	53.4	51.6
3	Lake Point Apt Bldg 2 - 1st Floor	E	42.3	40.6
4	Lake Point Apt Bldg 2 - 2nd Floor	E	51.5	49.8
5	Lake Point Apt Bldg 3 - 2nd Floor	SE	49.8	48.1
6	Lake Point Apt Bldg 3 - 1st Floor	SE	47.8	46.0
9	Lake Point Apt Bldg 5 2nd Floor	SE	48.5	46.7
10	Lake Point Apt Bldg 5 1st Floor	SE	46.8	45.1
11	Lake Point Apt Bldg 6 - 2nd Floor	E	49.1	47.4
12	Lake Point Apt Bldg 6 - 1st Floor	E	47.9	46.1
15	Commerical-Utilities West Building 01	SE	62.7	61.0
16	Commerical-Utilities West Building 02	S	59.1	57.4
17	Commerical-Utilities West Building 03	SE	56.0	54.2
18	Commerical-Utilities West Building 04	SE	55.2	53.5
19	Commerical-Utilities West Building 05	SE	45.0	43.3
20	Dam Control Building	S	60.7	58.9

Scale 1:4000

0 50 100 200 300 400 m

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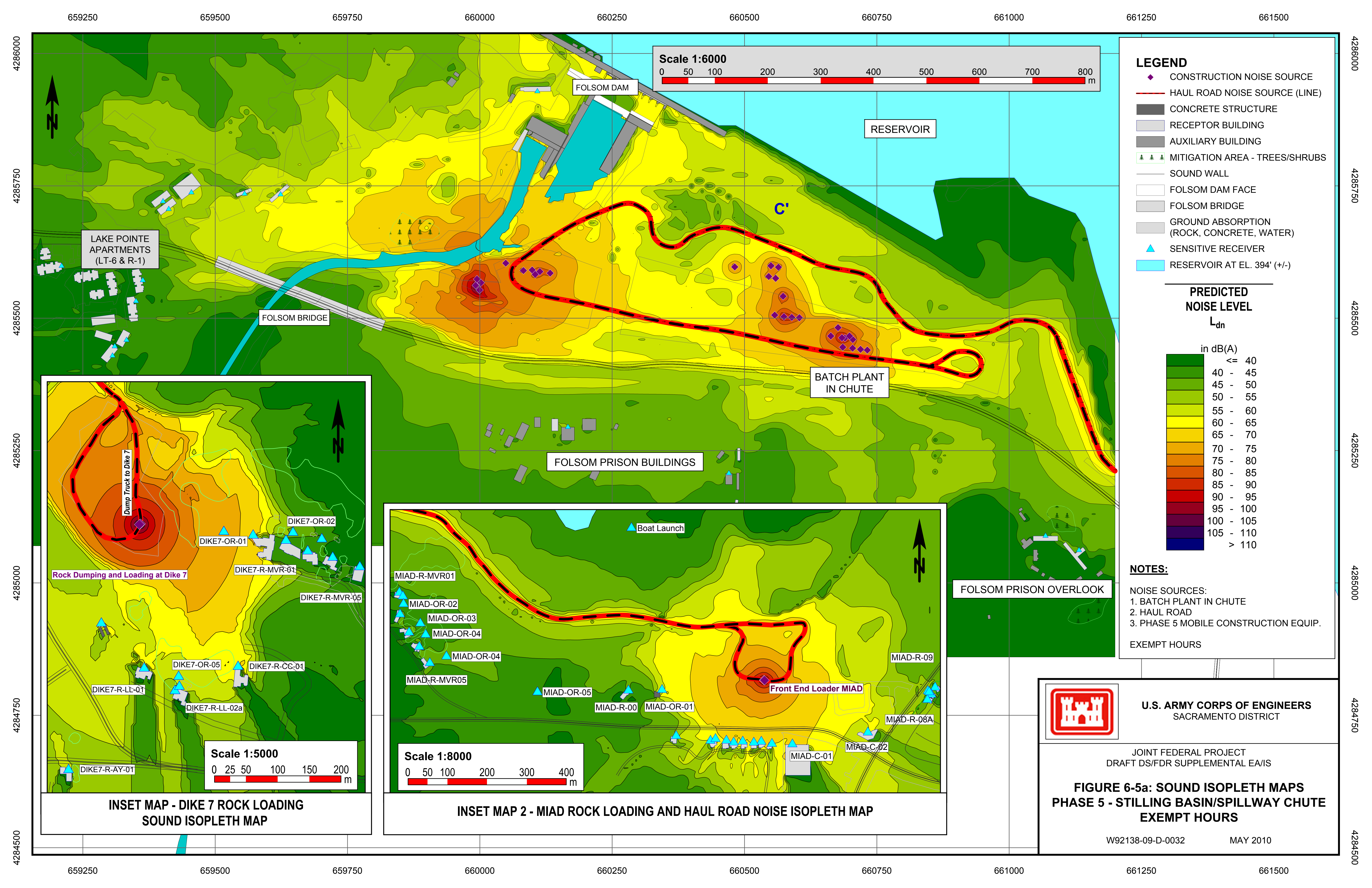
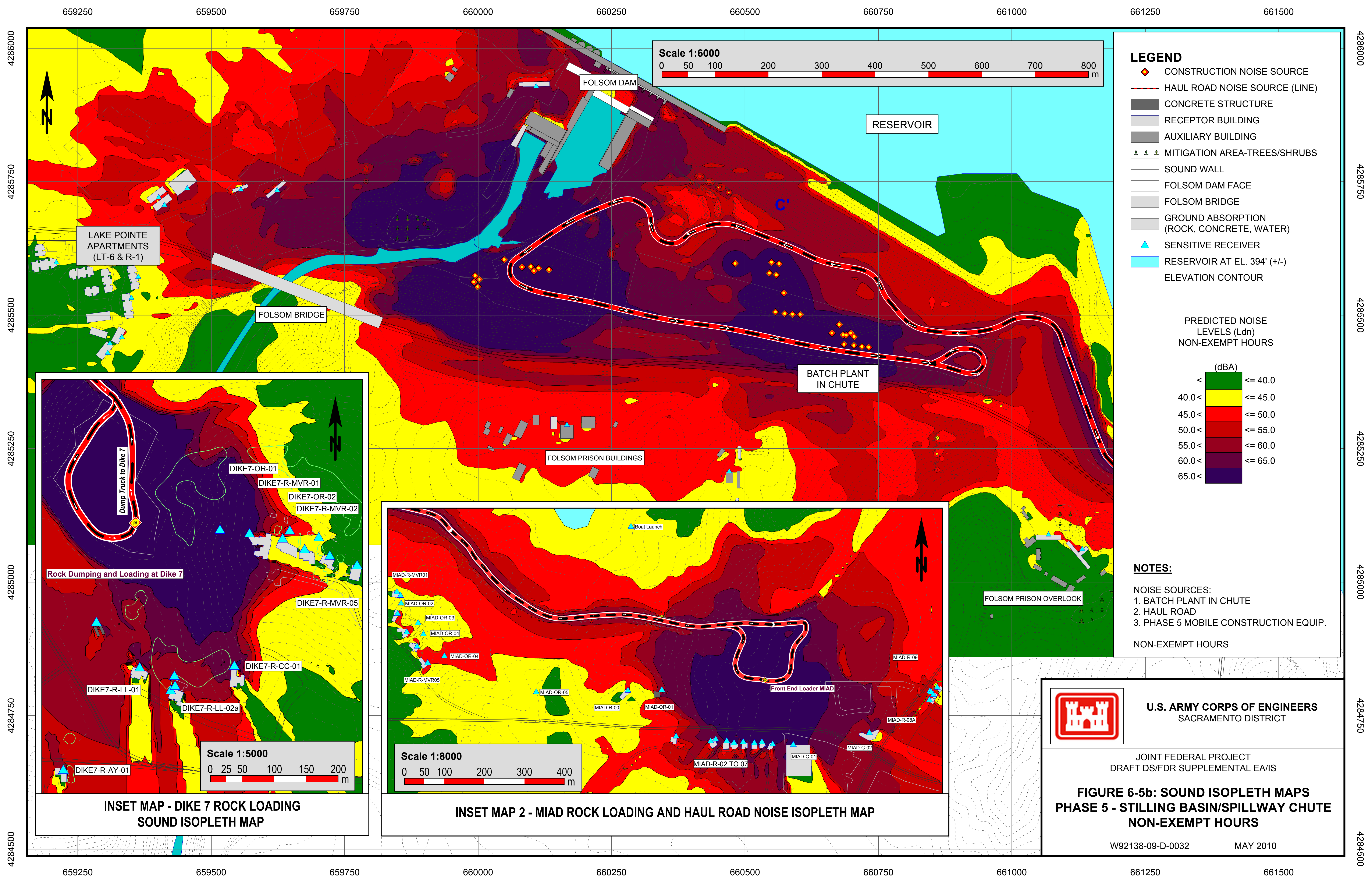
DRAFT DS/FDR SUPPLEMENTAL EA/IS

FIGURE 6-4: SOUND ISOPLETH MAP
PHASE 4-STILLING BASIN FOUNDATION WORK

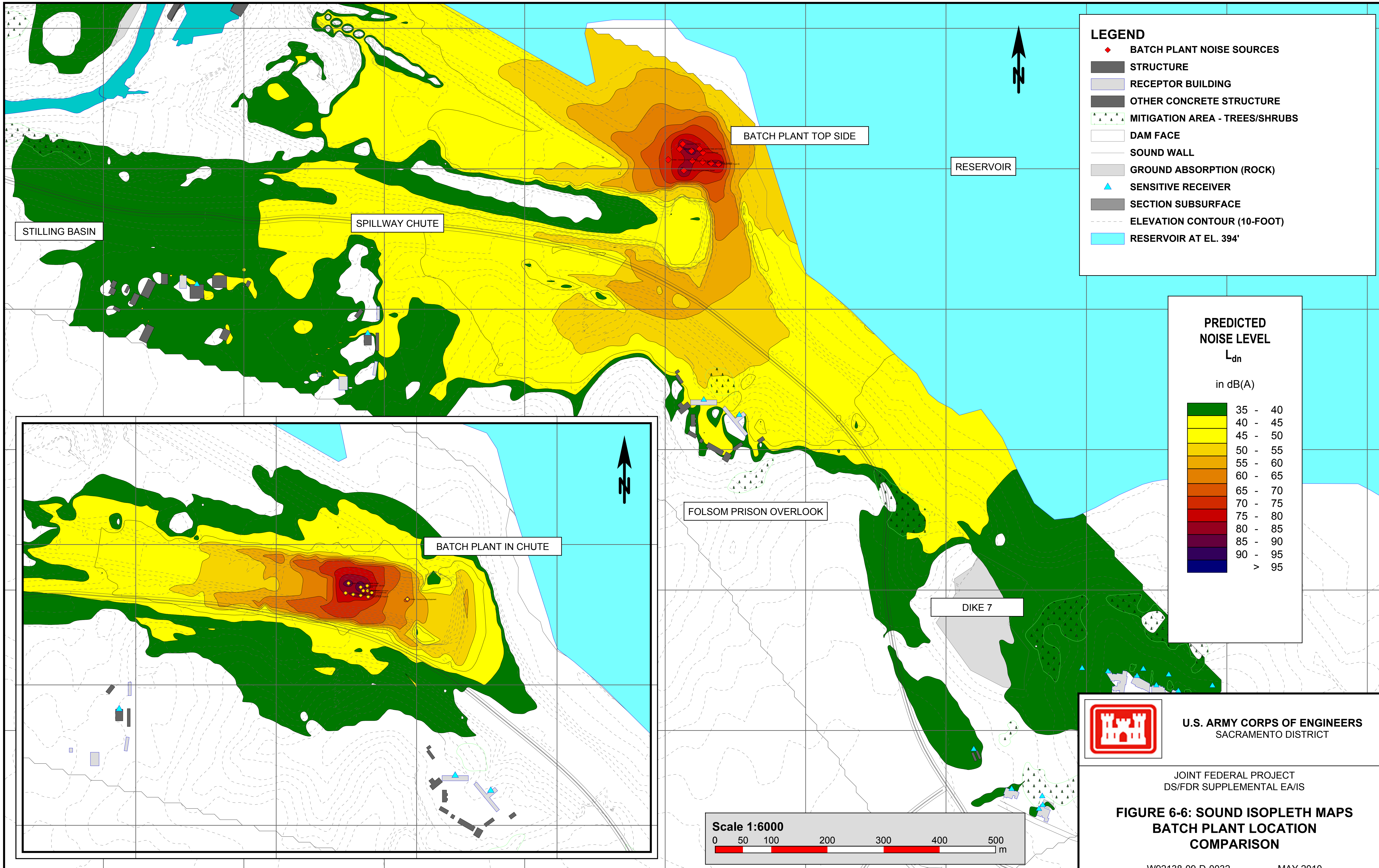
W92138-09-D-0032 MAY 2010



Scale 1:6000
0 50 100 200 300 400 500 600 700 800 m
FOLSOM DAM
RESERVOIR
LAKE POINTE APARTMENTS (LT-6 & R-1)
FOLSOM BRIDGE
C'
BATCH PLANT IN CHUTE
FOLSOM PRISON BUILDINGS
FOLSOM PRISON OVERLOOK
LEGEND
CONSTRUCTION NOISE SOURCE
HAUL ROAD NOISE SOURCE (LINE)
CONCRETE STRUCTURE
RECEPTOR BUILDING
AUXILIARY BUILDING
MITIGATION AREA - TREES/SHRUBS
SOUND WALL
FOLSOM DAM FACE
FOLSOM BRIDGE
GROUND ABSORPTION (ROCK, CONCRETE, WATER)
SENSITIVE RECEIVER
RESERVOIR AT EL. 394' (+/-)
PREDICTED NOISE LEVEL L_{dn}
in dB(A)
<= 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85
85 - 90
90 - 95
95 - 100
100 - 105
105 - 110
> 110
NOTES:
NOISE SOURCES:
1. BATCH PLANT IN CHUTE
2. HAUL ROAD
3. PHASE 5 MOBILE CONSTRUCTION EQUIP.
EXEMPT HOURS
Dump Truck to Dike 7
Rock Dumping and Loading at Dike 7
DIKE7-OR-01
DIKE7-OR-02
DIKE7-R-MVR-01
DIKE7-R-MVR-05
DIKE7-OR-05
DIKE7-R-CC-01
DIKE7-R-LL-01
DIKE7-R-LL-02a
DIKE7-R-AY-01
Scale 1:5000
0 25 50 100 150 200 m
INSET MAP - DIKE 7 ROCK LOADING SOUND ISOPLETH MAP
Boat Launch
MIAD-R-MVR01
MIAD-OR-02
MIAD-OR-03
MIAD-OR-04
MIAD-OR-04
MIAD-R-MVR05
MIAD-OR-05
MIAD-R-00
MIAD-OR-01
Front End Loader MIAD
MIAD-R-09
MIAD-R-08A
MIAD-C-02
MIAD-C-01
Scale 1:8000
0 50 100 200 300 400 m
INSET MAP 2 - MIAD ROCK LOADING AND HAUL ROAD NOISE ISOPLETH MAP
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
JOINT FEDERAL PROJECT
DRAFT DS/FDR SUPPLEMENTAL EA/IS
FIGURE 6-5a: SOUND ISOPLETH MAPS
PHASE 5 - STILLING BASIN/SPILLWAY CHUTE
EXEMPT HOURS
W92138-09-D-0032 MAY 2010



Scale 1:6000
0 50 100 200 300 400 500 600 700 800 m
FOLSOM DAM
RESERVOIR
LAKE POINTE APARTMENTS (LT-6 & R-1)
FOLSOM BRIDGE
C'
BATCH PLANT IN CHUTE
FOLSOM PRISON BUILDINGS
FOLSOM PRISON OVERLOOK
LEGEND
CONSTRUCTION NOISE SOURCE
HAUL ROAD NOISE SOURCE (LINE)
CONCRETE STRUCTURE
RECEPTOR BUILDING
AUXILIARY BUILDING
MITIGATION AREA-TREES/SHRUBS
SOUND WALL
FOLSOM DAM FACE
FOLSOM BRIDGE
GROUND ABSORPTION (ROCK, CONCRETE, WATER)
SENSITIVE RECEIVER
RESERVOIR AT EL. 394' (+/-)
ELEVATION CONTOUR
PREDICTED NOISE LEVELS (Ldn) NON-EXEMPT HOURS
(dBA)
< <= 40.0
40.0 < <= 45.0
45.0 < <= 50.0
50.0 < <= 55.0
55.0 < <= 60.0
60.0 < <= 65.0
65.0 <
NOTES:
NOISE SOURCES:
1. BATCH PLANT IN CHUTE
2. HAUL ROAD
3. PHASE 5 MOBILE CONSTRUCTION EQUIP.
NON-EXEMPT HOURS
Dump Truck to Dike 7
Rock Dumping and Loading at Dike 7
DIKE7-OR-01
DIKE7-R-MVR-01
DIKE7-OR-02
DIKE7-R-MVR-02
DIKE7-R-MVR-05
DIKE7-R-CC-01
DIKE7-R-LL-01
DIKE7-R-LL-02a
DIKE7-R-AY-01
Scale 1:5000
0 25 50 100 150 200 m
INSET MAP - DIKE 7 ROCK LOADING SOUND ISOPLETH MAP
Boat Launch
MIAD-R-MVR01
MIAD-OR-02
MIAD-OR-03
MIAD-OR-04
MIAD-OR-04
MIAD-R-MVR05
MIAD-OR-05
MIAD-R-00
MIAD-OR-01
Front End Loader MIAD
MIAD-R-09
MIAD-R-08A
MIAD-C-02
MIAD-C-01
MIAD-R-02 TO 07
Scale 1:8000
0 50 100 200 300 400 m
INSET MAP 2 - MIAD ROCK LOADING AND HAUL ROAD NOISE ISOPLETH MAP
U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT
JOINT FEDERAL PROJECT
DRAFT DS/FDR SUPPLEMENTAL EA/IS
FIGURE 6-5b: SOUND ISOPLETH MAPS
PHASE 5 - STILLING BASIN/SPILLWAY CHUTE
NON-EXEMPT HOURS
W92138-09-D-0032
MAY 2010
659250 659500 659750 660000 660250 660500 660750 661000 661250 661500
4286000 4285750 4285500 4285250 4285000 4284750 4284500



U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

JOINT FEDERAL PROJECT
DS/FDR SUPPLEMENTAL EA/IS

FIGURE 6-6: SOUND ISOPLETH MAPS BATCH PLANT LOCATION COMPARISON

W92138-09-D-0032 MAY 2010

Table 6-5: Summary Comparison of Noise Impacts[(1)]

Impact Statement	Off-Site Traffic	On-Site Construction							
		Phase 1a	Phase 1b	Phase 1c	Phase 1d	Phase 2	Phase 3	Phase 4	Phase 5
Noise									
Increases in Ambient Noise	**LS**	**N**	**N**	**N**	**LS**	**LS**	**SM**	**N**	**LS**
Impacts to Sensitive Receptors	**LS**	**SM**	**SM**	**SM**	**LS**	**SM**	**SM**	**N**	**SM**
Impact N-1: Transportation of material and equipment from off site would temporarily increase local noise levels near sensitive receptors during nighttime or evening hours	LS	na	na	na	na	na	na	na	na
Impact N-2: Blasting would cause vibration and noise causing potential startling and annoyance to nearby sensitive receptors.	na	SM	SM	LS	na	na	na	na	na
Impact N-3: Dike 7 and MIAD rock disposal would cause loud impulsive noise at nearby sensitive receptors.	na	na	na	na	SM	na	na	na	na
Impact N-4: Dike 7 and MIAD rock loading and transport to the Batch Plant would cause impulsive noise and high noise levels at nearby sensitive receptors.	na	na	na	na	na	SM	SM	na	na
Impact N-5: Stationary and Mobile Construction Equipment Noise would increase noise levels near sensitive receptors.	na	na	na	na	na	LS	LS	LS	na
Impact N-6: Dike 7 and MIAD rock loading and transport to the Batch Plant would cause impulsive noise and high noise levels at nearby sensitive receptors.	na	na	na	na	na	na	na	na	SM
Impact N-7: Stationary and Mobile Construction Equipment Noise would increase noise levels near sensitive receptors	na	na	na	na	na	na	na	na	SM

Key:
LS = Less-than-significant impact
N = No adverse impact
na = Not applicable
SM = Potentially significant but mitigable impact
SU = Potentially significant and unavoidable impact

Notes: (1) Construction noise is exempt from 7:00 AM to 7:00 PM on weekdays and from 8:00 AM to 5 PM on weekends. Noise impacts during these times are by definition "No adverse impact." Therefore, the values presented should be considered guidelines for adhering to the DoD's "Good Neighbor Policy" or for evaluating construction operations during non-exempt hours.

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APPENDIX A-1

INTERSECTION SYNCHRO ANALYSIS

INTERSECTION SYNCHRO ANALYSIS

YR-2007 AM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱	↰	↑↑	↱
Volume (vph)	160	160	590	110	360	100	1080	310	40	80	540	420
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.91	0.91	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1553	1770	3539	1555	1610	3286	1551	1770	3539	1563
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1553	1770	3539	1555	1610	3286	1551	1770	3539	1563
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	178	178	656	122	400	111	1200	344	44	89	600	467
RTOR Reduction (vph)	0	0	523	0	0	94	0	0	27	0	0	143
Lane Group Flow (vph)	178	178	133	122	400	17	600	944	17	89	600	324
Confl. Peds. (#/hr)						2			5			
Confl. Bikes (#/hr)			6			2			1			1
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2			6			8			7
Actuated Green, G (s)	14.0	20.2	20.2	10.0	17.0	17.0	44.8	44.8	44.8	23.8	23.8	23.8
Effective Green, g (s)	13.0	21.9	21.9	9.0	17.9	17.9	46.1	46.1	46.1	25.1	25.1	25.1
Actuated g/C Ratio	0.11	0.19	0.19	0.08	0.15	0.15	0.39	0.39	0.39	0.21	0.21	0.21
Clearance Time (s)	3.0	5.7	5.7	3.0	4.9	4.9	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	195	656	288	135	536	236	628	1283	605	376	752	332
v/s Ratio Prot	c0.10	0.05		0.07	c0.11		c0.37	0.29		0.05	0.17	
v/s Ratio Perm			c0.09			0.01			0.01			c0.21
v/c Ratio	0.91	0.27	0.46	0.90	0.75	0.07	0.96	0.91dl	0.03	0.24	0.80	0.98
Uniform Delay, d1	52.0	41.3	42.9	54.1	47.9	43.0	35.0	30.8	22.2	38.6	44.1	46.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	40.1	0.1	0.4	48.4	4.9	0.0	24.9	1.9	0.0	0.1	5.5	42.7
Delay (s)	92.1	41.3	43.3	102.6	52.9	43.0	59.9	32.7	22.2	38.7	49.6	88.9
Level of Service	F	D	D	F	D	D	E	C	C	D	D	F
Approach Delay (s)		51.5			60.7			42.7			64.6	
Approach LOS		D			E			D			E	

Intersection Summary			
HCM Average Control Delay	53.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	118.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	77.5%	ICU Level of Service	D
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑↱		↰	↑	↱
Volume (vph)	160	0	120	0	0	0	150	1230	0	0	1200	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	0.98
Flpb, ped/bikes		1.00	1.00				1.00	1.00			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1770	1547				1770	1863			1863	1551
Flt Permitted		0.76	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1410	1547				1770	1863			1863	1551
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	178	0	133	0	0	0	167	1367	0	0	1333	133
RTOR Reduction (vph)	0	0	116	0	0	0	0	0	0	0	0	22
Lane Group Flow (vph)	0	178	17	0	0	0	167	1367	0	0	1333	111
Confl. Bikes (#/hr)			1			1						1
Turn Type	Perm		Perm	Perm			Prot			Prot		Perm
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4								6
Actuated Green, G (s)		19.0	19.0				14.0	121.5			103.5	103.5
Effective Green, g (s)		19.0	19.0				14.0	123.0			105.0	105.0
Actuated g/C Ratio		0.13	0.13				0.09	0.82			0.70	0.70
Clearance Time (s)		4.0	4.0				4.0	5.5			5.5	5.5
Vehicle Extension (s)		3.0	3.0				1.0	2.5			2.5	2.5
Lane Grp Cap (vph)		179	196				165	1528			1304	1086
v/s Ratio Prot							c0.09	0.73			c0.72	
v/s Ratio Perm		c0.13	0.01									0.07
v/c Ratio		0.99	0.09				1.01	0.89			1.02	0.10
Uniform Delay, d1		65.4	57.8				68.0	9.1			22.5	7.3
Progression Factor		1.00	1.00				1.00	1.00			1.00	1.00
Incremental Delay, d2		65.3	0.2				73.3	7.1			30.7	0.0
Delay (s)		130.7	58.0				141.3	16.3			53.2	7.3
Level of Service		F	E				F	B			D	A
Approach Delay (s)		99.6			0.0			29.9			49.0	
Approach LOS		F			A			C			D	

Intersection Summary			
HCM Average Control Delay	44.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	90.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	20	10	430	10	10	10	350	1310	10	10	1280	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	5.7	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97		0.99		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1804	1543		1737		1770	3539	1549	1770	3539	1583
Flt Permitted		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1804	1543		1737		1770	3539	1549	1770	3539	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	21	11	457	11	11	11	372	1394	11	11	1362	32
RTOR Reduction (vph)	0	0	423	0	11	0	0	0	3	0	0	11
Lane Group Flow (vph)	0	32	34	0	22	0	372	1394	8	11	1362	21
Confl. Peds. (#/hr)			3			2						
Confl. Bikes (#/hr)			3			1			3			
Turn Type	Split		Perm	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)		7.2	7.2		3.9		24.2	59.5	59.5	3.8	39.1	39.1
Effective Green, g (s)		6.6	6.6		3.3		23.2	61.2	59.5	2.8	40.8	40.8
Actuated g/C Ratio		0.07	0.07		0.04		0.26	0.68	0.66	0.03	0.45	0.45
Clearance Time (s)		3.4	3.4		3.4		3.0	5.7	5.7	3.0	5.7	5.7
Vehicle Extension (s)		1.0	1.0		0.5		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		132	113		64		457	2409	1025	55	1606	718
v/s Ratio Prot		0.02			c0.01		c0.21	0.39		0.01	c0.38	
v/s Ratio Perm			c0.02						0.00			0.01
v/c Ratio		0.24	0.30		0.35		0.81	0.58	0.01	0.20	0.85	0.03
Uniform Delay, d1		39.3	39.5		42.3		31.3	7.6	5.2	42.5	21.8	13.6
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.3	0.5		1.2		10.1	0.2	0.0	0.7	4.2	0.0
Delay (s)		39.6	40.0		43.5		41.4	7.8	5.2	43.1	26.0	13.6
Level of Service		D	D		D		D	A	A	D	C	B
Approach Delay (s)		40.0			43.5			14.8			25.8	
Approach LOS		D			D			B			C	

Intersection Summary			
HCM Average Control Delay	22.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	89.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	76.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	100	0	0	0	20	1640	0	0	1640	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0				4.0	4.0			4.0	
Lane Util. Factor			0.88				1.00	0.95			0.86	
Frt			0.85				1.00	1.00			0.99	
Flt Protected			1.00				0.95	1.00			1.00	
Satd. Flow (prot)			2787				1770	3539			6374	
Flt Permitted			1.00				0.09	1.00			1.00	
Satd. Flow (perm)			2787				163	3539			6374	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	118	0	0	0	24	1929	0	0	1929	71
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	0	97	0	0	0	24	1929	0	0	1995	0
Turn Type			custom	Perm			Perm		Perm			
Protected Phases					8			2			6	
Permitted Phases			4	8			2		2			
Actuated Green, G (s)			6.4				45.6	45.6			45.6	
Effective Green, g (s)			6.4				45.6	45.6			45.6	
Actuated g/C Ratio			0.11				0.76	0.76			0.76	
Clearance Time (s)			4.0				4.0	4.0			4.0	
Vehicle Extension (s)			3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)			297				124	2690			4844	
v/s Ratio Prot								c0.55			0.31	
v/s Ratio Perm			c0.03				0.15					
v/c Ratio			0.33				0.19	0.72			0.41	
Uniform Delay, d1			24.8				2.0	3.8			2.5	
Progression Factor			1.00				1.00	1.00			1.00	
Incremental Delay, d2			0.6				3.5	1.7			0.3	
Delay (s)			25.4				5.5	5.5			2.8	
Level of Service			C				A	A			A	
Approach Delay (s)		25.4			0.0			5.5			2.8	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	4.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	48.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↰↑↱	↱	↰	↑↑	↱	↰↰	↑↱	
Volume (vph)	30	20	30	160	20	940	20	690	290	790	880	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.5	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.91	0.86	0.91	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.91		1.00	0.86	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1695		1610	2753	1441	1770	3539	1583	3433	3528	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1695		1610	2753	1441	1770	3539	1583	3433	3528	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	33	22	33	178	22	1044	22	767	322	878	978	22
RTOR Reduction (vph)	0	30	0	0	470	470	0	0	227	0	1	0
Lane Group Flow (vph)	33	25	0	160	92	52	22	767	95	878	999	0
Turn Type	Split			Split		Perm	Prot		Perm	Prot		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases						3			6			
Actuated Green, G (s)	7.9	7.9		9.0	9.0	9.0	2.1	26.6	26.6	29.0	53.5	
Effective Green, g (s)	7.9	7.9		9.0	9.0	9.0	2.1	28.1	26.6	29.0	55.0	
Actuated g/C Ratio	0.09	0.09		0.10	0.10	0.10	0.02	0.31	0.30	0.32	0.61	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.5	5.5	4.0	5.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0	1.0	1.0	4.7	4.7	1.5	5.4	
Lane Grp Cap (vph)	155	149		161	275	144	41	1105	468	1106	2156	
v/s Ratio Prot	c0.02	0.01		c0.10	0.03		0.01	c0.22		c0.26	0.28	
v/s Ratio Perm						0.04			0.06			
v/c Ratio	0.21	0.17		0.99	0.85dr	0.36	0.54	0.69	0.20	0.79	0.46	
Uniform Delay, d1	38.2	38.0		40.5	37.7	37.8	43.5	27.2	23.8	27.8	9.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.3	0.2		68.7	0.3	0.6	6.6	3.6	1.0	3.7	0.7	
Delay (s)	38.4	38.2		109.2	38.0	38.4	50.1	30.8	24.7	31.5	10.2	
Level of Service	D	D		F	D	D	D	C	C	C	B	
Approach Delay (s)		38.3			47.3			29.4			20.2	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	30.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑↱			↰↑↱		↰	↑↑↱		↰	↑↑↱	
Volume (vph)	170	10	790	40	10	10	190	840	10	10	980	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.89			0.98		1.00	1.00		1.00	0.98	
Flt Protected		0.99			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1644			1758		1770	3532		1770	3478	
Flt Permitted		0.99			0.50		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1644			905		1770	3532		1770	3478	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	179	11	832	42	11	11	200	884	11	11	1032	116
RTOR Reduction (vph)	0	109	0	0	6	0	0	1	0	0	7	0
Lane Group Flow (vph)	0	913	0	0	58	0	200	894	0	11	1141	0
Confl. Peds. (#/hr)									1			
Confl. Bikes (#/hr)						1						2
Turn Type	Split			Perm			Prot			Prot		
Protected Phases	4!	4			8!		5	2		1	6	
Permitted Phases				8								
Actuated Green, G (s)		56.3			56.3		12.3	50.3		0.5	38.5	
Effective Green, g (s)		58.0			58.0		13.0	52.5		1.2	40.7	
Actuated g/C Ratio		0.47			0.47		0.11	0.42		0.01	0.33	
Clearance Time (s)		5.7			5.7		4.7	6.2		4.7	6.2	
Vehicle Extension (s)		3.0			3.0		2.0	3.8		2.0	3.8	
Lane Grp Cap (vph)		771			424		186	1499		17	1144	
v/s Ratio Prot		c0.56					c0.11	0.25		0.01	c0.33	
v/s Ratio Perm					0.06							
v/c Ratio		1.18			0.14		1.08	0.60		0.65	1.00	
Uniform Delay, d1		32.8			18.6		55.4	27.4		61.0	41.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		95.9			0.1		87.4	0.7		49.2	25.9	
Delay (s)		128.8			18.8		142.8	28.2		110.2	67.3	
Level of Service		F			B		F	C		F	E	
Approach Delay (s)		128.8			18.8			49.1			67.7	
Approach LOS		F			B			D			E	

Intersection Summary			
HCM Average Control Delay	79.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	123.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	108.7%	ICU Level of Service	G
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	210	770	830	20	740	470	300	320	10	290	1510	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	233	856	922	22	822	522	333	356	11	322	1678	178
RTOR Reduction (vph)	0	0	116	0	0	377	0	0	8	0	0	58
Lane Group Flow (vph)	233	856	806	22	822	145	333	356	3	322	1678	120
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.9	56.1	56.1	1.2	38.4	38.4	10.5	33.3	33.3	30.4	53.2	53.2
Effective Green, g (s)	19.4	56.6	56.6	1.7	38.9	38.9	11.0	34.8	34.8	30.9	54.7	54.7
Actuated g/C Ratio	0.14	0.40	0.40	0.01	0.28	0.28	0.08	0.25	0.25	0.22	0.39	0.39
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	5.1	5.1	2.0	5.1	5.1
Lane Grp Cap (vph)	245	1431	640	21	983	440	270	880	393	391	1383	619
v/s Ratio Prot	c0.13	0.24		0.01	0.23		c0.10	0.10		0.18	c0.47	
v/s Ratio Perm			c0.51			0.09			0.00			0.08
v/c Ratio	0.95	0.60	1.26	1.05	0.84	0.33	1.23	0.40	0.01	0.82	1.21	0.19
Uniform Delay, d1	59.8	32.8	41.7	69.2	47.6	40.2	64.5	43.9	39.6	52.0	42.6	28.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	43.6	0.5	129.0	212.0	6.0	0.2	132.9	1.4	0.0	12.5	102.9	0.7
Delay (s)	103.4	33.2	170.7	281.2	53.6	40.3	197.4	45.3	39.6	64.5	145.5	28.8
Level of Service	F	C	F	F	D	D	F	D	D	E	F	C
Approach Delay (s)		104.4			52.2			117.6			124.0	
Approach LOS		F			D			F			F	

Intersection Summary			
HCM Average Control Delay	101.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.24		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	106.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱	↰	↰↑	↱	↰	↑↑↑↱		↰	↑↑	↱
Volume (vph)	10	20	20	200	0	160	10	460	200	110	2260	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.96	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected		0.98	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1832	1527	1681	1681	1562	1770	4854		1770	3539	1550
Flt Permitted		0.98	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1832	1527	1681	1681	1562	1770	4854		1770	3539	1550
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	22	22	222	0	178	11	511	222	122	2511	11
RTOR Reduction (vph)	0	0	22	0	0	154	0	50	0	0	0	2
Lane Group Flow (vph)	0	33	0	111	111	24	11	683	0	122	2511	9
Confl. Bikes (#/hr)			2			1						2
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)		1.6	1.6	14.3	14.3	14.3	0.4	62.6		11.5	73.7	73.7
Effective Green, g (s)		2.1	2.1	14.8	14.8	14.8	0.9	65.1		12.0	76.2	76.2
Actuated g/C Ratio		0.02	0.02	0.13	0.13	0.13	0.01	0.59		0.11	0.69	0.69
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	4.5	6.5		4.5	6.5	6.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	4.6		2.0	5.1	5.1
Lane Grp Cap (vph)		35	29	226	226	210	14	2873		193	2452	1074
v/s Ratio Prot		c0.02		c0.07	0.07		0.01	0.14		c0.07	c0.71	
v/s Ratio Perm			0.00			0.02						0.01
v/c Ratio		0.94	0.01	0.49	0.49	0.11	0.79	0.24		0.63	1.02	0.01
Uniform Delay, d1		53.9	52.9	44.1	44.1	41.8	54.5	10.7		46.9	16.9	5.2
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		127.2	0.1	0.6	0.6	0.1	123.8	0.2		4.9	24.6	0.0
Delay (s)		181.1	53.0	44.7	44.7	41.9	178.3	10.9		51.8	41.5	5.2
Level of Service		F	D	D	D	D	F	B		D	D	A
Approach Delay (s)		129.9			43.5			13.3			41.8	
Approach LOS		F			D			B			D	

Intersection Summary			
HCM Average Control Delay	37.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	88.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	10	10	1220	10	10	1060
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.95		1.00	1.00
Frt	0.93		1.00		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1695		3535		1770	1863
Flt Permitted	0.98		1.00		0.95	1.00
Satd. Flow (perm)	1695		3535		1770	1863
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	11	1356	11	11	1178
RTOR Reduction (vph)	10	0	0	0	0	0
Lane Group Flow (vph)	12	0	1367	0	11	1178
Turn Type					Prot	
Protected Phases	8		6		5	2
Permitted Phases						
Actuated Green, G (s)	4.9		59.5		3.6	67.1
Effective Green, g (s)	4.9		59.5		3.6	67.1
Actuated g/C Ratio	0.06		0.74		0.04	0.84
Clearance Time (s)	4.0		4.0		4.0	4.0
Vehicle Extension (s)	3.0		2.8		2.4	2.8
Lane Grp Cap (vph)	104		2629		80	1563
v/s Ratio Prot	c0.01		0.39		0.01	c0.63
v/s Ratio Perm						
v/c Ratio	0.11		0.52		0.14	0.75
Uniform Delay, d1	35.5		4.3		36.7	2.8
Progression Factor	1.00		0.64		1.00	1.00
Incremental Delay, d2	0.5		0.7		0.5	3.4
Delay (s)	36.0		3.4		37.2	6.2
Level of Service	D		A		D	A
Approach Delay (s)	36.0		3.4			6.5
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	5.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

	↗	↘	↖	↑	↓	↙
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↑↑	↑	↱
Volume (vph)	30	10	0	1200	990	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.97			0.95	1.00	1.00
Frt	0.96			1.00	1.00	0.85
Flt Protected	0.96			1.00	1.00	1.00
Satd. Flow (prot)	3352			3539	1863	1583
Flt Permitted	0.96			1.00	1.00	1.00
Satd. Flow (perm)	3352			3539	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	33	11	0	1333	1100	89
RTOR Reduction (vph)	10	0	0	0	0	15
Lane Group Flow (vph)	34	0	0	1333	1100	74
Turn Type						Perm
Protected Phases	4			2	2	
Permitted Phases						2
Actuated Green, G (s)	5.9			66.1	66.1	66.1
Effective Green, g (s)	5.9			66.1	66.1	66.1
Actuated g/C Ratio	0.07			0.83	0.83	0.83
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	2.8			2.8	2.8	2.8
Lane Grp Cap (vph)	247			2924	1539	1308
v/s Ratio Prot	c0.01			0.38	c0.59	
v/s Ratio Perm						0.05
v/c Ratio	0.14			0.46	0.71	0.06
Uniform Delay, d1	34.7			1.9	2.9	1.3
Progression Factor	1.00			0.24	1.09	1.99
Incremental Delay, d2	0.2			0.4	2.0	0.1
Delay (s)	34.9			0.9	5.3	2.6
Level of Service	C			A	A	A
Approach Delay (s)	34.9			0.9	5.1	
Approach LOS	C			A	A	

Intersection Summary			
HCM Average Control Delay	3.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱			✥			✥	
Volume (vph)	10	980	10	10	1180	10	10	20	10	10	10	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1710	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			0%			0%	
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		0.95			1.00			1.00	
Frpb, ped/bikes		1.00	0.96		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.97			0.96	
Flt Protected		1.00	1.00		1.00			0.99			0.98	
Satd. Flow (prot)		1815	1483		3096			1765			1741	
Flt Permitted		0.98	1.00		0.95			0.91			0.89	
Satd. Flow (perm)		1788	1483		2930			1635			1569	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	1089	11	11	1311	11	11	22	11	11	11	11
RTOR Reduction (vph)	0	0	2	0	0	0	0	10	0	0	10	0
Lane Group Flow (vph)	0	1100	9	0	1333	0	0	34	0	0	23	0
Confl. Peds. (#/hr)			9			2						
Confl. Bikes (#/hr)						1			2			1
Parking (#/hr)				0	0	0						
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		65.2	65.2		65.2			6.8			6.8	
Effective Green, g (s)		65.2	65.2		65.2			6.8			6.8	
Actuated g/C Ratio		0.82	0.82		0.82			0.08			0.08	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)		2.8	2.8		2.8			2.0			2.0	
Lane Grp Cap (vph)		1457	1209		2388			139			133	
v/s Ratio Prot												
v/s Ratio Perm		c0.62	0.01		0.45			c0.02			0.01	
v/c Ratio		0.75	0.01		0.56			0.24			0.17	
Uniform Delay, d1		3.6	1.4		2.5			34.2			34.0	
Progression Factor		0.29	0.22		1.00			1.00			1.00	
Incremental Delay, d2		2.7	0.0		0.9			0.3			0.2	
Delay (s)		3.7	0.3		3.5			34.5			34.2	
Level of Service		A	A		A			C			C	
Approach Delay (s)		3.7			3.5			34.5			34.2	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	4.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑	↱
Volume (vph)	320	670	10	20	380	20	20	370	80	50	330	800
Ideal Flow (vphpl)	1900	1900	1900	1900	1596	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1859		1770	1553		1770	1813		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1859		1770	1553		1770	1813		1770	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	356	744	11	22	422	22	22	411	89	56	367	889
RTOR Reduction (vph)	0	1	0	0	2	0	0	9	0	0	0	87
Lane Group Flow (vph)	356	755	0	22	442	0	22	491	0	56	367	802
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												6
Actuated Green, G (s)	20.4	46.7		1.2	27.5		1.2	26.5		3.0	28.3	48.7
Effective Green, g (s)	20.4	46.7		1.2	27.5		1.2	26.5		3.0	28.3	48.7
Actuated g/C Ratio	0.22	0.50		0.01	0.29		0.01	0.28		0.03	0.30	0.52
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.1		2.0	4.1		2.0	4.1		2.0	4.1	2.0
Lane Grp Cap (vph)	387	930		23	457		23	514		57	564	893
v/s Ratio Prot	c0.20	0.41		0.01	c0.28		0.01	0.27		c0.03	0.20	c0.20
v/s Ratio Perm												0.31
v/c Ratio	0.92	0.81		0.96	0.97		0.96	0.96		0.98	0.65	0.90
Uniform Delay, d1	35.7	19.6		46.1	32.5		46.1	32.9		45.2	28.3	20.1
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	26.0	5.8		165.6	33.5		165.6	28.9		112.1	3.0	11.4
Delay (s)	61.7	25.4		211.6	66.0		211.6	61.7		157.3	31.3	31.5
Level of Service	E	C		F	E		F	E		F	C	C
Approach Delay (s)		37.0			72.9			68.1			36.8	
Approach LOS		D			E			E			D	

Intersection Summary			
HCM Average Control Delay	46.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	93.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰	↱
Volume (vph)	390	400	180	140	300	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1570	1770	1546
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	3539	1570	1770	1546
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	433	444	200	156	333	267
RTOR Reduction (vph)	0	0	0	72	0	198
Lane Group Flow (vph)	433	444	200	84	333	69
Confl. Peds. (#/hr)				8		7
Confl. Bikes (#/hr)				8		8
Turn Type	Prot			pm+ov		Perm
Protected Phases	1	6	2	4	4	
Permitted Phases				2		4
Actuated Green, G (s)	16.7	28.2	7.5	20.0	12.5	12.5
Effective Green, g (s)	16.7	28.2	7.5	20.0	12.5	12.5
Actuated g/C Ratio	0.34	0.58	0.15	0.41	0.26	0.26
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.1	3.1	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	607	1079	545	774	454	397
v/s Ratio Prot	c0.24	c0.24	0.06	0.03	c0.19	
v/s Ratio Perm				0.03		0.04
v/c Ratio	0.71	0.41	0.37	0.11	0.73	0.17
Uniform Delay, d1	13.9	5.7	18.5	8.8	16.6	14.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.0	0.3	0.2	0.0	5.2	0.1
Delay (s)	17.9	5.9	18.6	8.9	21.8	14.2
Level of Service	B	A	B	A	C	B
Approach Delay (s)		11.8	14.4		18.4	
Approach LOS		B	B		B	

Intersection Summary			
HCM Average Control Delay	14.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	48.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	20	50	10	90	30	50	10	650	40	50	1100	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.91		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1815		1770	1687		1770	1847		1770	1858	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1815		1770	1687		1770	1847		1770	1858	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	22	54	11	97	32	54	11	699	43	54	1183	22
RTOR Reduction (vph)	0	7	0	0	48	0	0	1	0	0	1	0
Lane Group Flow (vph)	22	58	0	97	38	0	11	741	0	54	1204	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	2.1	7.7		7.7	13.3		0.7	72.8		5.7	77.8	
Effective Green, g (s)	1.9	7.5		7.5	13.1		0.5	72.6		5.5	77.6	
Actuated g/C Ratio	0.02	0.07		0.07	0.12		0.00	0.67		0.05	0.71	
Clearance Time (s)	3.8	3.8		3.8	3.8		3.8	3.8		3.8	3.8	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	31	125		122	203		8	1229		89	1322	
v/s Ratio Prot	0.01	c0.03		c0.05	0.02		0.01	0.40		c0.03	c0.65	
v/s Ratio Perm												
v/c Ratio	0.71	0.47		0.80	0.19		1.38	0.60		0.61	0.91	
Uniform Delay, d1	53.3	48.9		50.0	43.2		54.3	10.2		50.7	12.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	46.1	1.0		27.4	0.2		466.9	0.8		7.8	9.7	
Delay (s)	99.5	49.9		77.4	43.4		521.2	11.0		58.5	22.6	
Level of Service	F	D		E	D		F	B		E	C	
Approach Delay (s)		62.4			61.4			18.5			24.1	
Approach LOS		E			E			B			C	

Intersection Summary			
HCM Average Control Delay	26.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	109.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↱		↰	↑↱	
Volume (vph)	10	10	10	80	10	100	10	700	30	90	1080	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1704		1770	1567		1770	3514		1770	3534	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1704		1770	1567		1770	3514		1770	3534	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	11	11	11	88	11	110	11	769	33	99	1187	11
RTOR Reduction (vph)	0	10	0	0	94	0	0	3	0	0	0	0
Lane Group Flow (vph)	11	12	0	88	27	0	11	799	0	99	1198	0
Confl. Peds. (#/hr)			1			1			1			1
Confl. Bikes (#/hr)			3			3			2			1
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	0.4	3.9		4.6	8.1		0.7	23.9		4.9	28.1	
Effective Green, g (s)	0.4	3.9		4.6	8.1		0.7	24.9		4.9	29.1	
Actuated g/C Ratio	0.01	0.07		0.08	0.15		0.01	0.46		0.09	0.54	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	13	122		150	234		23	1611		160	1894	
v/s Ratio Prot	0.01	0.01		c0.05	c0.02		0.01	0.23		c0.06	c0.34	
v/s Ratio Perm												
v/c Ratio	0.85	0.10		0.59	0.12		0.48	0.50		0.62	0.63	
Uniform Delay, d1	26.9	23.6		23.9	20.0		26.6	10.3		23.8	8.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	162.2	0.1		3.7	0.1		5.6	0.3		4.9	0.7	
Delay (s)	189.1	23.7		27.7	20.1		32.2	10.6		28.7	9.5	
Level of Service	F	C		C	C		C	B		C	A	
Approach Delay (s)		78.8			23.3			10.8			11.0	
Approach LOS		E			C			B			B	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	54.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	670	100	0	1290	0	200
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	788	118	0	1518	0	235
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1283		
pX, platoon unblocked						
vC, conflicting volume			906		1547	788
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			906		1547	788
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	30
cM capacity (veh/h)			747		105	334

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	788	118	759	759	235
Volume Left	0	0	0	0	0
Volume Right	0	118	0	0	235
cSH	1700	1700	1700	1700	334
Volume to Capacity	0.46	0.07	0.45	0.45	0.70
Queue Length 95th (ft)	0	0	0	0	127
Control Delay (s)	0.0	0.0	0.0	0.0	37.9
Lane LOS					E
Approach Delay (s)	0.0		0.0		37.9
Approach LOS					E

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations						
Volume (vph)	820	280	1010	780	340	530
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	0.88	0.97	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3433	1563	3433	2724	3433	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3433	1563	3433	2724	3433	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	872	298	1074	830	362	564
RTOR Reduction (vph)	0	208	0	522	0	14
Lane Group Flow (vph)	872	90	1074	308	362	550
Confl. Peds. (#/hr)		1		2		
Turn Type		Perm		Perm		custom
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	19.1	19.1	21.9	21.9	8.0	33.9
Effective Green, g (s)	19.6	19.1	23.4	23.4	8.0	35.4
Actuated g/C Ratio	0.31	0.30	0.37	0.37	0.13	0.56
Clearance Time (s)	4.5	4.5	5.5	5.5	4.0	5.5
Vehicle Extension (s)	2.0	2.0	3.0	3.0	2.0	3.0
Lane Grp Cap (vph)	1068	474	1275	1012	436	889
v/s Ratio Prot	c0.25		c0.31		c0.11	0.35
v/s Ratio Perm		0.06		0.11		
v/c Ratio	0.82	0.19	0.84	0.30	0.83	0.62
Uniform Delay, d1	20.0	16.2	18.1	14.0	26.8	9.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.7	0.1	5.2	0.2	12.1	1.3
Delay (s)	24.7	16.3	23.3	14.2	38.9	10.6
Level of Service	C	B	C	B	D	B
Approach Delay (s)	22.6		19.4		21.7	
Approach LOS	C		B		C	

Intersection Summary			
HCM Average Control Delay	20.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	63.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	720	110	50	160	220	60	90	190	130	100	810	1020
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	800	122	56	178	244	67	100	211	144	111	900	1133
RTOR Reduction (vph)	0	0	37	0	0	54	0	0	95	0	0	0
Lane Group Flow (vph)	800	122	19	178	244	13	100	211	49	111	900	1133
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			Free
Actuated Green, G (s)	21.9	29.2	29.2	8.8	16.1	16.1	5.0	29.7	29.7	3.6	27.8	91.3
Effective Green, g (s)	22.4	30.7	30.7	9.3	17.6	17.6	5.5	31.2	31.2	4.1	29.8	91.3
Actuated g/C Ratio	0.25	0.34	0.34	0.10	0.19	0.19	0.06	0.34	0.34	0.04	0.33	1.00
Clearance Time (s)	4.5	5.5	5.5	4.5	5.5	5.5	4.5	5.5	5.5	4.5	6.0	
Vehicle Extension (s)	2.0	4.1	4.1	2.0	4.5	4.5	2.0	4.5	4.5	2.0	3.7	
Lane Grp Cap (vph)	842	1190	532	350	682	305	207	1209	952	154	1155	1583
v/s Ratio Prot	c0.23	0.03		0.05	0.07		0.03	0.06		0.03	0.25	
v/s Ratio Perm			0.01			0.01			0.02			c0.72
v/c Ratio	0.95	0.10	0.04	0.51	0.36	0.04	0.48	0.17	0.05	0.72	0.78	0.72
Uniform Delay, d1	33.9	20.8	20.4	38.8	31.9	30.0	41.5	21.0	20.1	43.0	27.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	19.7	0.1	0.0	0.4	0.6	0.1	0.6	0.1	0.0	13.1	3.5	2.8
Delay (s)	53.6	20.9	20.4	39.3	32.5	30.1	42.2	21.2	20.2	56.1	31.3	2.8
Level of Service	D	C	C	D	C	C	D	C	C	E	C	A
Approach Delay (s)		47.6			34.6			25.5			17.5	
Approach LOS		D			C			C			B	

Intersection Summary			
HCM Average Control Delay	27.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	91.3	Sum of lost time (s)	4.0
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑↱		↰	↰↑	↱		↰↑↱	
Volume (vph)	10	890	70	30	1840	10	80	10	50	10	10	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.7	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (prot)	1770	3539	1583	1770	3536		1681	1703	1583		1750	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (perm)	1770	3539	1583	1770	3536		1681	1703	1583		1750	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	10	918	72	31	1897	10	82	10	52	10	10	10
RTOR Reduction (vph)	0	0	25	0	0	0	0	0	47	0	10	0
Lane Group Flow (vph)	10	918	47	31	1907	0	46	46	5	0	20	0
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						8			
Actuated Green, G (s)	0.6	54.7	54.7	2.3	56.4		8.6	8.6	8.6		1.8	
Effective Green, g (s)	0.2	56.4	54.7	1.9	58.1		8.4	8.4	8.4		1.6	
Actuated g/C Ratio	0.00	0.67	0.65	0.02	0.69		0.10	0.10	0.10		0.02	
Clearance Time (s)	3.6	5.7	5.7	3.6	5.7		3.8	3.8	3.8		3.8	
Vehicle Extension (s)	2.2	3.2	3.2	2.2	3.2		3.1	3.1	3.1		3.1	
Lane Grp Cap (vph)	4	2368	1027	40	2437		168	170	158		33	
v/s Ratio Prot	0.01	0.26		c0.02	c0.54		c0.03	0.03			c0.01	
v/s Ratio Perm			0.03						0.00			
v/c Ratio	2.50	0.39	0.05	0.78	0.78		0.27	0.27	0.03		0.61	
Uniform Delay, d1	42.0	6.2	5.4	41.0	8.8		35.1	35.1	34.3		41.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	1125.0	0.1	0.0	58.3	1.7		0.9	0.9	0.1		29.4	
Delay (s)	1167.0	6.3	5.4	99.3	10.6		36.0	36.0	34.4		70.5	
Level of Service	F	A	A	F	B		D	D	C		E	
Approach Delay (s)		17.9			12.0			35.4			70.5	
Approach LOS		B			B			D			E	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	84.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

INTERSECTION SYNCHRO ANALYSIS

YR-2007 PM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱	↰	↑↑	↱
Volume (vph)	390	400	910	120	310	80	800	500	100	160	440	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.91	0.91	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1559	1770	3539	1555	1610	3319	1548	1770	3539	1562
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1559	1770	3539	1555	1610	3319	1548	1770	3539	1562
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	433	444	1011	133	344	89	889	556	111	178	489	311
RTOR Reduction (vph)	0	0	381	0	0	71	0	0	79	0	0	263
Lane Group Flow (vph)	433	444	630	133	344	18	471	974	32	178	489	48
Confl. Peds. (#/hr)						2			5			
Confl. Bikes (#/hr)			6			2			1			1
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2			6			8			7
Actuated Green, G (s)	36.8	53.0	53.0	11.0	28.0	28.0	39.7	39.7	39.7	21.1	21.1	21.1
Effective Green, g (s)	35.8	54.7	54.7	10.0	28.9	28.9	41.0	41.0	41.0	22.4	22.4	22.4
Actuated g/C Ratio	0.25	0.38	0.38	0.07	0.20	0.20	0.28	0.28	0.28	0.16	0.16	0.16
Clearance Time (s)	3.0	5.7	5.7	3.0	4.9	4.9	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	440	1343	592	123	710	312	458	944	440	275	550	243
v/s Ratio Prot	c0.24	0.13		0.08	0.10		0.29	c0.29		0.10	c0.14	
v/s Ratio Perm			c0.40			0.01			0.02			0.03
v/c Ratio	0.98	0.33	1.06	1.08	0.48	0.06	1.03	1.03	0.07	0.65	0.89	0.20
Uniform Delay, d1	53.9	31.7	44.7	67.0	51.0	46.6	51.6	51.6	37.7	57.1	59.6	53.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	38.4	0.1	55.3	104.6	0.2	0.0	49.5	37.8	0.0	3.9	15.7	0.1
Delay (s)	92.2	31.8	100.0	171.7	51.2	46.6	101.1	89.3	37.7	61.0	75.3	53.2
Level of Service	F	C	F	F	D	D	F	F	D	E	E	D
Approach Delay (s)		82.2			78.8			89.2			65.7	
Approach LOS		F			E			F			E	

Intersection Summary			
HCM Average Control Delay	80.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	144.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	85.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	0	200	0	0	0	130	1350	0	0	1210	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	0.98
Flpb, ped/bikes		1.00	1.00				1.00	1.00			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1770	1546				1770	1863			1863	1551
Flt Permitted		0.76	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1410	1546				1770	1863			1863	1551
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	111	0	222	0	0	0	144	1500	0	0	1344	111
RTOR Reduction (vph)	0	0	150	0	0	0	0	0	0	0	0	17
Lane Group Flow (vph)	0	111	72	0	0	0	144	1500	0	0	1344	94
Confl. Bikes (#/hr)			1			1						1
Turn Type	Perm		Perm	Perm			Prot			Prot		Perm
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4								6
Actuated Green, G (s)		15.7	15.7				12.0	121.6			105.6	105.6
Effective Green, g (s)		15.7	15.7				12.0	123.1			107.1	107.1
Actuated g/C Ratio		0.11	0.11				0.08	0.84			0.73	0.73
Clearance Time (s)		4.0	4.0				4.0	5.5			5.5	5.5
Vehicle Extension (s)		3.0	3.0				1.0	2.5			2.5	2.5
Lane Grp Cap (vph)		151	165				145	1562			1359	1132
v/s Ratio Prot							0.08	c0.81			c0.72	
v/s Ratio Perm		c0.08	0.05									0.06
v/c Ratio		0.74	0.44				0.99	0.96			0.99	0.08
Uniform Delay, d1		63.5	61.4				67.4	9.8			19.3	5.7
Progression Factor		1.00	1.00				1.00	1.00			1.00	1.00
Incremental Delay, d2		16.9	1.8				72.3	14.4			21.5	0.0
Delay (s)		80.4	63.2				139.6	24.3			40.8	5.7
Level of Service		F	E				F	C			D	A
Approach Delay (s)		69.0			0.0			34.4			38.1	
Approach LOS		E			A			C			D	

Intersection Summary			
HCM Average Control Delay	39.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	146.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	20	10	350	20	10	20	440	1380	10	10	1260	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	5.7	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97		0.99		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1804	1540		1714		1770	3539	1549	1770	3539	1583
Flt Permitted		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1804	1540		1714		1770	3539	1549	1770	3539	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	21	11	372	21	11	21	468	1468	11	11	1340	21
RTOR Reduction (vph)	0	0	348	0	20	0	0	0	3	0	0	7
Lane Group Flow (vph)	0	32	24	0	33	0	468	1468	8	11	1340	14
Confl. Peds. (#/hr)			3			2						
Confl. Bikes (#/hr)			3			1			3			
Turn Type	Split		Perm	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)		7.3	7.3		5.2		32.3	71.4	71.4	3.8	42.9	42.9
Effective Green, g (s)		6.7	6.7		4.6		31.3	73.1	71.4	2.8	44.6	44.6
Actuated g/C Ratio		0.06	0.06		0.04		0.30	0.71	0.69	0.03	0.43	0.43
Clearance Time (s)		3.4	3.4		3.4		3.0	5.7	5.7	3.0	5.7	5.7
Vehicle Extension (s)		1.0	1.0		0.5		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		117	100		76		537	2507	1072	48	1529	684
v/s Ratio Prot		c0.02			c0.02		c0.26	0.41		0.01	c0.38	
v/s Ratio Perm			0.02						0.01			0.01
v/c Ratio		0.27	0.24		0.43		0.87	0.59	0.01	0.23	0.88	0.02
Uniform Delay, d1		45.9	45.8		48.0		34.0	7.5	4.9	49.1	26.8	16.8
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.5	0.5		1.4		14.0	0.2	0.0	0.9	5.8	0.0
Delay (s)		46.4	46.3		49.5		48.1	7.7	4.9	50.0	32.6	16.8
Level of Service		D	D		D		D	A	A	D	C	B
Approach Delay (s)		46.3			49.5			17.4			32.5	
Approach LOS		D			D			B			C	

Intersection Summary			
HCM Average Control Delay	26.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	103.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↱↱		✥		↰	↑↑	↱		↑↑↑↑	
Volume (vph)	0	0	110	0	0	0	60	1750	0	0	1550	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0				4.0	4.0			4.0	
Lane Util. Factor			0.88				1.00	0.95			0.86	
Frt			0.85				1.00	1.00			0.99	
Flt Protected			1.00				0.95	1.00			1.00	
Satd. Flow (prot)			2787				1770	3539			6372	
Flt Permitted			1.00				0.09	1.00			1.00	
Satd. Flow (perm)			2787				166	3539			6372	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	129	0	0	0	71	2059	0	0	1824	71
RTOR Reduction (vph)	0	0	27	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	0	102	0	0	0	71	2059	0	0	1890	0
Turn Type			custom	Perm			Perm		Perm			
Protected Phases					8			2			6	
Permitted Phases			4	8			2		2			
Actuated Green, G (s)			6.5				45.5	45.5			45.5	
Effective Green, g (s)			6.5				45.5	45.5			45.5	
Actuated g/C Ratio			0.11				0.76	0.76			0.76	
Clearance Time (s)			4.0				4.0	4.0			4.0	
Vehicle Extension (s)			3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)			302				126	2684			4832	
v/s Ratio Prot								c0.58			0.30	
v/s Ratio Perm			c0.04				0.43					
v/c Ratio			0.34				0.56	0.77			0.39	
Uniform Delay, d1			24.8				3.1	4.2			2.5	
Progression Factor			1.00				1.00	1.00			1.00	
Incremental Delay, d2			0.7				17.0	2.2			0.2	
Delay (s)			25.4				20.0	6.4			2.7	
Level of Service			C				C	A			A	
Approach Delay (s)		25.4			0.0			6.8			2.7	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	20	40	370	20	890	30	870	230	960	610	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.5	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.91	0.86	0.91	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.90		1.00	0.88	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1676		1610	2788	1441	1770	3539	1583	3433	3507	
Flt Permitted	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1676		1610	2788	1441	1770	3539	1583	3433	3507	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	56	22	44	411	22	989	33	967	256	1067	678	44
RTOR Reduction (vph)	0	41	0	0	403	402	0	0	190	0	2	0
Lane Group Flow (vph)	56	25	0	329	196	92	33	967	66	1067	720	0
Turn Type	Split			Split		Perm	Prot		Perm	Prot		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases						3			6			
Actuated Green, G (s)	10.6	10.6		28.0	28.0	28.0	5.1	38.5	38.5	55.4	88.8	
Effective Green, g (s)	10.6	10.6		28.0	28.0	28.0	5.1	40.0	38.5	55.4	90.3	
Actuated g/C Ratio	0.07	0.07		0.19	0.19	0.19	0.03	0.27	0.26	0.37	0.60	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.5	5.5	4.0	5.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0	1.0	1.0	4.7	4.7	1.5	5.4	
Lane Grp Cap (vph)	125	118		301	520	269	60	944	406	1268	2111	
v/s Ratio Prot	c0.03	0.01		c0.20	0.07		0.02	c0.27		c0.31	0.21	
v/s Ratio Perm						0.06			0.04			
v/c Ratio	0.45	0.21		1.09	0.38	0.34	0.55	1.02	0.16	0.84	0.34	
Uniform Delay, d1	66.9	65.8		61.0	53.4	53.0	71.3	55.0	43.2	43.3	14.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.9	0.3		79.1	0.2	0.3	6.1	35.6	0.9	5.0	0.4	
Delay (s)	67.8	66.1		140.1	53.5	53.3	77.4	90.6	44.1	48.3	15.4	
Level of Service	E	E		F	D	D	E	F	D	D	B	
Approach Delay (s)		66.9			73.5			80.8			35.0	
Approach LOS		E			E			F			D	

Intersection Summary			
HCM Average Control Delay	60.3	HCM Level of Service	E
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↑↱		↰	↑↱	
Volume (vph)	140	10	560	30	20	10	760	1000	40	10	710	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.89			0.98		1.00	0.99		1.00	0.96	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1648			1771		1770	3516		1770	3381	
Flt Permitted		0.99			0.53		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1648			960		1770	3516		1770	3381	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	147	11	589	32	21	11	800	1053	42	11	747	263
RTOR Reduction (vph)	0	114	0	0	6	0	0	2	0	0	28	0
Lane Group Flow (vph)	0	633	0	0	58	0	800	1093	0	11	982	0
Confl. Peds. (#/hr)									1			
Confl. Bikes (#/hr)						1						2
Turn Type	Split			Perm			Prot			Prot		
Protected Phases	4!	4			8!		5	2		1	6	
Permitted Phases				8								
Actuated Green, G (s)		35.3			35.3		40.3	71.3		0.5	31.5	
Effective Green, g (s)		37.0			37.0		41.0	73.5		1.2	33.7	
Actuated g/C Ratio		0.30			0.30		0.33	0.59		0.01	0.27	
Clearance Time (s)		5.7			5.7		4.7	6.2		4.7	6.2	
Vehicle Extension (s)		3.0			3.0		2.0	3.8		2.0	3.8	
Lane Grp Cap (vph)		493			287		587	2089		17	921	
v/s Ratio Prot		c0.38					c0.45	0.31		0.01	c0.29	
v/s Ratio Perm					0.06							
v/c Ratio		1.28			0.20		1.36	0.52		0.65	1.07	
Uniform Delay, d1		43.4			32.3		41.4	14.8		61.0	45.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		143.0			0.3		174.1	0.3		49.2	48.8	
Delay (s)		186.3			32.7		215.4	15.1		110.2	93.8	
Level of Service		F			C		F	B		F	F	
Approach Delay (s)		186.3			32.7			99.7			94.0	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM Average Control Delay	114.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	123.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	124.2%	ICU Level of Service	H
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	330	640	550	10	880	750	960	1000	10	470	610	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	367	711	611	11	978	833	1067	1111	11	522	678	333
RTOR Reduction (vph)	0	0	173	0	0	313	0	0	7	0	0	159
Lane Group Flow (vph)	367	711	438	11	978	520	1067	1111	4	522	678	174
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.9	57.4	57.4	0.8	39.3	39.3	10.5	32.4	32.4	30.4	52.3	52.3
Effective Green, g (s)	19.4	57.9	57.9	1.3	39.8	39.8	11.0	33.9	33.9	30.9	53.8	53.8
Actuated g/C Ratio	0.14	0.41	0.41	0.01	0.28	0.28	0.08	0.24	0.24	0.22	0.38	0.38
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	5.1	5.1	2.0	5.1	5.1
Lane Grp Cap (vph)	245	1464	655	16	1006	450	270	857	383	391	1360	608
v/s Ratio Prot	c0.21	0.20		0.01	0.28		c0.31	c0.31		c0.29	0.19	
v/s Ratio Perm			0.28			c0.33			0.00			0.11
v/c Ratio	1.50	0.49	0.67	0.69	0.97	1.15	3.95	1.30	0.01	1.34	0.50	0.29
Uniform Delay, d1	60.3	30.1	33.3	69.1	49.6	50.1	64.5	53.0	40.3	54.6	32.8	29.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	244.3	0.1	2.0	67.5	21.7	92.1	1337.2	142.0	0.1	167.3	1.3	1.2
Delay (s)	304.6	30.2	35.3	136.7	71.2	142.2	1401.7	195.1	40.4	221.8	34.1	31.0
Level of Service	F	C	D	F	E	F	F	F	D	F	C	C
Approach Delay (s)		91.7			104.1			782.4			97.4	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	305.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.51		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	109.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱	↰	↰↑	↱	↰	↑↑↑↱		↰	↑↑	↱
Volume (vph)	10	20	10	150	20	420	20	1540	190	430	750	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected		0.98	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1832	1531	1681	1704	1561	1770	5002		1770	3539	1550
Flt Permitted		0.98	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1832	1531	1681	1704	1561	1770	5002		1770	3539	1550
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	22	11	167	22	467	22	1711	211	478	833	22
RTOR Reduction (vph)	0	0	11	0	0	396	0	9	0	0	0	6
Lane Group Flow (vph)	0	33	0	94	95	71	22	1913	0	478	833	16
Confl. Bikes (#/hr)			2			1						2
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)		2.5	2.5	14.8	14.8	14.8	3.8	59.6		43.1	98.9	98.9
Effective Green, g (s)		3.0	3.0	15.3	15.3	15.3	4.3	62.1		43.6	101.4	101.4
Actuated g/C Ratio		0.02	0.02	0.11	0.11	0.11	0.03	0.44		0.31	0.72	0.72
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	4.5	6.5		4.5	6.5	6.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	4.6		2.0	5.1	5.1
Lane Grp Cap (vph)		39	33	184	186	171	54	2219		551	2563	1123
v/s Ratio Prot		c0.02		c0.06	0.06		0.01	c0.38		c0.27	0.24	
v/s Ratio Perm			0.00			0.05						0.01
v/c Ratio		0.85	0.01	0.51	0.51	0.41	0.41	0.86		0.87	0.33	0.01
Uniform Delay, d1		68.3	67.0	58.8	58.8	58.2	66.6	35.1		45.5	7.0	5.4
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		0.91	0.77	0.80
Incremental Delay, d2		82.5	0.0	1.0	1.0	0.6	1.8	4.7		11.1	0.3	0.0
Delay (s)		150.7	67.1	59.8	59.8	58.8	68.4	39.8		52.6	5.6	4.3
Level of Service		F	E	E	E	E	E	D		D	A	A
Approach Delay (s)		129.8			59.1			40.1			22.4	
Approach LOS		F			E			D			C	

Intersection Summary			
HCM Average Control Delay	38.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑↱		↰	↑
Volume (vph)	20	20	1620	20	10	1110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.95		1.00	1.00
Frt	0.93		1.00		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1695		3533		1770	1863
Flt Permitted	0.98		1.00		0.95	1.00
Satd. Flow (perm)	1695		3533		1770	1863
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	22	22	1800	22	11	1233
RTOR Reduction (vph)	20	0	0	0	0	0
Lane Group Flow (vph)	24	0	1822	0	11	1233
Turn Type					Prot	
Protected Phases	8		6		5	2
Permitted Phases						
Actuated Green, G (s)	6.5		67.9		3.6	75.5
Effective Green, g (s)	6.5		67.9		3.6	75.5
Actuated g/C Ratio	0.07		0.75		0.04	0.84
Clearance Time (s)	4.0		4.0		4.0	4.0
Vehicle Extension (s)	3.0		2.8		2.4	2.8
Lane Grp Cap (vph)	122		2665		71	1563
v/s Ratio Prot	c0.01		0.52		0.01	c0.66
v/s Ratio Perm						
v/c Ratio	0.19		0.68		0.15	0.79
Uniform Delay, d1	39.3		5.6		41.7	3.5
Progression Factor	1.00		0.72		1.00	1.00
Incremental Delay, d2	0.8		1.2		0.7	4.1
Delay (s)	40.1		5.2		42.4	7.6
Level of Service	D		A		D	A
Approach Delay (s)	40.1		5.2			7.9
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰			↑↑	↑	↱
Volume (vph)	190	20	0	1450	1060	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.97			0.95	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	0.96			1.00	1.00	1.00
Satd. Flow (prot)	3408			3539	1863	1583
Flt Permitted	0.96			1.00	1.00	1.00
Satd. Flow (perm)	3408			3539	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	211	22	0	1611	1178	78
RTOR Reduction (vph)	10	0	0	0	0	17
Lane Group Flow (vph)	223	0	0	1611	1178	61
Turn Type						Perm
Protected Phases	4			2	2	
Permitted Phases						2
Actuated Green, G (s)	11.6			70.4	70.4	70.4
Effective Green, g (s)	11.6			70.4	70.4	70.4
Actuated g/C Ratio	0.13			0.78	0.78	0.78
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	2.8			2.8	2.8	2.8
Lane Grp Cap (vph)	439			2768	1457	1238
v/s Ratio Prot	c0.07			0.46	c0.63	
v/s Ratio Perm						0.04
v/c Ratio	0.51			0.58	0.81	0.05
Uniform Delay, d1	36.5			3.9	5.8	2.2
Progression Factor	1.00			0.29	0.88	1.70
Incremental Delay, d2	0.8			0.6	3.3	0.0
Delay (s)	37.4			1.8	8.4	3.8
Level of Service	D			A	A	A
Approach Delay (s)	37.4			1.8	8.1	
Approach LOS	D			A	A	

Intersection Summary			
HCM Average Control Delay	7.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↑↱			✥			✥	
Volume (vph)	10	1040	30	10	1380	20	30	100	50	40	40	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1710	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			0%			0%	
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		0.95			1.00			1.00	
Frpb, ped/bikes		1.00	0.96		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.96			0.96	
Flt Protected		1.00	1.00		1.00			0.99			0.98	
Satd. Flow (prot)		1815	1479		3093			1765			1742	
Flt Permitted		0.98	1.00		0.95			0.93			0.70	
Satd. Flow (perm)		1780	1479		2927			1656			1238	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	11	1156	33	11	1533	22	33	111	56	44	44	44
RTOR Reduction (vph)	0	0	8	0	1	0	0	17	0	0	22	0
Lane Group Flow (vph)	0	1167	25	0	1565	0	0	183	0	0	110	0
Confl. Peds. (#/hr)			9			2						
Confl. Bikes (#/hr)						1			2			1
Parking (#/hr)				0	0	0						
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		67.7	67.7		67.7			14.3			14.3	
Effective Green, g (s)		67.7	67.7		67.7			14.3			14.3	
Actuated g/C Ratio		0.75	0.75		0.75			0.16			0.16	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)		2.8	2.8		2.8			2.0			2.0	
Lane Grp Cap (vph)		1339	1113		2202			263			197	
v/s Ratio Prot												
v/s Ratio Perm		c0.66	0.02		0.53			c0.11			0.09	
v/c Ratio		0.87	0.02		0.71			0.70			0.56	
Uniform Delay, d1		8.0	2.8		5.9			35.8			34.9	
Progression Factor		0.30	0.13		1.00			1.00			1.00	
Incremental Delay, d2		4.8	0.0		2.0			6.3			2.0	
Delay (s)		7.2	0.4		7.9			42.1			36.9	
Level of Service		A	A		A			D			D	
Approach Delay (s)		7.0			7.9			42.1			36.9	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑	↱
Volume (vph)	500	610	20	40	720	10	20	440	110	100	340	670
Ideal Flow (vphpl)	1900	1900	1900	1900	1596	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1854		1770	1562		1770	1807		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1854		1770	1562		1770	1807		1770	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	556	678	22	44	800	11	22	489	122	111	378	744
RTOR Reduction (vph)	0	1	0	0	1	0	0	6	0	0	0	33
Lane Group Flow (vph)	556	699	0	44	810	0	22	605	0	111	378	711
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												6
Actuated Green, G (s)	32.0	81.2		6.6	55.8		1.8	41.6		7.0	46.8	78.8
Effective Green, g (s)	32.0	81.2		6.6	55.8		1.8	41.6		7.0	46.8	78.8
Actuated g/C Ratio	0.21	0.53		0.04	0.37		0.01	0.27		0.05	0.31	0.52
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.1		2.0	4.1		2.0	4.1		2.0	4.1	2.0
Lane Grp Cap (vph)	372	988		77	572		21	493		81	572	860
v/s Ratio Prot	c0.31	0.38		0.02	c0.52		0.01	c0.33		c0.06	0.20	0.17
v/s Ratio Perm												0.28
v/c Ratio	1.49	0.71		0.57	1.42		1.05	1.23		1.37	0.66	0.83
Uniform Delay, d1	60.2	26.7		71.5	48.3		75.3	55.4		72.7	45.9	31.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	236.4	2.5		6.2	197.7		212.0	119.3		227.0	3.2	6.2
Delay (s)	296.6	29.2		77.7	246.0		287.3	174.7		299.7	49.1	37.3
Level of Service	F	C		E	F		F	F		F	D	D
Approach Delay (s)		147.6			237.3			178.6			64.5	
Approach LOS		F			F			F			E	

Intersection Summary			
HCM Average Control Delay	146.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.37		
Actuated Cycle Length (s)	152.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	122.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰	↱
Volume (vph)	320	480	410	230	170	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1566	1770	1544
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	3539	1566	1770	1544
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	356	533	456	256	189	378
RTOR Reduction (vph)	0	0	0	59	0	299
Lane Group Flow (vph)	356	533	456	197	189	79
Confl. Peds. (#/hr)				8		7
Confl. Bikes (#/hr)				8		8
Turn Type	Prot			pm+ov		Perm
Protected Phases	1	6	2	4	4	
Permitted Phases				2		4
Actuated Green, G (s)	12.4	25.9	9.5	18.5	9.0	9.0
Effective Green, g (s)	12.4	25.9	9.5	18.5	9.0	9.0
Actuated g/C Ratio	0.29	0.60	0.22	0.43	0.21	0.21
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.1	3.1	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	512	1125	784	821	371	324
v/s Ratio Prot	c0.20	c0.29	0.13	0.05	c0.11	
v/s Ratio Perm				0.08		0.05
v/c Ratio	0.70	0.47	0.58	0.24	0.51	0.24
Uniform Delay, d1	13.6	4.7	14.9	7.7	15.0	14.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.1	0.3	0.7	0.1	0.4	0.1
Delay (s)	17.7	5.0	15.6	7.8	15.4	14.3
Level of Service	B	A	B	A	B	B
Approach Delay (s)		10.1	12.8		14.6	
Approach LOS		B	B		B	

Intersection Summary			
HCM Average Control Delay	12.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	42.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Volume (vph)	30	50	10	240	100	130	10	910	30	60	860	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.92		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1815		1770	1705		1770	1854		1770	1844	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1815		1770	1705		1770	1854		1770	1844	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	32	54	11	258	108	140	11	978	32	65	925	65
RTOR Reduction (vph)	0	6	0	0	38	0	0	1	0	0	2	0
Lane Group Flow (vph)	32	59	0	258	210	0	11	1009	0	65	988	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	3.6	8.7		19.5	24.6		0.8	71.5		5.9	76.6	
Effective Green, g (s)	3.4	8.5		19.3	24.4		0.6	71.3		5.7	76.4	
Actuated g/C Ratio	0.03	0.07		0.16	0.20		0.00	0.59		0.05	0.63	
Clearance Time (s)	3.8	3.8		3.8	3.8		3.8	3.8		3.8	3.8	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	50	128		283	344		9	1094		84	1166	
v/s Ratio Prot	0.02	0.03		c0.15	c0.12		0.01	c0.54		c0.04	0.54	
v/s Ratio Perm												
v/c Ratio	0.64	0.46		0.91	0.61		1.22	0.92		0.77	0.85	
Uniform Delay, d1	58.1	54.0		49.9	43.9		60.1	22.3		56.9	17.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	19.0	1.0		30.9	2.3		385.4	12.6		32.3	5.9	
Delay (s)	77.1	54.9		80.8	46.2		445.5	34.9		89.2	23.5	
Level of Service	E	D		F	D		F	C		F	C	
Approach Delay (s)		62.2			63.8			39.3			27.5	
Approach LOS		E			E			D			C	

Intersection Summary			
HCM Average Control Delay	40.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	120.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↱		↰	↑↱	
Volume (vph)	20	30	10	180	10	180	10	970	60	90	770	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1784		1770	1558		1770	3503		1770	3531	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1784		1770	1558		1770	3503		1770	3531	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	22	33	11	198	11	198	11	1066	66	99	846	11
RTOR Reduction (vph)	0	10	0	0	124	0	0	5	0	0	1	0
Lane Group Flow (vph)	22	34	0	198	85	0	11	1127	0	99	856	0
Confl. Peds. (#/hr)			1			1			1			1
Confl. Bikes (#/hr)			3			3			2			1
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	1.0	6.2		9.9	15.1		0.5	28.4		5.2	33.1	
Effective Green, g (s)	1.0	6.2		9.9	15.1		0.5	29.4		5.2	34.1	
Actuated g/C Ratio	0.01	0.09		0.15	0.23		0.01	0.44		0.08	0.51	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	27	166		263	353		13	1544		138	1805	
v/s Ratio Prot	0.01	0.02		c0.11	c0.05		0.01	c0.32		c0.06	0.24	
v/s Ratio Perm												
v/c Ratio	0.81	0.20		0.75	0.24		0.85	0.73		0.72	0.47	
Uniform Delay, d1	32.8	28.0		27.2	21.1		33.1	15.4		30.0	10.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	91.8	0.2		10.3	0.1		162.2	1.8		13.7	0.2	
Delay (s)	124.6	28.2		37.5	21.2		195.3	17.2		43.8	10.7	
Level of Service	F	C		D	C		F	B		D	B	
Approach Delay (s)		60.3			29.2			18.9			14.1	
Approach LOS		E			C			B			B	

Intersection Summary			
HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	66.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱		↑↑	↰↱	
Volume (veh/h)	1050	100	0	1030	0	360
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	1235	118	0	1212	0	424
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1283		
pX, platoon unblocked						
vC, conflicting volume			1353		1841	1235
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1353		1841	1235
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	0
cM capacity (veh/h)			505		67	168

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	1235	118	606	606	424
Volume Left	0	0	0	0	0
Volume Right	0	118	0	0	424
cSH	1700	1700	1700	1700	168
Volume to Capacity	0.73	0.07	0.36	0.36	2.52
Queue Length 95th (ft)	0	0	0	0	908
Control Delay (s)	0.0	0.0	0.0	0.0	745.3
Lane LOS					F
Approach Delay (s)	0.0		0.0		745.3
Approach LOS					F

Intersection Summary			
Average Delay	105.6		
Intersection Capacity Utilization	84.2%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations	↰↰	↱	↰↰	↱↱	↰↰	↱
Volume (vph)	920	290	740	740	540	870
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	0.88	0.97	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3433	1563	3433	2723	3433	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3433	1563	3433	2723	3433	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	979	309	787	787	574	926
RTOR Reduction (vph)	0	216	0	530	0	6
Lane Group Flow (vph)	979	93	787	257	574	920
Confl. Peds. (#/hr)		1		2		
Turn Type		Perm		Perm		custom
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	21.0	21.0	21.3	21.3	13.6	38.9
Effective Green, g (s)	21.5	21.0	22.8	22.8	13.6	40.4
Actuated g/C Ratio	0.31	0.30	0.33	0.33	0.19	0.58
Clearance Time (s)	4.5	4.5	5.5	5.5	4.0	5.5
Vehicle Extension (s)	2.0	2.0	3.0	3.0	2.0	3.0
Lane Grp Cap (vph)	1056	470	1120	888	668	915
v/s Ratio Prot	c0.29		0.23		0.17	c0.58
v/s Ratio Perm		0.06		0.09		
v/c Ratio	0.93	0.20	0.70	0.29	0.86	1.01
Uniform Delay, d1	23.4	18.2	20.6	17.5	27.2	14.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.2	0.1	2.0	0.2	10.3	31.1
Delay (s)	36.7	18.3	22.6	17.7	37.6	45.9
Level of Service	D	B	C	B	D	D
Approach Delay (s)	32.2		20.2		42.7	
Approach LOS	C		C		D	

Intersection Summary			
HCM Average Control Delay	31.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	69.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1000	180	60	160	140	120	80	830	130	100	380	790
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1111	200	67	178	156	133	89	922	144	111	422	878
RTOR Reduction (vph)	0	0	38	0	0	65	0	0	76	0	0	0
Lane Group Flow (vph)	1111	200	29	178	156	68	89	922	68	111	422	878
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			Free
Actuated Green, G (s)	46.2	51.7	51.7	10.3	15.8	15.8	6.9	37.1	37.1	5.0	34.7	124.1
Effective Green, g (s)	46.7	53.2	53.2	10.8	17.3	17.3	7.4	38.6	38.6	5.5	36.7	124.1
Actuated g/C Ratio	0.38	0.43	0.43	0.09	0.14	0.14	0.06	0.31	0.31	0.04	0.30	1.00
Clearance Time (s)	4.5	5.5	5.5	4.5	5.5	5.5	4.5	5.5	5.5	4.5	6.0	
Vehicle Extension (s)	2.0	4.1	4.1	2.0	4.5	4.5	2.0	4.5	4.5	2.0	3.7	
Lane Grp Cap (vph)	1292	1517	679	299	493	221	205	1101	867	152	1047	1583
v/s Ratio Prot	c0.32	0.06		0.05	0.04		0.03	c0.26		0.03	0.12	
v/s Ratio Perm			0.02			0.04			0.02			c0.55
v/c Ratio	0.86	0.13	0.04	0.60	0.32	0.31	0.43	0.84	0.08	0.73	0.40	0.55
Uniform Delay, d1	35.7	21.5	20.6	54.5	48.1	48.0	56.3	39.8	30.2	58.6	34.9	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.7	0.1	0.0	2.1	0.6	1.4	0.5	6.2	0.1	14.3	0.3	1.4
Delay (s)	41.4	21.5	20.7	56.7	48.7	49.4	56.9	46.0	30.3	72.9	35.3	1.4
Level of Service	D	C	C	E	D	D	E	D	C	E	D	A
Approach Delay (s)		37.5			51.9			44.9			17.2	
Approach LOS		D			D			D			B	

Intersection Summary			
HCM Average Control Delay	34.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	124.1	Sum of lost time (s)	4.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰	↰↑	↱		↰↑↱	
Volume (vph)	10	1880	60	70	1210	10	50	10	70	10	10	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.7	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.98	
Satd. Flow (prot)	1770	3539	1583	1770	3535		1681	1712	1583		1750	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.98	
Satd. Flow (perm)	1770	3539	1583	1770	3535		1681	1712	1583		1750	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	10	1938	62	72	1247	10	52	10	72	10	10	10
RTOR Reduction (vph)	0	0	15	0	0	0	0	0	66	0	10	0
Lane Group Flow (vph)	10	1938	47	72	1257	0	31	31	6	0	20	0
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						8			
Actuated Green, G (s)	0.7	62.4	62.4	5.8	67.5		8.3	8.3	8.3		2.8	
Effective Green, g (s)	0.3	64.1	62.4	5.4	69.2		8.1	8.1	8.1		2.6	
Actuated g/C Ratio	0.00	0.67	0.65	0.06	0.72		0.08	0.08	0.08		0.03	
Clearance Time (s)	3.6	5.7	5.7	3.6	5.7		3.8	3.8	3.8		3.8	
Vehicle Extension (s)	2.2	3.2	3.2	2.2	3.2		3.1	3.1	3.1		3.1	
Lane Grp Cap (vph)	6	2358	1027	99	2543		142	144	133		47	
v/s Ratio Prot	0.01	c0.55		c0.04	0.36		c0.02	0.02			c0.01	
v/s Ratio Perm			0.03						0.00			
v/c Ratio	1.67	0.82	0.05	0.73	0.49		0.22	0.22	0.05		0.43	
Uniform Delay, d1	48.0	11.8	6.1	44.7	5.9		41.1	41.1	40.5		46.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	647.5	2.5	0.0	20.8	0.2		0.8	0.8	0.1		6.5	
Delay (s)	695.4	14.3	6.1	65.4	6.0		41.9	41.9	40.6		52.5	
Level of Service	F	B	A	E	A		D	D	D		D	
Approach Delay (s)		17.4			9.3			41.2			52.5	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	96.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

INTERSECTION SYNCHRO ANALYSIS

YR-2010 NO-BUILD AM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱	↰	↑↑	↱
Volume (vph)	175	175	645	120	393	109	1180	339	44	87	590	459
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.91	0.91	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1553	1770	3539	1554	1610	3286	1548	1770	3539	1563
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1553	1770	3539	1554	1610	3286	1548	1770	3539	1563
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	194	194	717	133	437	121	1311	377	49	97	656	510
RTOR Reduction (vph)	0	0	524	0	0	103	0	0	29	0	0	139
Lane Group Flow (vph)	194	194	193	133	437	18	655	1033	20	97	656	371
Confl. Peds. (#/hr)						2			5			
Confl. Bikes (#/hr)			6			2			1			1
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2			6			8			7
Actuated Green, G (s)	17.0	24.3	24.3	12.0	20.1	20.1	56.2	56.2	56.2	30.1	30.1	30.1
Effective Green, g (s)	16.0	26.0	26.0	11.0	21.0	21.0	57.5	57.5	57.5	31.4	31.4	31.4
Actuated g/C Ratio	0.11	0.18	0.18	0.08	0.15	0.15	0.41	0.41	0.41	0.22	0.22	0.22
Clearance Time (s)	3.0	5.7	5.7	3.0	4.9	4.9	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	200	648	285	137	524	230	652	1332	627	392	783	346
v/s Ratio Prot	c0.11	0.05		0.08	c0.12		c0.41	0.31		0.05	0.19	
v/s Ratio Perm			0.12			0.01			0.01			c0.24
v/c Ratio	0.97	0.30	0.68	0.97	0.83	0.08	1.00	0.96dl	0.03	0.25	0.84	1.07
Uniform Delay, d1	62.7	50.1	54.0	65.3	58.8	52.1	42.2	36.6	25.4	45.5	52.8	55.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	54.6	0.1	4.9	67.4	10.5	0.1	36.4	2.6	0.0	0.1	7.5	68.6
Delay (s)	117.3	50.2	58.9	132.7	69.3	52.2	78.6	39.2	25.4	45.6	60.3	123.8
Level of Service	F	D	E	F	E	D	E	D	C	D	E	F
Approach Delay (s)		67.6			78.5			53.7			84.8	
Approach LOS		E			E			D			F	

Intersection Summary			
HCM Average Control Delay	68.7	HCM Level of Service	E
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	141.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.4%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰	↱		↰	↑	↱
Volume (vph)	175	0	131	0	0	0	164	1344	0	0	1311	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	0.98
Flpb, ped/bikes		1.00	1.00				1.00	1.00			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1770	1547				1770	1863			1863	1551
Flt Permitted		0.76	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1410	1547				1770	1863			1863	1551
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	194	0	146	0	0	0	182	1493	0	0	1457	146
RTOR Reduction (vph)	0	0	128	0	0	0	0	0	0	0	0	22
Lane Group Flow (vph)	0	194	18	0	0	0	182	1493	0	0	1457	124
Confl. Bikes (#/hr)			1			1						1
Turn Type	Perm		Perm	Perm			Prot			Prot		Perm
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4								6
Actuated Green, G (s)		19.0	19.0				13.0	121.5			104.5	104.5
Effective Green, g (s)		19.0	19.0				13.0	123.0			106.0	106.0
Actuated g/C Ratio		0.13	0.13				0.09	0.82			0.71	0.71
Clearance Time (s)		4.0	4.0				4.0	5.5			5.5	5.5
Vehicle Extension (s)		3.0	3.0				1.0	2.5			2.5	2.5
Lane Grp Cap (vph)		179	196				153	1528			1317	1096
v/s Ratio Prot							c0.10	0.80			c0.78	
v/s Ratio Perm		c0.14	0.01									0.08
v/c Ratio		1.08	0.09				1.19	0.98			1.11	0.11
Uniform Delay, d1		65.5	57.9				68.5	12.2			22.0	7.0
Progression Factor		1.00	1.00				1.00	1.00			1.00	1.00
Incremental Delay, d2		91.4	0.2				132.7	17.6			59.3	0.0
Delay (s)		156.9	58.1				201.2	29.9			81.3	7.0
Level of Service		F	E				F	C			F	A
Approach Delay (s)		114.5			0.0			48.5			74.5	
Approach LOS		F			A			D			E	

Intersection Summary			
HCM Average Control Delay	66.2	HCM Level of Service	E
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	97.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↔		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	22	11	470	11	11	11	382	1431	11	11	1399	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	5.7	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1803	1545		1736		1770	3539	1549	1770	3539	1583
Flt Permitted		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1803	1545		1736		1770	3539	1549	1770	3539	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	23	12	500	12	12	12	406	1522	12	12	1488	35
RTOR Reduction (vph)	0	0	393	0	12	0	0	0	3	0	0	11
Lane Group Flow (vph)	0	35	107	0	24	0	406	1522	9	12	1488	24
Confl. Peds. (#/hr)			3			2						
Confl. Bikes (#/hr)			3			1			3			
Turn Type	Split		Perm	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)		11.1	11.1		4.0		30.0	74.5	74.5	3.9	48.4	48.4
Effective Green, g (s)		10.5	10.5		3.4		29.0	76.2	74.5	2.9	50.1	50.1
Actuated g/C Ratio		0.10	0.10		0.03		0.27	0.70	0.68	0.03	0.46	0.46
Clearance Time (s)		3.4	3.4		3.4		3.0	5.7	5.7	3.0	5.7	5.7
Vehicle Extension (s)		1.0	1.0		0.5		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		174	149		54		471	2474	1059	47	1627	728
v/s Ratio Prot		0.02			c0.01		c0.23	0.43		0.01	c0.42	
v/s Ratio Perm			c0.07						0.01			0.02
v/c Ratio		0.20	0.72		0.45		0.86	0.62	0.01	0.26	0.91	0.03
Uniform Delay, d1		45.4	47.8		51.9		38.1	8.7	5.5	52.0	27.5	16.2
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.2	12.8		2.2		14.5	0.3	0.0	1.0	8.2	0.0
Delay (s)		45.6	60.6		54.1		52.6	9.0	5.5	53.0	35.6	16.2
Level of Service		D	E		D		D	A	A	D	D	B
Approach Delay (s)		59.6			54.1			18.1			35.3	
Approach LOS		E			D			B			D	

Intersection Summary			
HCM Average Control Delay	30.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	109.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	81.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	109	0	0	0	22	1792	0	0	1792	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0				4.0	4.0			4.0	
Lane Util. Factor			0.88				1.00	0.95			0.86	
Frt			0.85				1.00	1.00			0.99	
Flt Protected			1.00				0.95	1.00			1.00	
Satd. Flow (prot)			2787				1770	3539			6374	
Flt Permitted			1.00				0.08	1.00			1.00	
Satd. Flow (perm)			2787				148	3539			6374	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	128	0	0	0	26	2108	0	0	2108	78
RTOR Reduction (vph)	0	0	18	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	0	110	0	0	0	26	2108	0	0	2181	0
Turn Type			custom	Perm			Perm		Perm			
Protected Phases					8			2			6	
Permitted Phases			4	8			2		2			
Actuated Green, G (s)			6.8				50.2	50.2			50.2	
Effective Green, g (s)			6.8				50.2	50.2			50.2	
Actuated g/C Ratio			0.10				0.77	0.77			0.77	
Clearance Time (s)			4.0				4.0	4.0			4.0	
Vehicle Extension (s)			3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)			292				114	2733			4923	
v/s Ratio Prot								c0.60			0.34	
v/s Ratio Perm			c0.04				0.18					
v/c Ratio			0.38				0.23	0.77			0.44	
Uniform Delay, d1			27.1				2.0	4.2			2.6	
Progression Factor			1.00				1.00	1.00			1.00	
Incremental Delay, d2			0.8				4.6	2.2			0.3	
Delay (s)			27.9				6.6	6.3			2.9	
Level of Service			C				A	A			A	
Approach Delay (s)		27.9			0.0			6.3			2.9	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	5.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	33	22	33	175	22	1027	22	754	317	863	962	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.5	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.91	0.86	0.91	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.91		1.00	0.86	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1693		1610	2753	1441	1770	3539	1583	3433	3528	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1693		1610	2753	1441	1770	3539	1583	3433	3528	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	37	24	37	194	24	1141	24	838	352	959	1069	24
RTOR Reduction (vph)	0	34	0	0	506	505	0	0	239	0	1	0
Lane Group Flow (vph)	37	27	0	175	108	65	24	838	113	959	1092	0
Turn Type	Split			Split		Perm	Prot		Perm	Prot		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases						3			6			
Actuated Green, G (s)	8.2	8.2		12.5	12.5	12.5	3.2	35.3	35.3	36.5	68.6	
Effective Green, g (s)	8.2	8.2		12.5	12.5	12.5	3.2	36.8	35.3	36.5	70.1	
Actuated g/C Ratio	0.07	0.07		0.11	0.11	0.11	0.03	0.33	0.32	0.33	0.64	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.5	5.5	4.0	5.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0	1.0	1.0	4.7	4.7	1.5	5.4	
Lane Grp Cap (vph)	132	126		183	313	164	51	1184	508	1139	2248	
v/s Ratio Prot	c0.02	0.02		c0.11	0.04		0.01	c0.24		c0.28	0.31	
v/s Ratio Perm						0.04			0.07			
v/c Ratio	0.28	0.21		0.96	0.85dr	0.39	0.47	0.71	0.22	0.84	0.49	
Uniform Delay, d1	48.1	47.9		48.5	45.0	45.2	52.6	31.9	27.3	34.1	10.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	0.3		53.0	0.2	0.6	2.5	3.6	1.0	5.6	0.8	
Delay (s)	48.5	48.2		101.5	45.2	45.8	55.1	35.5	28.3	39.6	11.2	
Level of Service	D	D		F	D	D	E	D	C	D	B	
Approach Delay (s)		48.3			52.7			33.8			24.5	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	35.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↑↱		↰	↑↱	
Volume (vph)	186	11	863	44	11	11	208	918	11	11	1071	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.89			0.98		1.00	1.00		1.00	0.98	
Flt Protected		0.99			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1644			1758		1770	3532		1770	3478	
Flt Permitted		0.99			0.45		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1644			809		1770	3532		1770	3478	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	196	12	908	46	12	12	219	966	12	12	1127	126
RTOR Reduction (vph)	0	107	0	0	5	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	1009	0	0	65	0	219	977	0	12	1248	0
Confl. Peds. (#/hr)									1			
Confl. Bikes (#/hr)						1						2
Turn Type	Split			Perm			Prot			Prot		
Protected Phases	4!	4			8!		5	2		1	6	
Permitted Phases				8								
Actuated Green, G (s)		73.3			73.3		15.3	61.4		1.6	47.7	
Effective Green, g (s)		75.0			75.0		16.0	63.6		2.3	49.9	
Actuated g/C Ratio		0.49			0.49		0.10	0.42		0.02	0.33	
Clearance Time (s)		5.7			5.7		4.7	6.2		4.7	6.2	
Vehicle Extension (s)		3.0			3.0		2.0	3.8		2.0	3.8	
Lane Grp Cap (vph)		806			397		185	1469		27	1135	
v/s Ratio Prot		c0.61					c0.12	0.28		0.01	c0.36	
v/s Ratio Perm					0.08							
v/c Ratio		1.25			0.16		1.18	0.67		0.44	1.10	
Uniform Delay, d1		38.9			21.6		68.4	36.1		74.7	51.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		123.5			0.2		124.4	1.2		4.2	58.1	
Delay (s)		162.5			21.8		192.8	37.3		78.9	109.6	
Level of Service		F			C		F	D		E	F	
Approach Delay (s)		162.5			21.8			65.8			109.3	
Approach LOS		F			C			E			F	

Intersection Summary			
HCM Average Control Delay	109.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	152.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	117.9%	ICU Level of Service	H
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	229	841	907	22	809	514	328	350	11	317	1650	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	254	934	1008	24	899	571	364	389	12	352	1833	194
RTOR Reduction (vph)	0	0	102	0	0	360	0	0	9	0	0	55
Lane Group Flow (vph)	254	934	906	24	899	211	364	389	3	352	1833	139
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	20.9	58.8	58.8	1.6	39.5	39.5	9.5	35.5	35.5	30.1	56.1	56.1
Effective Green, g (s)	21.4	59.3	59.3	2.1	40.0	40.0	10.0	37.0	37.0	30.6	57.6	57.6
Actuated g/C Ratio	0.15	0.41	0.41	0.01	0.28	0.28	0.07	0.26	0.26	0.21	0.40	0.40
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	5.1	5.1	2.0	5.1	5.1
Lane Grp Cap (vph)	261	1447	647	26	976	437	237	903	404	374	1406	629
v/s Ratio Prot	c0.14	0.26		0.01	0.25		c0.11	0.11		0.20	c0.52	
v/s Ratio Perm			c0.57			0.13			0.00			0.09
v/c Ratio	0.97	0.65	1.40	0.92	0.92	0.48	1.54	0.43	0.01	0.94	1.30	0.22
Uniform Delay, d1	61.5	34.4	42.8	71.4	51.0	43.9	67.5	45.2	40.3	56.3	43.7	28.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	47.8	0.7	189.6	140.5	13.4	0.3	261.2	1.5	0.0	31.4	142.0	0.8
Delay (s)	109.3	35.2	232.5	211.9	64.4	44.2	328.7	46.7	40.3	87.7	185.7	29.7
Level of Service	F	D	F	F	E	D	F	D	D	F	F	C
Approach Delay (s)		134.3			59.0			180.8			158.4	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM Average Control Delay	131.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.37		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	115.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱	↰	↰↑	↱	↰	↑↑↑↱		↰	↑↑	↱
Volume (vph)	11	22	22	219	0	175	11	503	219	120	2470	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected		0.98	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1832	1529	1681	1681	1561	1770	4854		1770	3539	1550
Flt Permitted		0.98	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1832	1529	1681	1681	1561	1770	4854		1770	3539	1550
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	24	24	243	0	194	12	559	243	133	2744	12
RTOR Reduction (vph)	0	0	24	0	0	127	0	39	0	0	0	2
Lane Group Flow (vph)	0	36	0	121	122	67	12	763	0	133	2744	10
Confl. Bikes (#/hr)			2			1						2
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)		2.5	2.5	17.0	17.0	17.0	1.7	95.3		15.2	108.8	108.8
Effective Green, g (s)		3.0	3.0	17.5	17.5	17.5	2.2	97.8		15.7	111.3	111.3
Actuated g/C Ratio		0.02	0.02	0.12	0.12	0.12	0.01	0.65		0.10	0.74	0.74
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	4.5	6.5		4.5	6.5	6.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	4.6		2.0	5.1	5.1
Lane Grp Cap (vph)		37	31	196	196	182	26	3165		185	2626	1150
v/s Ratio Prot		c0.02		0.07	c0.07		0.01	0.16		c0.08	c0.78	
v/s Ratio Perm			0.00			0.04						0.01
v/c Ratio		0.97	0.02	0.62	0.62	0.37	0.46	0.24		0.72	1.04	0.01
Uniform Delay, d1		73.5	72.1	63.1	63.1	61.1	73.3	10.8		65.0	19.4	5.0
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		136.0	0.1	4.0	4.4	0.5	4.7	0.2		10.6	30.7	0.0
Delay (s)		209.5	72.1	67.1	67.5	61.6	78.0	11.0		75.6	50.1	5.0
Level of Service		F	E	E	E	E	E	B		E	D	A
Approach Delay (s)		154.5			64.8			11.9			51.1	
Approach LOS		F			E			B			D	

Intersection Summary			
HCM Average Control Delay	46.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		↑↱		↰	↑
Volume (vph)	11	11	1333	11	11	1158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.95		1.00	1.00
Frt	0.93		1.00		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1695		3535		1770	1863
Flt Permitted	0.98		1.00		0.95	1.00
Satd. Flow (perm)	1695		3535		1770	1863
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	12	1481	12	12	1287
RTOR Reduction (vph)	11	0	0	0	0	0
Lane Group Flow (vph)	13	0	1493	0	12	1287
Turn Type					Prot	
Protected Phases	8		6		5	2
Permitted Phases						
Actuated Green, G (s)	5.0		59.4		3.6	67.0
Effective Green, g (s)	5.0		59.4		3.6	67.0
Actuated g/C Ratio	0.06		0.74		0.04	0.84
Clearance Time (s)	4.0		4.0		4.0	4.0
Vehicle Extension (s)	3.0		2.8		2.4	2.8
Lane Grp Cap (vph)	106		2625		80	1560
v/s Ratio Prot	c0.01		0.42		0.01	c0.69
v/s Ratio Perm						
v/c Ratio	0.12		0.57		0.15	0.82
Uniform Delay, d1	35.4		4.6		36.7	3.4
Progression Factor	1.00		0.77		1.00	1.00
Incremental Delay, d2	0.5		0.8		0.6	5.1
Delay (s)	35.9		4.3		37.3	8.5
Level of Service	D		A		D	A
Approach Delay (s)	35.9		4.3			8.8
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	6.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰			↑↑	↑	↱
Volume (vph)	33	11	0	1311	1082	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.97			0.95	1.00	1.00
Frt	0.96			1.00	1.00	0.85
Flt Protected	0.96			1.00	1.00	1.00
Satd. Flow (prot)	3354			3539	1863	1583
Flt Permitted	0.96			1.00	1.00	1.00
Satd. Flow (perm)	3354			3539	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	37	12	0	1457	1202	97
RTOR Reduction (vph)	11	0	0	0	0	17
Lane Group Flow (vph)	38	0	0	1457	1202	80
Turn Type						Perm
Protected Phases	4			2	2	
Permitted Phases						2
Actuated Green, G (s)	6.0			66.0	66.0	66.0
Effective Green, g (s)	6.0			66.0	66.0	66.0
Actuated g/C Ratio	0.08			0.82	0.82	0.82
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	2.8			2.8	2.8	2.8
Lane Grp Cap (vph)	252			2920	1537	1306
v/s Ratio Prot	c0.01			0.41	c0.65	
v/s Ratio Perm						0.05
v/c Ratio	0.15			0.50	0.78	0.06
Uniform Delay, d1	34.6			2.1	3.5	1.3
Progression Factor	1.00			0.23	1.13	2.15
Incremental Delay, d2	0.2			0.5	2.6	0.1
Delay (s)	34.9			1.0	6.5	2.8
Level of Service	C			A	A	A
Approach Delay (s)	34.9			1.0	6.2	
Approach LOS	C			A	A	

Intersection Summary			
HCM Average Control Delay	4.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↑↱			↰↑↱			↰↑↱	
Volume (vph)	11	1071	11	11	1289	11	11	22	11	11	11	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1710	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			0%			0%	
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		0.95			1.00			1.00	
Frpb, ped/bikes		1.00	0.96		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.97			0.96	
Flt Protected		1.00	1.00		1.00			0.99			0.98	
Satd. Flow (prot)		1815	1483		3096			1765			1741	
Flt Permitted		0.98	1.00		0.94			0.91			0.88	
Satd. Flow (perm)		1783	1483		2924			1633			1565	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	1190	12	12	1432	12	12	24	12	12	12	12
RTOR Reduction (vph)	0	0	2	0	0	0	0	11	0	0	11	0
Lane Group Flow (vph)	0	1202	10	0	1456	0	0	37	0	0	25	0
Confl. Peds. (#/hr)			9			2						
Confl. Bikes (#/hr)						1			2			1
Parking (#/hr)				0	0	0						
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		65.1	65.1		65.1			6.9			6.9	
Effective Green, g (s)		65.1	65.1		65.1			6.9			6.9	
Actuated g/C Ratio		0.81	0.81		0.81			0.09			0.09	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)		2.8	2.8		2.8			2.0			2.0	
Lane Grp Cap (vph)		1451	1207		2379			141			135	
v/s Ratio Prot												
v/s Ratio Perm		c0.67	0.01		0.50			c0.02			0.02	
v/c Ratio		0.83	0.01		0.61			0.26			0.19	
Uniform Delay, d1		4.3	1.4		2.8			34.2			33.9	
Progression Factor		0.28	0.21		1.00			1.00			1.00	
Incremental Delay, d2		3.7	0.0		1.2			0.4			0.2	
Delay (s)		4.9	0.3		3.9			34.5			34.2	
Level of Service		A	A		A			C			C	
Approach Delay (s)		4.9			3.9			34.5			34.2	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	5.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↑	↱
Volume (vph)	350	732	11	22	415	22	22	404	87	55	361	874
Ideal Flow (vphpl)	1900	1900	1900	1900	1596	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1859		1770	1553		1770	1813		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1859		1770	1553		1770	1813		1770	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	389	813	12	24	461	24	24	449	97	61	401	971
RTOR Reduction (vph)	0	0	0	0	1	0	0	7	0	0	0	53
Lane Group Flow (vph)	389	825	0	24	484	0	24	539	0	61	401	918
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												6
Actuated Green, G (s)	27.2	57.0		1.8	31.6		1.2	33.6		4.0	36.4	63.6
Effective Green, g (s)	27.2	57.0		1.8	31.6		1.2	33.6		4.0	36.4	63.6
Actuated g/C Ratio	0.24	0.51		0.02	0.28		0.01	0.30		0.04	0.32	0.57
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.1		2.0	4.1		2.0	4.1		2.0	4.1	2.0
Lane Grp Cap (vph)	428	943		28	437		19	542		63	603	952
v/s Ratio Prot	0.22	0.44		0.01	c0.31		0.01	0.30		c0.03	0.22	c0.23
v/s Ratio Perm												0.35
v/c Ratio	0.91	0.87		0.86	1.11		1.26	0.99		0.97	0.67	0.96
Uniform Delay, d1	41.4	24.5		55.2	40.4		55.6	39.3		54.1	32.7	23.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	22.3	9.4		106.2	75.2		298.7	37.1		100.6	3.1	20.7
Delay (s)	63.7	33.9		161.4	115.6		354.3	76.4		154.7	35.8	44.0
Level of Service	E	C		F	F		F	E		F	D	D
Approach Delay (s)		43.4			117.8			88.1			46.4	
Approach LOS		D			F			F			D	

Intersection Summary			
HCM Average Control Delay	61.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	112.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	95.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰	↱
Volume (vph)	426	437	197	153	328	262
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1570	1770	1546
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	3539	1570	1770	1546
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	473	486	219	170	364	291
RTOR Reduction (vph)	0	0	0	58	0	214
Lane Group Flow (vph)	473	486	219	112	364	77
Confl. Peds. (#/hr)				8		7
Confl. Bikes (#/hr)				8		8
Turn Type	Prot			pm+ov		Perm
Protected Phases	1	6	2	4	4	
Permitted Phases				2		4
Actuated Green, G (s)	17.4	29.2	7.8	21.1	13.3	13.3
Effective Green, g (s)	17.4	29.2	7.8	21.1	13.3	13.3
Actuated g/C Ratio	0.34	0.58	0.15	0.42	0.26	0.26
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.1	3.1	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	610	1077	547	780	466	407
v/s Ratio Prot	c0.27	c0.26	0.06	0.04	c0.21	
v/s Ratio Perm				0.03		0.05
v/c Ratio	0.78	0.45	0.40	0.14	0.78	0.19
Uniform Delay, d1	14.8	6.1	19.2	9.1	17.3	14.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.2	0.3	0.2	0.0	7.7	0.1
Delay (s)	21.0	6.4	19.4	9.1	24.9	14.5
Level of Service	C	A	B	A	C	B
Approach Delay (s)		13.6	14.9		20.3	
Approach LOS		B	B		C	

Intersection Summary			
HCM Average Control Delay	16.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	50.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	22	55	11	98	33	55	11	710	44	55	1202	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.91		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1816		1770	1687		1770	1847		1770	1858	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1816		1770	1687		1770	1847		1770	1858	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	24	59	12	105	35	59	12	763	47	59	1292	24
RTOR Reduction (vph)	0	6	0	0	42	0	0	1	0	0	0	0
Lane Group Flow (vph)	24	65	0	105	52	0	12	809	0	59	1316	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	3.5	9.5		9.9	15.9		0.9	99.5		6.8	105.4	
Effective Green, g (s)	3.3	9.3		9.7	15.7		0.7	99.3		6.6	105.2	
Actuated g/C Ratio	0.02	0.07		0.07	0.11		0.00	0.70		0.05	0.75	
Clearance Time (s)	3.8	3.8		3.8	3.8		3.8	3.8		3.8	3.8	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	41	120		122	188		9	1302		83	1387	
v/s Ratio Prot	0.01	c0.04		c0.06	0.03		0.01	0.44		c0.03	c0.71	
v/s Ratio Perm												
v/c Ratio	0.59	0.54		0.86	0.28		1.33	0.62		0.71	0.95	
Uniform Delay, d1	68.1	63.8		64.9	57.4		70.1	10.9		66.2	15.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	13.0	2.7		41.2	0.3		429.4	0.9		21.1	13.7	
Delay (s)	81.1	66.4		106.1	57.7		499.5	11.9		87.3	29.2	
Level of Service	F	E		F	E		F	B		F	C	
Approach Delay (s)		70.1			83.2			19.0			31.7	
Approach LOS		E			F			B			C	

Intersection Summary			
HCM Average Control Delay	33.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	140.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↑↱		↰	↑↑↱	
Volume (vph)	11	11	11	87	11	109	11	765	33	98	1180	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1703		1770	1567		1770	3514		1770	3534	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1703		1770	1567		1770	3514		1770	3534	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	12	12	12	96	12	120	12	841	36	108	1297	12
RTOR Reduction (vph)	0	11	0	0	102	0	0	3	0	0	0	0
Lane Group Flow (vph)	12	13	0	96	30	0	12	874	0	108	1309	0
Confl. Peds. (#/hr)			1			1			1			1
Confl. Bikes (#/hr)			3			3			2			1
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	0.4	3.7		5.4	8.7		0.7	26.0		5.8	31.1	
Effective Green, g (s)	0.4	3.7		5.4	8.7		0.7	27.0		5.8	32.1	
Actuated g/C Ratio	0.01	0.06		0.09	0.15		0.01	0.47		0.10	0.55	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	12	109		165	235		21	1639		177	1959	
v/s Ratio Prot	0.01	0.01		c0.05	c0.02		0.01	0.25		c0.06	c0.37	
v/s Ratio Perm												
v/c Ratio	1.00	0.12		0.58	0.13		0.57	0.53		0.61	0.67	
Uniform Delay, d1	28.8	25.6		25.2	21.3		28.5	11.0		25.0	9.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	259.8	0.2		3.3	0.1		21.2	0.3		4.3	0.9	
Delay (s)	288.6	25.7		28.5	21.4		49.7	11.3		29.3	10.0	
Level of Service	F	C		C	C		D	B		C	B	
Approach Delay (s)		113.3			24.4			11.8			11.5	
Approach LOS		F			C			B			B	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	57.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱		↑↑	Y	
Volume (veh/h)	732	109	0	1410	0	219
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	861	128	0	1659	0	258
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1283		
pX, platoon unblocked						
vC, conflicting volume			989		1691	861
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			989		1691	861
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	14
cM capacity (veh/h)			694		84	299

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	861	128	829	829	258
Volume Left	0	0	0	0	0
Volume Right	0	128	0	0	258
cSH	1700	1700	1700	1700	299
Volume to Capacity	0.51	0.08	0.49	0.49	0.86
Queue Length 95th (ft)	0	0	0	0	190
Control Delay (s)	0.0	0.0	0.0	0.0	61.2
Lane LOS					F
Approach Delay (s)	0.0		0.0		61.2
Approach LOS					F

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations						
Volume (vph)	896	306	1104	852	372	579
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	0.88	0.97	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3433	1563	3433	2724	3433	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3433	1563	3433	2724	3433	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	953	326	1174	906	396	616
RTOR Reduction (vph)	0	207	0	554	0	7
Lane Group Flow (vph)	953	119	1174	352	396	609
Confl. Peds. (#/hr)		1		2		
Turn Type		Perm		Perm		custom
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	21.0	21.0	25.5	25.5	9.0	38.5
Effective Green, g (s)	21.5	21.0	27.0	27.0	9.0	40.0
Actuated g/C Ratio	0.31	0.30	0.39	0.39	0.13	0.58
Clearance Time (s)	4.5	4.5	5.5	5.5	4.0	5.5
Vehicle Extension (s)	2.0	2.0	3.0	3.0	2.0	3.0
Lane Grp Cap (vph)	1062	472	1334	1058	445	911
v/s Ratio Prot	c0.28		c0.34		c0.12	0.38
v/s Ratio Perm		0.08		0.13		
v/c Ratio	0.90	0.25	0.88	0.33	0.89	0.67
Uniform Delay, d1	22.9	18.3	19.7	14.9	29.8	10.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.8	0.1	7.1	0.2	18.6	1.9
Delay (s)	32.7	18.4	26.8	15.1	48.4	12.0
Level of Service	C	B	C	B	D	B
Approach Delay (s)	29.1		21.7		26.3	
Approach LOS	C		C		C	

Intersection Summary			
HCM Average Control Delay	24.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	69.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	787	120	55	175	240	66	98	208	142	109	885	1115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	874	133	61	194	267	73	109	231	158	121	983	1239
RTOR Reduction (vph)	0	0	38	0	0	60	0	0	106	0	0	0
Lane Group Flow (vph)	874	133	23	194	267	13	109	231	52	121	983	1239
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			Free
Actuated Green, G (s)	30.9	38.5	38.5	9.9	17.5	17.5	4.5	33.6	33.6	4.7	33.3	106.7
Effective Green, g (s)	31.4	40.0	40.0	10.4	19.0	19.0	5.0	35.1	35.1	5.2	35.3	106.7
Actuated g/C Ratio	0.29	0.37	0.37	0.10	0.18	0.18	0.05	0.33	0.33	0.05	0.33	1.00
Clearance Time (s)	4.5	5.5	5.5	4.5	5.5	5.5	4.5	5.5	5.5	4.5	6.0	
Vehicle Extension (s)	2.0	4.1	4.1	2.0	4.5	4.5	2.0	4.5	4.5	2.0	3.7	
Lane Grp Cap (vph)	1010	1327	593	335	630	282	161	1164	917	167	1171	1583
v/s Ratio Prot	c0.25	0.04		0.06	0.08		0.03	0.07		0.04	0.28	
v/s Ratio Perm			0.01			0.01			0.02			c0.78
v/c Ratio	0.87	0.10	0.04	0.58	0.42	0.05	0.68	0.20	0.06	0.72	0.84	0.78
Uniform Delay, d1	35.6	21.7	21.2	46.1	39.0	36.3	50.1	25.7	24.5	50.0	33.1	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.6	0.0	0.0	1.5	0.8	0.1	8.5	0.1	0.0	12.4	5.6	3.9
Delay (s)	43.3	21.7	21.2	47.6	39.8	36.5	58.6	25.8	24.5	62.4	38.7	3.9
Level of Service	D	C	C	D	D	D	E	C	C	E	D	A
Approach Delay (s)		39.3			42.2			32.6			21.5	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	29.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	106.7	Sum of lost time (s)	0.0
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑↱		↰	↰↑	↱		✥	
Volume (vph)	11	973	76	33	2011	11	87	11	55	11	11	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.7	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (prot)	1770	3539	1583	1770	3536		1681	1703	1583		1750	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (perm)	1770	3539	1583	1770	3536		1681	1703	1583		1750	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	11	1003	78	34	2073	11	90	11	57	11	11	11
RTOR Reduction (vph)	0	0	28	0	0	0	0	0	52	0	11	0
Lane Group Flow (vph)	11	1003	50	34	2084	0	50	51	5	0	22	0
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						8			
Actuated Green, G (s)	0.7	57.5	57.5	3.8	60.6		8.8	8.8	8.8		2.9	
Effective Green, g (s)	0.3	59.2	57.5	3.4	62.3		8.6	8.6	8.6		2.7	
Actuated g/C Ratio	0.00	0.66	0.64	0.04	0.69		0.10	0.10	0.10		0.03	
Clearance Time (s)	3.6	5.7	5.7	3.6	5.7		3.8	3.8	3.8		3.8	
Vehicle Extension (s)	2.2	3.2	3.2	2.2	3.2		3.1	3.1	3.1		3.1	
Lane Grp Cap (vph)	6	2330	1012	67	2450		161	163	151		53	
v/s Ratio Prot	0.01	0.28		c0.02	c0.59		0.03	c0.03			c0.01	
v/s Ratio Perm			0.03						0.00			
v/c Ratio	1.83	0.43	0.05	0.51	0.85		0.31	0.31	0.04		0.42	
Uniform Delay, d1	44.8	7.3	6.0	42.4	10.3		37.9	37.9	36.9		42.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	719.2	0.1	0.0	3.1	3.1		1.1	1.1	0.1		5.5	
Delay (s)	764.0	7.5	6.1	45.5	13.4		39.0	39.0	37.0		48.4	
Level of Service	F	A	A	D	B		D	D	D		D	
Approach Delay (s)		15.0			13.9			38.3			48.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	15.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	89.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

INTERSECTION SYNCHRO ANALYSIS

YR-2010 NO-BUILD PM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱	↰	↑↑	↱
Volume (vph)	426	437	994	131	339	87	874	546	109	175	481	306
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.91	0.91	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1559	1770	3539	1555	1610	3319	1548	1770	3539	1562
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1559	1770	3539	1555	1610	3319	1548	1770	3539	1562
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	473	486	1104	146	377	97	971	607	121	194	534	340
RTOR Reduction (vph)	0	0	369	0	0	78	0	0	88	0	0	271
Lane Group Flow (vph)	473	486	735	146	377	19	515	1063	33	194	534	69
Confl. Peds. (#/hr)						2			5			
Confl. Bikes (#/hr)			6			2			1			1
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2			6			8			7
Actuated Green, G (s)	39.0	55.0	55.0	10.0	26.8	26.8	38.7	38.7	38.7	21.8	21.8	21.8
Effective Green, g (s)	38.0	56.7	56.7	9.0	27.7	27.7	40.0	40.0	40.0	23.1	23.1	23.1
Actuated g/C Ratio	0.26	0.39	0.39	0.06	0.19	0.19	0.28	0.28	0.28	0.16	0.16	0.16
Clearance Time (s)	3.0	5.7	5.7	3.0	4.9	4.9	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	465	1386	610	110	677	297	445	917	428	282	565	249
v/s Ratio Prot	0.27	0.14		c0.08	0.11		0.32	c0.32		0.11	c0.15	
v/s Ratio Perm			c0.47			0.01			0.02			0.04
v/c Ratio	1.02	0.35	1.20	1.33	0.56	0.06	1.16	1.16	0.08	0.69	0.95	0.28
Uniform Delay, d1	53.4	31.1	44.0	67.9	53.0	47.9	52.4	52.4	38.8	57.4	60.2	53.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	46.1	0.1	106.9	196.9	0.6	0.0	93.4	83.9	0.0	5.5	24.5	0.2
Delay (s)	99.5	31.1	151.0	264.8	53.6	48.0	145.8	136.3	38.8	62.9	84.8	53.7
Level of Service	F	C	F	F	D	D	F	F	D	E	F	D
Approach Delay (s)		111.0			102.4			132.2			70.9	
Approach LOS		F			F			F			E	

Intersection Summary			
HCM Average Control Delay	108.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	144.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	109	0	219	0	0	0	142	1475	0	0	1322	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	0.98
Flpb, ped/bikes		1.00	1.00				1.00	1.00			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1770	1546				1770	1863			1863	1551
Flt Permitted		0.76	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1410	1546				1770	1863			1863	1551
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	121	0	243	0	0	0	158	1639	0	0	1469	121
RTOR Reduction (vph)	0	0	127	0	0	0	0	0	0	0	0	17
Lane Group Flow (vph)	0	121	116	0	0	0	158	1639	0	0	1469	104
Confl. Bikes (#/hr)			1			1						1
Turn Type	Perm		Perm	Perm			Prot			Prot		Perm
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4								6
Actuated Green, G (s)		16.4	16.4				11.0	121.6			106.6	106.6
Effective Green, g (s)		16.4	16.4				11.0	123.1			108.1	108.1
Actuated g/C Ratio		0.11	0.11				0.07	0.83			0.73	0.73
Clearance Time (s)		4.0	4.0				4.0	5.5			5.5	5.5
Vehicle Extension (s)		3.0	3.0				1.0	2.5			2.5	2.5
Lane Grp Cap (vph)		157	172				132	1555			1365	1137
v/s Ratio Prot							0.09	c0.88			0.79	
v/s Ratio Perm		c0.09	0.07									0.07
v/c Ratio		0.77	0.67				1.20	1.05			1.08	0.09
Uniform Delay, d1		63.7	63.0				68.2	12.2			19.7	5.6
Progression Factor		1.00	1.00				1.00	1.00			1.00	1.00
Incremental Delay, d2		20.5	10.0				140.8	38.6			47.7	0.0
Delay (s)		84.2	72.9				209.1	50.8			67.4	5.7
Level of Service		F	E				F	D			E	A
Approach Delay (s)		76.7			0.0			64.7			62.7	
Approach LOS		E			A			E			E	

Intersection Summary			
HCM Average Control Delay	65.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	147.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	97.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	22	11	382	22	11	22	481	1508	11	11	1377	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	5.7	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97		0.99		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1803	1535		1713		1770	3539	1549	1770	3539	1583
Flt Permitted		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1803	1535		1713		1770	3539	1549	1770	3539	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	23	12	406	23	12	23	512	1604	12	12	1465	23
RTOR Reduction (vph)	0	0	383	0	16	0	0	0	2	0	0	6
Lane Group Flow (vph)	0	35	23	0	42	0	512	1604	10	12	1465	17
Confl. Peds. (#/hr)			3			2						
Confl. Bikes (#/hr)			3			1			3			
Turn Type	Split		Perm	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)		7.8	7.8		5.8		42.8	95.0	95.0	4.5	56.7	56.7
Effective Green, g (s)		7.2	7.2		5.2		41.8	96.7	95.0	3.5	58.4	58.4
Actuated g/C Ratio		0.06	0.06		0.04		0.33	0.75	0.74	0.03	0.45	0.45
Clearance Time (s)		3.4	3.4		3.4		3.0	5.7	5.7	3.0	5.7	5.7
Vehicle Extension (s)		1.0	1.0		0.5		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		101	86		69		575	2661	1144	48	1607	719
v/s Ratio Prot		c0.02			c0.02		c0.29	0.45		0.01	c0.41	
v/s Ratio Perm			0.01						0.01			0.01
v/c Ratio		0.35	0.26		0.60		0.89	0.60	0.01	0.25	0.91	0.02
Uniform Delay, d1		58.4	58.2		60.7		41.2	7.2	4.4	61.3	32.7	19.4
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.8	0.6		9.8		15.5	0.3	0.0	1.0	8.1	0.0
Delay (s)		59.2	58.8		70.5		56.7	7.5	4.4	62.3	40.7	19.4
Level of Service		E	E		E		E	A	A	E	D	B
Approach Delay (s)		58.8			70.5			19.3			40.6	
Approach LOS		E			E			B			D	

Intersection Summary			
HCM Average Control Delay	32.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	128.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
4: Exist. Folsom Dam Rd & Folsom-Auburn Rd

3/1/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↱↱		✥		↰	↑↑	↱		↓↓↓↓	
Volume (vph)	0	0	120	0	0	0	66	1912	0	0	1694	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0				4.0	4.0			4.0	
Lane Util. Factor			0.88				1.00	0.95			0.86	
Frt			0.85				1.00	1.00			0.99	
Flt Protected			1.00				0.95	1.00			1.00	
Satd. Flow (prot)			2787				1770	3539			6372	
Flt Permitted			1.00				0.07	1.00			1.00	
Satd. Flow (perm)			2787				135	3539			6372	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	141	0	0	0	78	2249	0	0	1993	78
RTOR Reduction (vph)	0	0	43	0	0	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	0	98	0	0	0	78	2249	0	0	2067	0
Turn Type			custom	Perm			Perm		Perm			
Protected Phases					8			2			6	
Permitted Phases			4	8			2		2			
Actuated Green, G (s)			8.5				73.5	73.5			73.5	
Effective Green, g (s)			8.5				73.5	73.5			73.5	
Actuated g/C Ratio			0.09				0.82	0.82			0.82	
Clearance Time (s)			4.0				4.0	4.0			4.0	
Vehicle Extension (s)			3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)			263				110	2890			5204	
v/s Ratio Prot								c0.64			0.32	
v/s Ratio Perm			c0.04				0.58					
v/c Ratio			0.37				0.71	0.78			0.40	
Uniform Delay, d1			38.2				3.6	4.1			2.2	
Progression Factor			1.00				1.00	1.00			1.00	
Incremental Delay, d2			0.9				32.0	2.1			0.2	
Delay (s)			39.1				35.6	6.3			2.5	
Level of Service			D				D	A			A	
Approach Delay (s)		39.1			0.0			7.3			2.5	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	6.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↰↑↱	↱	↰	↑↑	↱	↰↰	↑↱	
Volume (vph)	55	22	44	404	22	973	33	951	251	1049	667	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.5	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.91	0.86	0.91	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.90		1.00	0.88	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1675		1610	2788	1441	1770	3539	1583	3433	3506	
Flt Permitted	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1675		1610	2788	1441	1770	3539	1583	3433	3506	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	61	24	49	449	24	1081	37	1057	279	1166	741	49
RTOR Reduction (vph)	0	45	0	0	444	443	0	0	204	0	2	0
Lane Group Flow (vph)	61	28	0	359	211	97	37	1057	75	1166	788	0
Turn Type	Split			Split		Perm	Prot		Perm	Prot		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases						3			6			
Actuated Green, G (s)	10.9	10.9		27.0	27.0	27.0	5.5	40.5	40.5	54.1	89.1	
Effective Green, g (s)	10.9	10.9		27.0	27.0	27.0	5.5	42.0	40.5	54.1	90.6	
Actuated g/C Ratio	0.07	0.07		0.18	0.18	0.18	0.04	0.28	0.27	0.36	0.60	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.5	5.5	4.0	5.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0	1.0	1.0	4.7	4.7	1.5	5.4	
Lane Grp Cap (vph)	129	122		290	502	259	65	991	427	1238	2118	
v/s Ratio Prot	c0.03	0.02		c0.22	0.08		0.02	c0.30		c0.34	0.22	
v/s Ratio Perm						0.07			0.05			
v/c Ratio	0.47	0.23		1.24	0.42	0.38	0.57	1.07	0.18	0.94	0.37	
Uniform Delay, d1	66.8	65.6		61.5	54.6	54.1	71.1	54.0	42.0	46.4	15.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	0.3		133.1	0.2	0.3	6.7	48.1	0.9	13.8	0.5	
Delay (s)	67.8	65.9		194.6	54.8	54.4	77.7	102.1	42.9	60.2	15.7	
Level of Service	E	E		F	D	D	E	F	D	E	B	
Approach Delay (s)		66.8			86.9			89.4			42.2	
Approach LOS		E			F			F			D	

Intersection Summary			
HCM Average Control Delay	69.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↱		↰	↑↱	
Volume (vph)	153	11	612	33	22	11	830	1093	44	11	776	273
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.89			0.98		1.00	0.99		1.00	0.96	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1648			1771		1770	3516		1770	3381	
Flt Permitted		0.99			0.52		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1648			947		1770	3516		1770	3381	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	161	12	644	35	23	12	874	1151	46	12	817	287
RTOR Reduction (vph)	0	113	0	0	6	0	0	2	0	0	29	0
Lane Group Flow (vph)	0	704	0	0	64	0	874	1195	0	12	1075	0
Confl. Peds. (#/hr)									1			
Confl. Bikes (#/hr)						1						2
Turn Type	Split			Perm			Prot			Prot		
Protected Phases	4!	4			8!		5	2		1	6	
Permitted Phases				8								
Actuated Green, G (s)		37.3			37.3		39.3	67.8		1.1	29.6	
Effective Green, g (s)		39.0			39.0		40.0	70.0		1.8	31.8	
Actuated g/C Ratio		0.32			0.32		0.33	0.57		0.01	0.26	
Clearance Time (s)		5.7			5.7		4.7	6.2		4.7	6.2	
Vehicle Extension (s)		3.0			3.0		2.0	3.8		2.0	3.8	
Lane Grp Cap (vph)		523			301		577	2004		26	876	
v/s Ratio Prot		c0.43					c0.49	0.34		0.01	c0.32	
v/s Ratio Perm					0.07							
v/c Ratio		1.35			0.21		1.51	0.60		0.46	1.23	
Uniform Delay, d1		41.9			30.7		41.4	17.2		60.0	45.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		168.5			0.4		240.5	0.5		4.7	112.4	
Delay (s)		210.4			31.0		281.9	17.7		64.7	157.9	
Level of Service		F			C		F	B		E	F	
Approach Delay (s)		210.4			31.0			129.2			156.9	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM Average Control Delay	151.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.37		
Actuated Cycle Length (s)	122.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	134.8%	ICU Level of Service	H
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	361	699	601	11	962	820	1049	1093	11	514	667	328
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	401	777	668	12	1069	911	1166	1214	12	571	741	364
RTOR Reduction (vph)	0	0	292	0	0	261	0	0	7	0	0	139
Lane Group Flow (vph)	401	777	376	12	1069	650	1166	1214	5	571	741	225
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.5	60.7	60.7	1.0	43.2	43.2	27.5	37.8	37.8	26.5	36.8	36.8
Effective Green, g (s)	19.0	61.2	61.2	1.5	43.7	43.7	28.0	39.3	39.3	27.0	38.3	38.3
Actuated g/C Ratio	0.13	0.42	0.42	0.01	0.30	0.30	0.19	0.27	0.27	0.19	0.26	0.26
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	5.1	5.1	2.0	5.1	5.1
Lane Grp Cap (vph)	232	1494	668	18	1067	477	663	959	429	330	935	418
v/s Ratio Prot	c0.23	0.22		0.01	0.30		c0.34	c0.34		c0.32	0.21	
v/s Ratio Perm			0.24			c0.41			0.00			0.14
v/c Ratio	1.73	0.52	0.56	0.67	1.00	1.36	1.76	1.27	0.01	1.73	0.79	0.54
Uniform Delay, d1	63.0	31.0	31.7	71.5	50.6	50.6	58.5	52.8	38.7	59.0	49.7	45.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	345.3	0.2	0.6	54.1	28.0	176.7	347.6	128.0	0.1	341.1	6.9	4.9
Delay (s)	408.3	31.2	32.4	125.6	78.7	227.4	406.1	180.9	38.7	400.1	56.5	50.7
Level of Service	F	C	C	F	E	F	F	F	D	F	E	D
Approach Delay (s)		113.5			146.9			289.9			172.3	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	187.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.56		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	118.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱	↰	↰	↱	↰	↑↑↱		↰	↑↑	↱
Volume (vph)	11	22	11	164	22	459	22	1683	208	470	820	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected		0.98	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1832	1530	1681	1704	1561	1770	5001		1770	3539	1550
Flt Permitted		0.98	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1832	1530	1681	1704	1561	1770	5001		1770	3539	1550
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	24	12	182	24	510	24	1870	231	522	911	24
RTOR Reduction (vph)	0	0	12	0	0	393	0	10	0	0	0	7
Lane Group Flow (vph)	0	36	0	102	104	117	24	2091	0	522	911	17
Confl. Bikes (#/hr)			2			1						2
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)		2.6	2.6	16.8	16.8	16.8	4.0	59.6		51.0	106.6	106.6
Effective Green, g (s)		3.1	3.1	17.3	17.3	17.3	4.5	62.1		51.5	109.1	109.1
Actuated g/C Ratio		0.02	0.02	0.12	0.12	0.12	0.03	0.41		0.34	0.73	0.73
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	4.5	6.5		4.5	6.5	6.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	4.6		2.0	5.1	5.1
Lane Grp Cap (vph)		38	32	194	197	180	53	2070		608	2574	1127
v/s Ratio Prot		c0.02		0.06	0.06		0.01	c0.42		c0.29	0.26	
v/s Ratio Perm			0.00			c0.08						0.01
v/c Ratio		0.95	0.01	0.53	0.53	0.65	0.45	1.01		0.86	0.35	0.02
Uniform Delay, d1		73.4	71.9	62.5	62.5	63.5	71.5	43.9		45.9	7.5	5.6
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		122.9	0.0	1.2	1.2	6.3	2.2	22.3		11.2	0.4	0.0
Delay (s)		196.3	72.0	63.7	63.7	69.7	73.8	66.2		57.0	7.9	5.7
Level of Service		F	E	E	E	E	E	E		E	A	A
Approach Delay (s)		165.2			68.0			66.3			25.5	
Approach LOS		F			E			E			C	

Intersection Summary			
HCM Average Control Delay	54.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	85.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	22	22	1770	22	11	1213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.95		1.00	1.00
Frt	0.93		1.00		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1695		3533		1770	1863
Flt Permitted	0.98		1.00		0.95	1.00
Satd. Flow (perm)	1695		3533		1770	1863
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	24	24	1967	24	12	1348
RTOR Reduction (vph)	22	0	0	0	0	0
Lane Group Flow (vph)	26	0	1991	0	12	1348
Turn Type					Prot	
Protected Phases	8		6		5	2
Permitted Phases						
Actuated Green, G (s)	6.6		77.8		3.6	85.4
Effective Green, g (s)	6.6		77.8		3.6	85.4
Actuated g/C Ratio	0.07		0.78		0.04	0.85
Clearance Time (s)	4.0		4.0		4.0	4.0
Vehicle Extension (s)	3.0		2.8		2.4	2.8
Lane Grp Cap (vph)	112		2749		64	1591
v/s Ratio Prot	c0.02		0.56		0.01	c0.72
v/s Ratio Perm						
v/c Ratio	0.23		0.72		0.19	0.85
Uniform Delay, d1	44.3		5.6		46.8	3.9
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	1.0		1.7		0.9	5.8
Delay (s)	45.3		7.3		47.7	9.6
Level of Service	D		A		D	A
Approach Delay (s)	45.3		7.3			10.0
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	8.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	208	22	0	1584	1158	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.97			0.95	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	0.96			1.00	1.00	1.00
Satd. Flow (prot)	3408			3539	1863	1583
Flt Permitted	0.96			1.00	1.00	1.00
Satd. Flow (perm)	3408			3539	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	231	24	0	1760	1287	84
RTOR Reduction (vph)	10	0	0	0	0	19
Lane Group Flow (vph)	245	0	0	1760	1287	65
Turn Type						Perm
Protected Phases	4			2	2	
Permitted Phases						2
Actuated Green, G (s)	12.0			70.0	70.0	70.0
Effective Green, g (s)	12.0			70.0	70.0	70.0
Actuated g/C Ratio	0.13			0.78	0.78	0.78
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	2.8			2.8	2.8	2.8
Lane Grp Cap (vph)	454			2753	1449	1231
v/s Ratio Prot	c0.07			0.50	c0.69	
v/s Ratio Perm						0.04
v/c Ratio	0.54			0.64	0.89	0.05
Uniform Delay, d1	36.4			4.4	7.2	2.3
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	1.2			1.2	8.4	0.1
Delay (s)	37.6			5.6	15.6	2.4
Level of Service	D			A	B	A
Approach Delay (s)	37.6			5.6	14.8	
Approach LOS	D			A	B	

Intersection Summary			
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	1136	33	11	1508	22	33	109	55	44	44	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1710	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			0%			0%	
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		0.95			1.00			1.00	
Frpb, ped/bikes		1.00	0.96		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.96			0.96	
Flt Protected		1.00	1.00		1.00			0.99			0.98	
Satd. Flow (prot)		1815	1475		3093			1765			1742	
Flt Permitted		0.98	1.00		0.90			0.91			0.64	
Satd. Flow (perm)		1771	1475		2781			1613			1132	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	1262	37	12	1676	24	37	121	61	49	49	49
RTOR Reduction (vph)	0	0	9	0	1	0	0	15	0	0	19	0
Lane Group Flow (vph)	0	1274	28	0	1711	0	0	204	0	0	128	0
Confl. Peds. (#/hr)			9			2						
Confl. Bikes (#/hr)						1			2			1
Parking (#/hr)				0	0	0						
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		76.0	76.0		76.0			16.0			16.0	
Effective Green, g (s)		76.0	76.0		76.0			16.0			16.0	
Actuated g/C Ratio		0.76	0.76		0.76			0.16			0.16	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)		2.8	2.8		2.8			2.0			2.0	
Lane Grp Cap (vph)		1346	1121		2114			258			181	
v/s Ratio Prot												
v/s Ratio Perm		c0.72	0.02		0.62			c0.13			0.11	
v/c Ratio		0.95	0.03		0.81			0.79			0.71	
Uniform Delay, d1		10.3	2.9		7.5			40.4			39.8	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		14.7	0.0		3.5			14.2			9.8	
Delay (s)		25.0	3.0		11.0			54.6			49.5	
Level of Service		C	A		B			D			D	
Approach Delay (s)		24.3			11.0			54.6			49.5	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑	↱
Volume (vph)	546	667	22	44	787	11	22	481	120	109	372	732
Ideal Flow (vphpl)	1900	1900	1900	1900	1596	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1854		1770	1562		1770	1807		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1854		1770	1562		1770	1807		1770	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	607	741	24	49	874	12	24	534	133	121	413	813
RTOR Reduction (vph)	0	1	0	0	1	0	0	6	0	0	0	28
Lane Group Flow (vph)	607	764	0	49	885	0	24	661	0	121	413	785
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												6
Actuated Green, G (s)	31.0	82.2		5.6	56.8		2.4	41.8		6.0	45.4	76.4
Effective Green, g (s)	31.0	82.2		5.6	56.8		2.4	41.8		6.0	45.4	76.4
Actuated g/C Ratio	0.20	0.54		0.04	0.37		0.02	0.28		0.04	0.30	0.50
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.1		2.0	4.1		2.0	4.1		2.0	4.1	2.0
Lane Grp Cap (vph)	362	1005		65	585		28	498		70	558	840
v/s Ratio Prot	c0.34	0.41		0.03	c0.57		0.01	c0.37		c0.07	0.22	c0.19
v/s Ratio Perm												0.30
v/c Ratio	1.68	0.76		0.75	1.51		0.86	1.33		1.73	0.74	0.93
Uniform Delay, d1	60.3	27.0		72.3	47.4		74.4	54.9		72.8	47.8	35.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	316.4	3.7		34.8	239.8		106.2	160.9		380.4	5.6	17.0
Delay (s)	376.7	30.7		107.2	287.2		180.6	215.8		453.2	53.4	52.3
Level of Service	F	C		F	F		F	F		F	D	D
Approach Delay (s)		183.8			277.8			214.6			88.6	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	179.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.53		
Actuated Cycle Length (s)	151.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	132.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰	↱
Volume (vph)	350	525	448	251	186	372
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1566	1770	1544
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	3539	1566	1770	1544
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	389	583	498	279	207	413
RTOR Reduction (vph)	0	0	0	46	0	323
Lane Group Flow (vph)	389	583	498	233	207	90
Confl. Peds. (#/hr)				8		7
Confl. Bikes (#/hr)				8		8
Turn Type	Prot			pm+ov		Perm
Protected Phases	1	6	2	4	4	
Permitted Phases				2		4
Actuated Green, G (s)	12.4	26.3	9.9	19.4	9.5	9.5
Effective Green, g (s)	12.4	26.3	9.9	19.4	9.5	9.5
Actuated g/C Ratio	0.28	0.60	0.23	0.44	0.22	0.22
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.1	3.1	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	501	1119	800	837	384	335
v/s Ratio Prot	c0.22	c0.31	0.14	0.06	c0.12	
v/s Ratio Perm				0.09		0.06
v/c Ratio	0.78	0.52	0.62	0.28	0.54	0.27
Uniform Delay, d1	14.4	5.1	15.3	7.8	15.2	14.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.5	0.5	1.1	0.1	0.7	0.2
Delay (s)	21.9	5.5	16.4	7.8	15.9	14.4
Level of Service	C	A	B	A	B	B
Approach Delay (s)		12.1	13.3		14.9	
Approach LOS		B	B		B	

Intersection Summary			
HCM Average Control Delay	13.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	43.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	33	55	11	262	109	142	11	994	33	66	940	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.92		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1816		1770	1704		1770	1854		1770	1844	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1816		1770	1704		1770	1854		1770	1844	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	35	59	12	282	117	153	12	1069	35	71	1011	71
RTOR Reduction (vph)	0	5	0	0	33	0	0	1	0	0	1	0
Lane Group Flow (vph)	35	66	0	282	237	0	12	1103	0	71	1081	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	4.2	8.9		24.3	29.0		0.9	88.5		7.0	94.6	
Effective Green, g (s)	4.0	8.7		24.1	28.8		0.7	88.3		6.8	94.4	
Actuated g/C Ratio	0.03	0.06		0.17	0.20		0.00	0.61		0.05	0.66	
Clearance Time (s)	3.8	3.8		3.8	3.8		3.8	3.8		3.8	3.8	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	49	110		296	341		9	1138		84	1210	
v/s Ratio Prot	0.02	0.04		c0.16	c0.14		0.01	c0.60		c0.04	0.59	
v/s Ratio Perm												
v/c Ratio	0.71	0.60		0.95	0.70		1.33	0.97		0.85	0.89	
Uniform Delay, d1	69.4	65.9		59.3	53.5		71.6	26.5		68.0	20.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	33.5	6.2		39.2	4.9		429.4	19.5		48.9	8.7	
Delay (s)	102.9	72.2		98.6	58.4		501.0	46.0		117.0	29.3	
Level of Service	F	E		F	E		F	D		F	C	
Approach Delay (s)		82.3			78.9			50.9			34.7	
Approach LOS		F			E			D			C	

Intersection Summary			
HCM Average Control Delay	50.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	143.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↱		↰	↑↱	
Volume (vph)	22	33	11	197	11	197	11	1060	66	98	841	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1784		1770	1557		1770	3503		1770	3531	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1784		1770	1557		1770	3503		1770	3531	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	24	36	12	216	12	216	12	1165	73	108	924	12
RTOR Reduction (vph)	0	11	0	0	130	0	0	4	0	0	1	0
Lane Group Flow (vph)	24	37	0	216	98	0	12	1234	0	108	935	0
Confl. Peds. (#/hr)			1			1			1			1
Confl. Bikes (#/hr)			3			3			2			1
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	1.7	6.4		11.8	16.5		0.5	33.5		6.3	39.3	
Effective Green, g (s)	1.7	6.4		11.8	16.5		0.5	34.5		6.3	40.3	
Actuated g/C Ratio	0.02	0.09		0.16	0.22		0.01	0.46		0.08	0.54	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	40	152		278	343		12	1611		149	1897	
v/s Ratio Prot	0.01	0.02		c0.12	c0.06		0.01	c0.35		c0.06	0.26	
v/s Ratio Perm												
v/c Ratio	0.60	0.24		0.78	0.28		1.00	0.77		0.72	0.49	
Uniform Delay, d1	36.3	32.0		30.3	24.3		37.2	16.9		33.5	10.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	16.1	0.3		11.7	0.2		259.8	2.2		13.7	0.2	
Delay (s)	52.4	32.3		42.1	24.5		297.1	19.1		47.3	11.1	
Level of Service	D	C		D	C		F	B		D	B	
Approach Delay (s)		39.0			33.0			21.8			14.9	
Approach LOS		D			C			C			B	

Intersection Summary			
HCM Average Control Delay	21.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱		↑↑	↰↱	
Volume (veh/h)	1147	109	0	1126	0	393
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	1349	128	0	1325	0	462
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1283		
pX, platoon unblocked						
vC, conflicting volume			1478		2012	1349
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1478		2012	1349
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	0
cM capacity (veh/h)			452		51	141

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	1349	128	662	662	462
Volume Left	0	0	0	0	0
Volume Right	0	128	0	0	462
cSH	1700	1700	1700	1700	141
Volume to Capacity	0.79	0.08	0.39	0.39	3.29
Queue Length 95th (ft)	0	0	0	0	Err
Control Delay (s)	0.0	0.0	0.0	0.0	Err
Lane LOS					F
Approach Delay (s)	0.0		0.0		Err
Approach LOS					F

Intersection Summary			
Average Delay	1416.1		
Intersection Capacity Utilization	91.4%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations						
Volume (vph)	1005	317	809	809	590	951
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	0.88	0.97	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3433	1563	3433	2723	3433	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3433	1563	3433	2723	3433	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1069	337	861	861	628	1012
RTOR Reduction (vph)	0	238	0	565	0	3
Lane Group Flow (vph)	1069	99	861	296	628	1009
Confl. Peds. (#/hr)		1		2		
Turn Type		Perm		Perm		custom
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	23.5	23.5	26.0	26.0	16.5	46.5
Effective Green, g (s)	24.0	23.5	27.5	27.5	16.5	48.0
Actuated g/C Ratio	0.30	0.29	0.34	0.34	0.21	0.60
Clearance Time (s)	4.5	4.5	5.5	5.5	4.0	5.5
Vehicle Extension (s)	2.0	2.0	3.0	3.0	2.0	3.0
Lane Grp Cap (vph)	1030	459	1180	936	708	950
v/s Ratio Prot	c0.31		0.25		0.18	c0.64
v/s Ratio Perm		0.06		0.11		
v/c Ratio	1.04	0.22	0.73	0.32	0.89	1.06
Uniform Delay, d1	28.0	21.3	23.0	19.3	30.8	16.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	38.3	0.1	2.3	0.2	12.5	47.1
Delay (s)	66.3	21.4	25.3	19.5	43.4	63.1
Level of Service	E	C	C	B	D	E
Approach Delay (s)	55.6		22.4		55.5	
Approach LOS	E		C		E	

Intersection Summary			
HCM Average Control Delay	43.6	HCM Level of Service	D
HCM Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱↱	↰↰	↑↑	↱
Volume (vph)	1093	197	66	175	153	131	87	907	142	109	415	863
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1214	219	73	194	170	146	97	1008	158	121	461	959
RTOR Reduction (vph)	0	0	42	0	0	63	0	0	77	0	0	0
Lane Group Flow (vph)	1214	219	31	194	170	83	97	1008	81	121	461	959
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			Free
Actuated Green, G (s)	46.8	52.3	52.3	11.0	16.5	16.5	7.2	37.5	37.5	5.1	34.9	125.9
Effective Green, g (s)	47.3	53.8	53.8	11.5	18.0	18.0	7.7	39.0	39.0	5.6	36.9	125.9
Actuated g/C Ratio	0.38	0.43	0.43	0.09	0.14	0.14	0.06	0.31	0.31	0.04	0.29	1.00
Clearance Time (s)	4.5	5.5	5.5	4.5	5.5	5.5	4.5	5.5	5.5	4.5	6.0	
Vehicle Extension (s)	2.0	4.1	4.1	2.0	4.5	4.5	2.0	4.5	4.5	2.0	3.7	
Lane Grp Cap (vph)	1290	1512	676	314	506	226	210	1096	863	153	1037	1583
v/s Ratio Prot	c0.35	0.06		0.06	0.05		0.03	c0.28		0.04	0.13	
v/s Ratio Perm			0.02			0.05			0.03			c0.61
v/c Ratio	0.94	0.14	0.05	0.62	0.34	0.37	0.46	0.92	0.09	0.79	0.44	0.61
Uniform Delay, d1	38.0	22.0	21.1	55.1	48.6	48.8	57.1	41.9	30.9	59.6	36.2	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.3	0.1	0.0	2.5	0.7	1.7	0.6	12.5	0.1	22.3	0.4	1.7
Delay (s)	51.2	22.1	21.1	57.6	49.3	50.5	57.7	54.4	31.0	81.9	36.6	1.7
Level of Service	D	C	C	E	D	D	E	D	C	F	D	A
Approach Delay (s)		45.5			52.8			51.7			18.4	
Approach LOS		D			D			D			B	

Intersection Summary			
HCM Average Control Delay	39.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	125.9	Sum of lost time (s)	4.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰	↰↑	↱		↰↑↱	
Volume (vph)	11	2054	66	76	1322	11	55	11	76	11	11	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.7	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.98	
Satd. Flow (prot)	1770	3539	1583	1770	3535		1681	1712	1583		1750	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.98	
Satd. Flow (perm)	1770	3539	1583	1770	3535		1681	1712	1583		1750	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	11	2118	68	78	1363	11	57	11	78	11	11	11
RTOR Reduction (vph)	0	0	13	0	0	0	0	0	72	0	11	0
Lane Group Flow (vph)	11	2118	55	78	1374	0	34	34	6	0	22	0
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						8			
Actuated Green, G (s)	0.6	75.5	75.5	7.1	82.0		8.5	8.5	8.5		2.6	
Effective Green, g (s)	0.2	77.2	75.5	6.7	83.7		8.3	8.3	8.3		2.4	
Actuated g/C Ratio	0.00	0.70	0.68	0.06	0.76		0.08	0.08	0.08		0.02	
Clearance Time (s)	3.6	5.7	5.7	3.6	5.7		3.8	3.8	3.8		3.8	
Vehicle Extension (s)	2.2	3.2	3.2	2.2	3.2		3.1	3.1	3.1		3.1	
Lane Grp Cap (vph)	3	2470	1081	107	2675		126	128	119		38	
v/s Ratio Prot	0.01	c0.60		c0.04	0.39		c0.02	0.02			c0.01	
v/s Ratio Perm			0.03						0.00			
v/c Ratio	3.67	0.86	0.05	0.73	0.51		0.27	0.27	0.05		0.59	
Uniform Delay, d1	55.2	12.6	5.8	51.1	5.4		48.3	48.3	47.5		53.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	1761.9	3.2	0.0	19.5	0.2		1.2	1.2	0.2		21.2	
Delay (s)	1817.1	15.8	5.8	70.6	5.5		49.5	49.4	47.7		74.8	
Level of Service	F	B	A	E	A		D	D	D		E	
Approach Delay (s)		24.5			9.0			48.5			74.8	
Approach LOS		C			A			D			E	

Intersection Summary			
HCM Average Control Delay	20.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	110.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

INTERSECTION SYNCHRO ANALYSIS

YR-2016 NO-BUILD AM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱	↰	↑↑	↱
Volume (vph)	197	197	726	135	443	123	1329	382	50	98	664	517
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.91	0.91	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1554	1770	3539	1554	1610	3286	1548	1770	3539	1563
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1554	1770	3539	1554	1610	3286	1548	1770	3539	1563
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	219	219	807	150	492	137	1477	424	56	109	738	574
RTOR Reduction (vph)	0	0	490	0	0	112	0	0	35	0	0	120
Lane Group Flow (vph)	219	219	317	150	492	25	738	1163	21	109	738	454
Confl. Peds. (#/hr)						2			5			
Confl. Bikes (#/hr)			6			2			1			1
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2			6			8			7
Actuated Green, G (s)	15.0	28.4	28.4	11.0	25.2	25.2	53.7	53.7	53.7	31.7	31.7	31.7
Effective Green, g (s)	14.0	30.1	30.1	10.0	26.1	26.1	55.0	55.0	55.0	33.0	33.0	33.0
Actuated g/C Ratio	0.10	0.21	0.21	0.07	0.18	0.18	0.38	0.38	0.38	0.23	0.23	0.23
Clearance Time (s)	3.0	5.7	5.7	3.0	4.9	4.9	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	172	739	325	123	641	281	615	1254	591	405	810	358
v/s Ratio Prot	c0.12	0.06		0.08	0.14		c0.46	0.35		0.06	0.21	
v/s Ratio Perm			c0.20			0.02			0.01			c0.29
v/c Ratio	1.27	0.30	0.98	1.22	0.77	0.09	1.20	1.15dl	0.04	0.27	0.91	1.27
Uniform Delay, d1	65.0	48.1	56.6	67.0	56.1	49.1	44.6	42.6	27.9	45.6	54.1	55.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	160.4	0.1	42.9	151.7	5.0	0.0	105.0	11.6	0.0	0.1	14.1	141.6
Delay (s)	225.4	48.2	99.6	218.8	61.1	49.1	149.6	54.2	27.9	45.8	68.2	197.1
Level of Service	F	D	F	F	E	D	F	D	C	D	E	F
Approach Delay (s)		112.7			89.3			89.4			118.6	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	102.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	144.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		✥		↰	↱		↰	↑	↱
Volume (vph)	197	0	148	0	0	0	185	1514	0	0	1476	148
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	0.98
Flpb, ped/bikes		1.00	1.00				1.00	1.00			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1770	1547				1770	1863			1863	1551
Flt Permitted		0.76	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1410	1547				1770	1863			1863	1551
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	219	0	164	0	0	0	206	1682	0	0	1640	164
RTOR Reduction (vph)	0	0	128	0	0	0	0	0	0	0	0	22
Lane Group Flow (vph)	0	219	36	0	0	0	206	1682	0	0	1640	142
Confl. Bikes (#/hr)			1			1						1
Turn Type	Perm		Perm	Perm			Prot			Prot		Perm
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4								6
Actuated Green, G (s)		19.0	19.0				14.0	121.5			103.5	103.5
Effective Green, g (s)		19.0	19.0				14.0	123.0			105.0	105.0
Actuated g/C Ratio		0.13	0.13				0.09	0.82			0.70	0.70
Clearance Time (s)		4.0	4.0				4.0	5.5			5.5	5.5
Vehicle Extension (s)		3.0	3.0				1.0	2.5			2.5	2.5
Lane Grp Cap (vph)		179	196				165	1528			1304	1086
v/s Ratio Prot							c0.12	0.90			c0.88	
v/s Ratio Perm		c0.16	0.02									0.09
v/c Ratio		1.22	0.18				1.25	1.10			1.26	0.13
Uniform Delay, d1		65.5	58.6				68.0	13.5			22.5	7.4
Progression Factor		1.00	1.00				1.00	1.00			1.00	1.00
Incremental Delay, d2		140.1	0.4				152.1	55.8			122.3	0.0
Delay (s)		205.6	59.0				220.1	69.3			144.8	7.5
Level of Service		F	E				F	E			F	A
Approach Delay (s)		142.8			0.0			85.8			132.3	
Approach LOS		F			A			F			F	

Intersection Summary			
HCM Average Control Delay	111.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	108.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	25	12	529	12	12	12	430	1612	12	12	1576	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	5.7	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1802	1545		1735		1770	3539	1549	1770	3539	1583
Flt Permitted		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1802	1545		1735		1770	3539	1549	1770	3539	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	27	13	563	13	13	13	457	1715	13	13	1677	39
RTOR Reduction (vph)	0	0	374	0	13	0	0	0	3	0	0	9
Lane Group Flow (vph)	0	40	189	0	26	0	457	1715	10	13	1677	30
Confl. Peds. (#/hr)			3			2						
Confl. Bikes (#/hr)			3			1			3			
Turn Type	Split		Perm	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)		19.4	19.4		5.5		36.1	97.0	97.0	4.6	65.5	65.5
Effective Green, g (s)		18.8	18.8		4.9		35.1	98.7	97.0	3.6	67.2	67.2
Actuated g/C Ratio		0.13	0.13		0.03		0.25	0.70	0.68	0.03	0.47	0.47
Clearance Time (s)		3.4	3.4		3.4		3.0	5.7	5.7	3.0	5.7	5.7
Vehicle Extension (s)		1.0	1.0		0.5		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		239	205		60		438	2460	1058	45	1675	749
v/s Ratio Prot		0.02			c0.02		c0.26	0.48		0.01	c0.47	
v/s Ratio Perm			c0.12						0.01			0.02
v/c Ratio		0.17	0.92		0.44		1.04	0.70	0.01	0.29	1.00	0.04
Uniform Delay, d1		54.7	60.9		67.2		53.4	12.8	7.2	67.9	37.4	20.1
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.1	41.0		1.9		54.8	0.7	0.0	1.3	22.3	0.0
Delay (s)		54.8	101.9		69.1		108.2	13.5	7.2	69.2	59.7	20.1
Level of Service		D	F		E		F	B	A	E	E	C
Approach Delay (s)		98.8			69.1			33.3			58.9	
Approach LOS		F			E			C			E	

Intersection Summary			
HCM Average Control Delay	52.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	142.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	90.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↱↱		✥		↰	↑↑	↱		↑↑↑↑	
Volume (vph)	0	0	123	0	0	0	25	2018	0	0	2018	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0				4.0	4.0			4.0	
Lane Util. Factor			0.88				1.00	0.95			0.86	
Frt			0.85				1.00	1.00			0.99	
Flt Protected			1.00				0.95	1.00			1.00	
Satd. Flow (prot)			2787				1770	3539			6374	
Flt Permitted			1.00				0.06	1.00			1.00	
Satd. Flow (perm)			2787				118	3539			6374	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	145	0	0	0	29	2374	0	0	2374	87
RTOR Reduction (vph)	0	0	16	0	0	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	0	129	0	0	0	29	2374	0	0	2457	0
Turn Type			custom	Perm			Perm		Perm			
Protected Phases					8			2			6	
Permitted Phases			4	8			2		2			
Actuated Green, G (s)			9.0				63.0	63.0			63.0	
Effective Green, g (s)			9.0				63.0	63.0			63.0	
Actuated g/C Ratio			0.11				0.79	0.79			0.79	
Clearance Time (s)			4.0				4.0	4.0			4.0	
Vehicle Extension (s)			3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)			314				93	2787			5020	
v/s Ratio Prot								c0.67			0.39	
v/s Ratio Perm			c0.05				0.25					
v/c Ratio			0.41				0.31	0.85			0.49	
Uniform Delay, d1			33.0				2.4	5.5			2.9	
Progression Factor			1.00				1.00	1.00			1.00	
Incremental Delay, d2			0.9				8.5	3.5			0.3	
Delay (s)			33.9				10.9	9.0			3.3	
Level of Service			C				B	A			A	
Approach Delay (s)		33.9			0.0			9.0			3.3	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↰↑↱	↱	↰	↑↑	↱	↰↰	↑↱	
Volume (vph)	37	25	37	197	25	1157	25	849	357	972	1083	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.5	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.91	0.86	0.91	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.91		1.00	0.86	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1697		1610	2754	1441	1770	3539	1583	3433	3527	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1697		1610	2754	1441	1770	3539	1583	3433	3527	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	41	28	41	219	28	1286	28	943	397	1080	1203	28
RTOR Reduction (vph)	0	38	0	0	559	559	0	0	295	0	1	0
Lane Group Flow (vph)	41	31	0	197	134	84	28	943	102	1080	1230	0
Turn Type	Split			Split		Perm	Prot		Perm	Prot		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases						3			6			
Actuated Green, G (s)	8.4	8.4		11.0	11.0	11.0	3.3	28.2	28.2	44.9	69.8	
Effective Green, g (s)	8.4	8.4		11.0	11.0	11.0	3.3	29.7	28.2	44.9	71.3	
Actuated g/C Ratio	0.08	0.08		0.10	0.10	0.10	0.03	0.27	0.26	0.41	0.65	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.5	5.5	4.0	5.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0	1.0	1.0	4.7	4.7	1.5	5.4	
Lane Grp Cap (vph)	135	130		161	275	144	53	956	406	1401	2286	
v/s Ratio Prot	c0.02	0.02		c0.12	0.05		0.02	c0.27		c0.31	0.35	
v/s Ratio Perm						0.06			0.06			
v/c Ratio	0.30	0.24		1.22	0.91dr	0.58	0.53	0.99	0.25	0.77	0.54	
Uniform Delay, d1	48.0	47.8		49.5	46.8	47.3	52.6	39.9	32.5	28.1	10.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.3		143.5	0.5	3.9	4.3	26.0	1.5	2.4	0.9	
Delay (s)	48.5	48.1		193.0	47.3	51.2	56.9	66.0	34.0	30.6	11.4	
Level of Service	D	D		F	D	D	E	E	C	C	B	
Approach Delay (s)		48.3			67.7			56.5			20.3	
Approach LOS		D			E			E			C	

Intersection Summary			
HCM Average Control Delay	43.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.8%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↱		↰	↑↱	
Volume (vph)	209	12	972	50	12	12	234	1034	12	12	1206	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.89			0.98		1.00	1.00		1.00	0.98	
Flt Protected		0.99			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1644			1759		1770	3532		1770	3478	
Flt Permitted		0.99			0.40		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1644			727		1770	3532		1770	3478	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	220	13	1023	53	13	13	246	1088	13	13	1269	142
RTOR Reduction (vph)	0	99	0	0	5	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	1157	0	0	74	0	246	1100	0	13	1406	0
Confl. Peds. (#/hr)									1			
Confl. Bikes (#/hr)						1						2
Turn Type	Split			Perm			Prot			Prot		
Protected Phases	4!	4			8!		5	2		1	6	
Permitted Phases				8								
Actuated Green, G (s)		74.3			74.3		14.3	60.8		1.1	47.6	
Effective Green, g (s)		76.0			76.0		15.0	63.0		1.8	49.8	
Actuated g/C Ratio		0.50			0.50		0.10	0.41		0.01	0.33	
Clearance Time (s)		5.7			5.7		4.7	6.2		4.7	6.2	
Vehicle Extension (s)		3.0			3.0		2.0	3.8		2.0	3.8	
Lane Grp Cap (vph)		818			362		174	1456		21	1134	
v/s Ratio Prot		c0.70					c0.14	0.31		0.01	c0.40	
v/s Ratio Perm					0.10							
v/c Ratio		1.42			0.20		1.41	0.76		0.62	1.24	
Uniform Delay, d1		38.4			21.5		68.9	38.3		75.2	51.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		194.0			0.3		216.6	2.4		32.5	115.4	
Delay (s)		232.4			21.8		285.5	40.7		107.7	166.9	
Level of Service		F			C		F	D		F	F	
Approach Delay (s)		232.4			21.8			85.4			166.4	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM Average Control Delay	157.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.35		
Actuated Cycle Length (s)	152.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	131.3%	ICU Level of Service	H
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	258	947	1021	25	911	579	369	394	12	357	1858	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	287	1052	1134	28	1012	643	410	438	13	397	2064	219
RTOR Reduction (vph)	0	0	101	0	0	339	0	0	9	0	0	55
Lane Group Flow (vph)	287	1052	1033	28	1012	304	410	438	4	397	2064	164
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	21.3	57.5	57.5	2.0	38.2	38.2	9.5	37.8	37.8	28.7	57.0	57.0
Effective Green, g (s)	21.8	58.0	58.0	2.5	38.7	38.7	10.0	39.3	39.3	29.2	58.5	58.5
Actuated g/C Ratio	0.15	0.40	0.40	0.02	0.27	0.27	0.07	0.27	0.27	0.20	0.40	0.40
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	5.1	5.1	2.0	5.1	5.1
Lane Grp Cap (vph)	266	1416	633	31	945	422	237	959	429	356	1428	639
v/s Ratio Prot	c0.16	0.30		0.02	0.29		c0.12	0.12		0.22	c0.58	
v/s Ratio Perm			c0.65			0.19			0.00			0.10
v/c Ratio	1.08	0.74	1.63	0.90	1.07	0.72	1.73	0.46	0.01	1.12	1.45	0.26
Uniform Delay, d1	61.6	37.1	43.5	71.1	53.2	48.3	67.5	44.0	38.6	57.9	43.2	28.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	77.8	1.9	291.2	119.0	50.2	5.1	345.6	1.6	0.0	82.6	204.4	1.0
Delay (s)	139.4	39.0	334.7	190.2	103.3	53.3	413.1	45.5	38.6	140.5	247.7	29.8
Level of Service	F	D	F	F	F	D	F	D	D	F	F	C
Approach Delay (s)		186.3			85.7			220.5			214.0	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	177.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.56		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	127.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱	↰	↰↑	↱	↰	↑↑↑↱		↰	↑↑	↱
Volume (vph)	12	25	25	247	0	197	12	566	247	135	2782	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	1.00	0.85
Flt Protected		0.98	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1834	1529	1681	1681	1561	1770	4854		1770	3539	1550
Flt Permitted		0.98	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1834	1529	1681	1681	1561	1770	4854		1770	3539	1550
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	28	28	274	0	219	13	629	274	150	3091	13
RTOR Reduction (vph)	0	0	27	0	0	126	0	41	0	0	0	2
Lane Group Flow (vph)	0	41	1	137	137	93	13	862	0	150	3091	11
Confl. Bikes (#/hr)			2			1						2
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)		2.5	2.5	18.0	18.0	18.0	1.7	93.3		16.2	107.8	107.8
Effective Green, g (s)		3.0	3.0	18.5	18.5	18.5	2.2	95.8		16.7	110.3	110.3
Actuated g/C Ratio		0.02	0.02	0.12	0.12	0.12	0.01	0.64		0.11	0.74	0.74
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	4.5	6.5		4.5	6.5	6.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	4.6		2.0	5.1	5.1
Lane Grp Cap (vph)		37	31	207	207	193	26	3100		197	2602	1140
v/s Ratio Prot		c0.02		c0.08	0.08		0.01	0.18		c0.08	c0.87	
v/s Ratio Perm			0.00			0.06						0.01
v/c Ratio		1.11	0.02	0.66	0.66	0.48	0.50	0.28		0.76	1.19	0.01
Uniform Delay, d1		73.5	72.1	62.8	62.8	61.3	73.4	11.9		64.7	19.9	5.3
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		182.0	0.1	6.0	6.0	0.7	5.4	0.2		14.4	88.7	0.0
Delay (s)		255.5	72.1	68.8	68.8	62.0	78.8	12.1		79.1	108.6	5.3
Level of Service		F	E	E	E	E	E	B		E	F	A
Approach Delay (s)		181.1			65.8			13.1			106.8	
Approach LOS		F			E			B			F	

Intersection Summary			
HCM Average Control Delay	85.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	103.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	12	12	1501	12	12	1304
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.95		1.00	1.00
Frt	0.93		1.00		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1695		3535		1770	1863
Flt Permitted	0.98		1.00		0.95	1.00
Satd. Flow (perm)	1695		3535		1770	1863
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	13	1668	13	13	1449
RTOR Reduction (vph)	12	0	0	0	0	0
Lane Group Flow (vph)	14	0	1681	0	13	1449
Turn Type					Prot	
Protected Phases	8		6		5	2
Permitted Phases						
Actuated Green, G (s)	6.3		84.5		7.2	95.7
Effective Green, g (s)	6.3		84.5		7.2	95.7
Actuated g/C Ratio	0.06		0.77		0.07	0.87
Clearance Time (s)	4.0		4.0		4.0	4.0
Vehicle Extension (s)	3.0		2.8		2.4	2.8
Lane Grp Cap (vph)	97		2716		116	1621
v/s Ratio Prot	c0.01		0.48		0.01	c0.78
v/s Ratio Perm						
v/c Ratio	0.14		0.62		0.11	0.89
Uniform Delay, d1	49.3		5.6		48.4	4.2
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	0.7		1.1		0.3	8.0
Delay (s)	50.0		6.7		48.7	12.2
Level of Service	D		A		D	B
Approach Delay (s)	50.0		6.7			12.5
Approach LOS	D		A			B

Intersection Summary			
HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↑↑	↑	↱
Volume (vph)	37	12	0	1476	1219	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.97			0.95	1.00	1.00
Frt	0.96			1.00	1.00	0.85
Flt Protected	0.96			1.00	1.00	1.00
Satd. Flow (prot)	3356			3539	1863	1583
Flt Permitted	0.96			1.00	1.00	1.00
Satd. Flow (perm)	3356			3539	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	41	13	0	1640	1354	109
RTOR Reduction (vph)	12	0	0	0	0	18
Lane Group Flow (vph)	42	0	0	1640	1354	91
Turn Type						Perm
Protected Phases	4			2	2	
Permitted Phases						2
Actuated Green, G (s)	7.2			74.8	74.8	74.8
Effective Green, g (s)	7.2			74.8	74.8	74.8
Actuated g/C Ratio	0.08			0.83	0.83	0.83
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	2.8			2.8	2.8	2.8
Lane Grp Cap (vph)	268			2941	1548	1316
v/s Ratio Prot	c0.01			0.46	c0.73	
v/s Ratio Perm						0.06
v/c Ratio	0.16			0.56	0.87	0.07
Uniform Delay, d1	38.6			2.4	4.7	1.4
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.2			0.8	7.2	0.1
Delay (s)	38.8			3.2	11.9	1.5
Level of Service	D			A	B	A
Approach Delay (s)	38.8			3.2	11.1	
Approach LOS	D			A	B	

Intersection Summary			
HCM Average Control Delay	7.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↑↱			✣			✣	
Volume (vph)	12	1206	12	12	1452	12	12	25	12	12	12	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1710	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			0%			0%	
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		0.95			1.00			1.00	
Frpb, ped/bikes		1.00	0.95		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.97			0.96	
Flt Protected		1.00	1.00		1.00			0.99			0.98	
Satd. Flow (prot)		1815	1471		3096			1768			1741	
Flt Permitted		0.98	1.00		0.94			0.92			0.93	
Satd. Flow (perm)		1771	1471		2911			1645			1638	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	1340	13	13	1613	13	13	28	13	13	13	13
RTOR Reduction (vph)	0	0	2	0	0	0	0	12	0	0	12	0
Lane Group Flow (vph)	0	1353	11	0	1639	0	0	42	0	0	27	0
Confl. Peds. (#/hr)			9			2						
Confl. Bikes (#/hr)						1			2			1
Parking (#/hr)				0	0	0						
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		93.5	93.5		93.5			8.5			8.5	
Effective Green, g (s)		93.5	93.5		93.5			8.5			8.5	
Actuated g/C Ratio		0.85	0.85		0.85			0.08			0.08	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)		2.8	2.8		2.8			2.0			2.0	
Lane Grp Cap (vph)		1505	1250		2474			127			127	
v/s Ratio Prot												
v/s Ratio Perm		c0.76	0.01		0.56			c0.03			0.02	
v/c Ratio		0.90	0.01		0.66			0.33			0.21	
Uniform Delay, d1		5.2	1.2		2.8			48.1			47.6	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		8.9	0.0		1.4			0.6			0.3	
Delay (s)		14.1	1.3		4.2			48.6			47.9	
Level of Service		B	A		A			D			D	
Approach Delay (s)		14.0			4.2			48.6			47.9	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↑	↱
Volume (vph)	394	824	12	25	467	25	25	455	98	62	407	984
Ideal Flow (vphpl)	1900	1900	1900	1900	1596	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1859		1770	1553		1770	1813		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1859		1770	1553		1770	1813		1770	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	438	916	13	28	519	28	28	506	109	69	452	1093
RTOR Reduction (vph)	0	0	0	0	1	0	0	5	0	0	0	44
Lane Group Flow (vph)	438	929	0	28	546	0	28	610	0	69	452	1049
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												6
Actuated Green, G (s)	36.0	74.4		2.4	40.8		2.4	44.8		4.0	46.4	82.4
Effective Green, g (s)	36.0	74.4		2.4	40.8		2.4	44.8		4.0	46.4	82.4
Actuated g/C Ratio	0.25	0.53		0.02	0.29		0.02	0.32		0.03	0.33	0.58
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.1		2.0	4.1		2.0	4.1		2.0	4.1	2.0
Lane Grp Cap (vph)	450	977		30	447		30	574		50	610	966
v/s Ratio Prot	0.25	0.50		0.02	c0.35		0.02	0.34		c0.04	0.24	c0.28
v/s Ratio Perm												0.39
v/c Ratio	0.97	0.95		0.93	1.22		0.93	1.06		1.38	0.74	1.09
Uniform Delay, d1	52.3	31.9		69.5	50.4		69.5	48.4		68.8	42.3	29.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	35.2	18.1		134.2	118.0		134.2	55.1		257.7	5.2	55.2
Delay (s)	87.5	50.0		203.7	168.4		203.7	103.5		326.5	47.5	84.8
Level of Service	F	D		F	F		F	F		F	D	F
Approach Delay (s)		62.0			170.1			107.8			84.7	
Approach LOS		E			F			F			F	

Intersection Summary			
HCM Average Control Delay	92.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	141.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	105.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰	↱
Volume (vph)	480	492	222	172	369	295
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1571	1770	1545
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	3539	1571	1770	1545
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	533	547	247	191	410	328
RTOR Reduction (vph)	0	0	0	66	0	236
Lane Group Flow (vph)	533	547	247	125	410	92
Confl. Peds. (#/hr)				8		7
Confl. Bikes (#/hr)				8		8
Turn Type	Prot			pm+ov		Perm
Protected Phases	1	6	2	4	4	
Permitted Phases				2		4
Actuated Green, G (s)	21.5	34.1	8.6	25.0	16.4	16.4
Effective Green, g (s)	21.5	34.1	8.6	25.0	16.4	16.4
Actuated g/C Ratio	0.37	0.58	0.15	0.43	0.28	0.28
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.1	3.1	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	651	1086	520	779	496	433
v/s Ratio Prot	c0.30	c0.29	0.07	0.04	c0.23	
v/s Ratio Perm				0.03		0.06
v/c Ratio	0.82	0.50	0.48	0.16	0.83	0.21
Uniform Delay, d1	16.7	7.2	22.9	10.3	19.7	16.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.0	0.4	0.3	0.0	10.3	0.1
Delay (s)	24.7	7.6	23.1	10.3	30.0	16.2
Level of Service	C	A	C	B	C	B
Approach Delay (s)		16.0	17.5		23.9	
Approach LOS		B	B		C	

Intersection Summary			
HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	58.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	62	12	110	37	62	12	800	50	62	1354	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.91		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1817		1770	1688		1770	1846		1770	1858	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1817		1770	1688		1770	1846		1770	1858	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	27	67	13	118	40	67	13	860	54	67	1456	27
RTOR Reduction (vph)	0	5	0	0	41	0	0	1	0	0	0	0
Lane Group Flow (vph)	27	75	0	118	66	0	13	913	0	67	1483	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	3.6	12.1		10.4	18.9		0.9	98.6		7.3	105.0	
Effective Green, g (s)	3.4	11.9		10.2	18.7		0.7	98.4		7.1	104.8	
Actuated g/C Ratio	0.02	0.08		0.07	0.13		0.00	0.69		0.05	0.73	
Clearance Time (s)	3.8	3.8		3.8	3.8		3.8	3.8		3.8	3.8	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	42	151		126	220		9	1265		88	1356	
v/s Ratio Prot	0.02	c0.04		c0.07	0.04		0.01	0.49		c0.04	c0.80	
v/s Ratio Perm												
v/c Ratio	0.64	0.50		0.94	0.30		1.44	0.72		0.76	1.09	
Uniform Delay, d1	69.5	63.0		66.4	56.5		71.4	14.1		67.4	19.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	22.5	0.9		59.6	0.3		474.2	2.1		28.8	54.1	
Delay (s)	92.0	63.9		126.0	56.8		545.6	16.1		96.2	73.5	
Level of Service	F	E		F	E		F	B		F	E	
Approach Delay (s)		71.0			93.1			23.6			74.5	
Approach LOS		E			F			C			E	

Intersection Summary			
HCM Average Control Delay	59.1	HCM Level of Service	E
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	143.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↱		↰	↑↱	
Volume (vph)	12	12	12	98	12	123	12	862	37	110	1329	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1704		1770	1567		1770	3514		1770	3534	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1704		1770	1567		1770	3514		1770	3534	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	13	13	13	108	13	135	13	947	41	121	1460	13
RTOR Reduction (vph)	0	12	0	0	112	0	0	3	0	0	0	0
Lane Group Flow (vph)	13	14	0	108	36	0	13	985	0	121	1473	0
Confl. Peds. (#/hr)			1			1			1			1
Confl. Bikes (#/hr)			3			3			2			1
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	0.4	4.5		7.0	11.1		0.7	29.7		6.7	35.7	
Effective Green, g (s)	0.4	4.5		7.0	11.1		0.7	30.7		6.7	36.7	
Actuated g/C Ratio	0.01	0.07		0.11	0.17		0.01	0.47		0.10	0.57	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	11	118		191	268		19	1662		183	1998	
v/s Ratio Prot	0.01	0.01		c0.06	c0.02		0.01	0.28		c0.07	c0.42	
v/s Ratio Perm												
v/c Ratio	1.18	0.12		0.57	0.13		0.68	0.59		0.66	0.74	
Uniform Delay, d1	32.2	28.3		27.5	22.8		32.0	12.5		28.0	10.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	338.7	0.2		2.3	0.1		58.7	0.6		6.8	1.5	
Delay (s)	371.0	28.5		29.8	22.9		90.7	13.1		34.8	12.0	
Level of Service	F	C		C	C		F	B		C	B	
Approach Delay (s)		142.7			25.8			14.1			13.7	
Approach LOS		F			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	64.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱		↑↑	Y	
Volume (veh/h)	824	123	0	1588	0	247
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	969	145	0	1868	0	291
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1283		
pX, platoon unblocked						
vC, conflicting volume			1114		1904	969
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1114		1904	969
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	0
cM capacity (veh/h)			623		61	253

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	969	145	934	934	291
Volume Left	0	0	0	0	0
Volume Right	0	145	0	0	291
cSH	1700	1700	1700	1700	253
Volume to Capacity	0.57	0.09	0.55	0.55	1.15
Queue Length 95th (ft)	0	0	0	0	326
Control Delay (s)	0.0	0.0	0.0	0.0	144.5
Lane LOS					F
Approach Delay (s)	0.0		0.0		144.5
Approach LOS					F

Intersection Summary			
Average Delay	12.8		
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations						
Volume (vph)	1009	345	1243	959	419	652
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	0.88	0.97	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3433	1562	3433	2724	3433	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3433	1562	3433	2724	3433	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1073	367	1322	1020	446	694
RTOR Reduction (vph)	0	195	0	602	0	5
Lane Group Flow (vph)	1073	172	1322	418	446	689
Confl. Peds. (#/hr)		1		2		
Turn Type		Perm		Perm		custom
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	28.6	28.6	35.4	35.4	12.0	51.4
Effective Green, g (s)	29.1	28.6	36.9	36.9	12.0	52.9
Actuated g/C Ratio	0.32	0.32	0.41	0.41	0.13	0.59
Clearance Time (s)	4.5	4.5	5.5	5.5	4.0	5.5
Vehicle Extension (s)	2.0	2.0	3.0	3.0	2.0	3.0
Lane Grp Cap (vph)	1110	496	1408	1117	458	930
v/s Ratio Prot	c0.31		c0.39		c0.13	0.44
v/s Ratio Perm		0.11		0.15		
v/c Ratio	0.97	0.35	0.94	0.37	0.97	0.74
Uniform Delay, d1	30.0	23.5	25.5	18.5	38.8	13.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	19.2	0.2	12.1	0.2	34.9	3.2
Delay (s)	49.1	23.7	37.6	18.7	73.7	16.8
Level of Service	D	C	D	B	E	B
Approach Delay (s)	42.6		29.4		39.1	
Approach LOS	D		C		D	

Intersection Summary			
HCM Average Control Delay	35.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱↱	↰↰	↑↑	↱
Volume (vph)	988	135	62	197	270	74	110	234	160	123	997	1256
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1098	150	69	219	300	82	122	260	178	137	1108	1396
RTOR Reduction (vph)	0	0	41	0	0	68	0	0	124	0	0	0
Lane Group Flow (vph)	1098	150	28	219	300	14	122	260	54	137	1108	1396
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			Free
Actuated Green, G (s)	42.7	50.4	50.4	12.1	19.8	19.8	5.1	37.8	37.8	8.9	41.1	129.2
Effective Green, g (s)	43.2	51.9	51.9	12.6	21.3	21.3	5.6	39.3	39.3	9.4	43.1	129.2
Actuated g/C Ratio	0.33	0.40	0.40	0.10	0.16	0.16	0.04	0.30	0.30	0.07	0.33	1.00
Clearance Time (s)	4.5	5.5	5.5	4.5	5.5	5.5	4.5	5.5	5.5	4.5	6.0	
Vehicle Extension (s)	2.0	4.1	4.1	2.0	4.5	4.5	2.0	4.5	4.5	2.0	3.7	
Lane Grp Cap (vph)	1148	1422	636	335	583	261	149	1076	848	250	1181	1583
v/s Ratio Prot	c0.32	0.04		0.06	0.08		0.04	0.07		0.04	c0.31	
v/s Ratio Perm			0.02			0.01			0.02			c0.88
v/c Ratio	0.96	0.11	0.04	0.65	0.51	0.05	0.82	0.24	0.06	0.55	0.94	0.88
Uniform Delay, d1	42.1	24.1	23.5	56.2	49.2	45.4	61.3	33.8	31.9	57.8	41.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.8	0.0	0.0	3.5	1.3	0.1	27.0	0.2	0.1	1.3	13.9	7.4
Delay (s)	58.9	24.2	23.6	59.7	50.5	45.6	88.3	34.0	32.0	59.2	55.7	7.4
Level of Service	E	C	C	E	D	D	F	C	C	E	E	A
Approach Delay (s)		53.1			53.2			45.2			30.4	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	40.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	129.2	Sum of lost time (s)	0.0
Intersection Capacity Utilization	79.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	1096	86	37	2265	12	98	12	62	12	12	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.7	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (prot)	1770	3539	1583	1770	3537		1681	1703	1583		1750	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (perm)	1770	3539	1583	1770	3537		1681	1703	1583		1750	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	12	1130	89	38	2335	12	101	12	64	12	12	12
RTOR Reduction (vph)	0	0	25	0	0	0	0	0	58	0	12	0
Lane Group Flow (vph)	12	1130	64	38	2347	0	57	56	6	0	24	0
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						8			
Actuated Green, G (s)	1.5	89.9	89.9	4.3	92.7		11.3	11.3	11.3		3.0	
Effective Green, g (s)	1.1	91.6	89.9	3.9	94.4		11.1	11.1	11.1		2.8	
Actuated g/C Ratio	0.01	0.73	0.72	0.03	0.75		0.09	0.09	0.09		0.02	
Clearance Time (s)	3.6	5.7	5.7	3.6	5.7		3.8	3.8	3.8		3.8	
Vehicle Extension (s)	2.2	3.2	3.2	2.2	3.2		3.1	3.1	3.1		3.1	
Lane Grp Cap (vph)	16	2585	1135	55	2663		149	151	140		39	
v/s Ratio Prot	0.01	0.32		c0.02	c0.66		c0.03	0.03			c0.01	
v/s Ratio Perm			0.04						0.00			
v/c Ratio	0.75	0.44	0.06	0.69	0.88		0.38	0.37	0.04		0.62	
Uniform Delay, d1	62.0	6.7	5.2	60.2	11.4		53.9	53.9	52.3		60.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	99.6	0.1	0.0	27.3	3.8		1.7	1.6	0.1		27.3	
Delay (s)	161.6	6.8	5.3	87.4	15.2		55.6	55.5	52.4		88.0	
Level of Service	F	A	A	F	B		E	E	D		F	
Approach Delay (s)		8.2			16.4			54.4			88.0	
Approach LOS		A			B			D			F	

Intersection Summary			
HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	125.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

INTERSECTION SYNCHRO ANALYSIS

YR-2016 NO-BUILD PM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱	↰	↑↑	↱
Volume (vph)	480	492	1119	148	382	98	984	615	123	197	542	345
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.91	0.91	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1559	1770	3539	1555	1610	3319	1548	1770	3539	1562
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1559	1770	3539	1555	1610	3319	1548	1770	3539	1562
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	533	547	1243	164	424	109	1093	683	137	219	602	383
RTOR Reduction (vph)	0	0	376	0	0	83	0	0	98	0	0	270
Lane Group Flow (vph)	533	547	867	164	424	26	579	1197	39	219	602	113
Confl. Peds. (#/hr)						2			5			
Confl. Bikes (#/hr)			6			2			1			1
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2			6			8			7
Actuated Green, G (s)	31.0	54.0	54.0	10.0	33.8	33.8	39.7	39.7	39.7	22.0	22.0	22.0
Effective Green, g (s)	30.0	55.7	55.7	9.0	34.7	34.7	41.0	41.0	41.0	23.3	23.3	23.3
Actuated g/C Ratio	0.21	0.38	0.38	0.06	0.24	0.24	0.28	0.28	0.28	0.16	0.16	0.16
Clearance Time (s)	3.0	5.7	5.7	3.0	4.9	4.9	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	366	1359	599	110	847	372	455	938	438	284	569	251
v/s Ratio Prot	c0.30	0.15		0.09	0.12		0.36	c0.36		0.12	c0.17	
v/s Ratio Perm			c0.56			0.02			0.03			0.07
v/c Ratio	1.46	0.40	1.45	1.49	0.50	0.07	1.27	1.28	0.09	0.77	1.06	0.45
Uniform Delay, d1	57.5	32.5	44.6	68.0	47.7	42.7	52.0	52.0	38.3	58.3	60.8	55.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	220.0	0.1	210.9	262.7	0.2	0.0	138.9	132.6	0.0	11.2	54.0	0.5
Delay (s)	277.5	32.6	255.5	330.7	47.8	42.7	190.9	184.6	38.3	69.5	114.8	55.5
Level of Service	F	C	F	F	D	D	F	F	D	E	F	E
Approach Delay (s)		208.1			113.6			176.0			87.7	
Approach LOS		F			F			F			F	

Intersection Summary

HCM Average Control Delay	163.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.31		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	102.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	123	0	247	0	0	0	160	1661	0	0	1489	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	0.98
Flpb, ped/bikes		1.00	1.00				1.00	1.00			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1770	1547				1770	1863			1863	1551
Flt Permitted		0.76	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1410	1547				1770	1863			1863	1551
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	137	0	274	0	0	0	178	1846	0	0	1654	137
RTOR Reduction (vph)	0	0	115	0	0	0	0	0	0	0	0	17
Lane Group Flow (vph)	0	137	159	0	0	0	178	1846	0	0	1654	120
Confl. Bikes (#/hr)			1			1						1
Turn Type	Perm		Perm	Perm			Prot			Prot		Perm
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4								6
Actuated Green, G (s)		17.6	17.6				12.0	121.5			105.5	105.5
Effective Green, g (s)		17.6	17.6				12.0	123.0			107.0	107.0
Actuated g/C Ratio		0.12	0.12				0.08	0.83			0.72	0.72
Clearance Time (s)		4.0	4.0				4.0	5.5			5.5	5.5
Vehicle Extension (s)		3.0	3.0				1.0	2.5			2.5	2.5
Lane Grp Cap (vph)		167	183				143	1542			1341	1117
v/s Ratio Prot							0.10	c0.99			c0.89	
v/s Ratio Perm		0.10	c0.10									0.08
v/c Ratio		0.82	0.87				1.24	1.20			1.23	0.11
Uniform Delay, d1		64.0	64.4				68.3	12.8			20.8	6.3
Progression Factor		1.00	1.00				1.00	1.00			1.00	1.00
Incremental Delay, d2		26.4	33.4				155.5	95.3			111.7	0.0
Delay (s)		90.4	97.8				223.8	108.1			132.5	6.3
Level of Service		F	F				F	F			F	A
Approach Delay (s)		95.3			0.0			118.3			122.9	
Approach LOS		F			A			F			F	

Intersection Summary			
HCM Average Control Delay	118.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.20		
Actuated Cycle Length (s)	148.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	107.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	25	12	430	25	12	25	542	1698	12	12	1551	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	5.7	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97		0.99		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1802	1535		1710		1770	3539	1549	1770	3539	1583
Flt Permitted		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1802	1535		1710		1770	3539	1549	1770	3539	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	27	13	457	27	13	27	577	1806	13	13	1650	27
RTOR Reduction (vph)	0	0	431	0	17	0	0	0	2	0	0	6
Lane Group Flow (vph)	0	40	26	0	50	0	577	1806	11	13	1650	21
Confl. Peds. (#/hr)			3			2						
Confl. Bikes (#/hr)			3			1			3			
Turn Type	Split		Perm	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)		8.4	8.4		6.4		43.2	100.5	100.5	4.5	61.8	61.8
Effective Green, g (s)		7.8	7.8		5.8		42.2	102.2	100.5	3.5	63.5	63.5
Actuated g/C Ratio		0.06	0.06		0.04		0.31	0.76	0.74	0.03	0.47	0.47
Clearance Time (s)		3.4	3.4		3.4		3.0	5.7	5.7	3.0	5.7	5.7
Vehicle Extension (s)		1.0	1.0		0.5		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		104	88		73		552	2673	1151	46	1661	743
v/s Ratio Prot		c0.02			c0.03		c0.33	0.51		0.01	c0.47	
v/s Ratio Perm			0.02						0.01			0.01
v/c Ratio		0.38	0.30		0.68		1.05	0.68	0.01	0.28	0.99	0.03
Uniform Delay, d1		61.4	61.1		63.8		46.6	8.3	4.5	64.7	35.7	19.3
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.9	0.7		18.9		50.7	0.5	0.0	1.2	20.4	0.0
Delay (s)		62.3	61.8		82.7		97.2	8.8	4.5	65.9	56.1	19.3
Level of Service		E	E		F		F	A	A	E	E	B
Approach Delay (s)		61.9			82.7			30.1			55.6	
Approach LOS		E			F			C			E	

Intersection Summary			
HCM Average Control Delay	43.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	135.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↱↱		✥		↰	↑↑	↱		↑↑↑↑	
Volume (vph)	0	0	135	0	0	0	74	2153	0	0	1908	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0				4.0	4.0			4.0	
Lane Util. Factor			0.88				1.00	0.95			0.86	
Frt			0.85				1.00	1.00			0.99	
Flt Protected			1.00				0.95	1.00			1.00	
Satd. Flow (prot)			2787				1770	3539			6372	
Flt Permitted			1.00				0.06	1.00			1.00	
Satd. Flow (perm)			2787				119	3539			6372	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	159	0	0	0	87	2533	0	0	2245	87
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	0	138	0	0	0	87	2533	0	0	2327	0
Turn Type			custom	Perm			Perm		Perm			
Protected Phases					8			2			6	
Permitted Phases			4	8			2		2			
Actuated Green, G (s)			9.2				62.8	62.8			62.8	
Effective Green, g (s)			9.2				62.8	62.8			62.8	
Actuated g/C Ratio			0.12				0.78	0.78			0.78	
Clearance Time (s)			4.0				4.0	4.0			4.0	
Vehicle Extension (s)			3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)			321				93	2778			5002	
v/s Ratio Prot								0.72			0.37	
v/s Ratio Perm			c0.05				c0.73					
v/c Ratio			0.43				0.94	0.91			0.47	
Uniform Delay, d1			33.0				7.0	6.5			2.9	
Progression Factor			1.00				1.00	1.00			1.00	
Incremental Delay, d2			0.9				76.9	5.8			0.3	
Delay (s)			33.9				83.9	12.3			3.2	
Level of Service			C				F	B			A	
Approach Delay (s)		33.9			0.0			14.7			3.2	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↰↑↱	↱	↰	↑↑	↱	↰↰	↑↱	
Volume (vph)	62	25	50	455	25	1096	37	1071	283	1181	751	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.5	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.91	0.86	0.91	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.90		1.00	0.88	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1676		1610	2788	1441	1770	3539	1583	3433	3506	
Flt Permitted	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1676		1610	2788	1441	1770	3539	1583	3433	3506	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	69	28	56	506	28	1218	41	1190	314	1312	834	56
RTOR Reduction (vph)	0	52	0	0	441	441	0	0	229	0	2	0
Lane Group Flow (vph)	69	32	0	405	297	168	41	1190	85	1312	888	0
Turn Type	Split			Split		Perm	Prot		Perm	Prot		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases						3			6			
Actuated Green, G (s)	11.4	11.4		28.0	28.0	28.0	6.0	40.5	40.5	52.6	87.1	
Effective Green, g (s)	11.4	11.4		28.0	28.0	28.0	6.0	42.0	40.5	52.6	88.6	
Actuated g/C Ratio	0.08	0.08		0.19	0.19	0.19	0.04	0.28	0.27	0.35	0.59	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.5	5.5	4.0	5.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0	1.0	1.0	4.7	4.7	1.5	5.4	
Lane Grp Cap (vph)	135	127		301	520	269	71	991	427	1204	2071	
v/s Ratio Prot	c0.04	0.02		c0.25	0.11		0.02	c0.34		c0.38	0.25	
v/s Ratio Perm						0.12			0.05			
v/c Ratio	0.51	0.25		1.35	0.86dr	0.63	0.58	1.20	0.20	1.09	0.43	
Uniform Delay, d1	66.6	65.3		61.0	55.5	56.2	70.8	54.0	42.2	48.7	16.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.4	0.4		176.0	0.9	3.2	6.9	100.2	1.0	54.0	0.7	
Delay (s)	68.0	65.7		237.0	56.5	59.4	77.6	154.2	43.3	102.7	17.5	
Level of Service	E	E		F	E	E	E	F	D	F	B	
Approach Delay (s)		66.7			99.2			129.6			68.2	
Approach LOS		E			F			F			E	

Intersection Summary			
HCM Average Control Delay	94.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	98.1%	ICU Level of Service	F
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣		↰	↑↱		↰	↑↱	
Volume (vph)	172	12	689	37	25	12	935	1231	50	12	874	307
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.89			0.98		1.00	0.99		1.00	0.96	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1648			1773		1770	3515		1770	3381	
Flt Permitted		0.99			0.49		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1648			895		1770	3515		1770	3381	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	181	13	725	39	26	13	984	1296	53	13	920	323
RTOR Reduction (vph)	0	97	0	0	5	0	0	2	0	0	24	0
Lane Group Flow (vph)	0	822	0	0	73	0	984	1347	0	13	1219	0
Confl. Peds. (#/hr)									1			
Confl. Bikes (#/hr)						1						2
Turn Type	Split			Perm			Prot			Prot		
Protected Phases	4!	4			8!		5	2		1	6	
Permitted Phases				8								
Actuated Green, G (s)		46.3			46.3		45.3	78.1		1.8	34.6	
Effective Green, g (s)		48.0			48.0		46.0	80.3		2.5	36.8	
Actuated g/C Ratio		0.34			0.34		0.32	0.56		0.02	0.26	
Clearance Time (s)		5.7			5.7		4.7	6.2		4.7	6.2	
Vehicle Extension (s)		3.0			3.0		2.0	3.8		2.0	3.8	
Lane Grp Cap (vph)		554			301		570	1977		31	871	
v/s Ratio Prot		c0.50					c0.56	0.38		0.01	c0.36	
v/s Ratio Perm					0.08							
v/c Ratio		1.48			0.24		1.73	0.68		0.42	1.40	
Uniform Delay, d1		47.4			34.2		48.4	22.2		69.4	53.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		227.3			0.4		334.2	1.0		3.3	186.5	
Delay (s)		274.7			34.7		382.6	23.2		72.7	239.5	
Level of Service		F			C		F	C		E	F	
Approach Delay (s)		274.7			34.7			174.8			237.8	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM Average Control Delay	209.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.54		
Actuated Cycle Length (s)	142.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	150.4%	ICU Level of Service	H
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	407	787	677	12	1083	923	1181	1231	12	579	751	369
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	452	874	752	13	1203	1026	1312	1368	13	643	834	410
RTOR Reduction (vph)	0	0	272	0	0	240	0	0	6	0	0	129
Lane Group Flow (vph)	452	874	480	13	1203	786	1312	1368	7	643	834	281
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	17.5	61.5	61.5	1.2	45.2	45.2	25.5	38.8	38.8	24.5	37.8	37.8
Effective Green, g (s)	18.0	62.0	62.0	1.7	45.7	45.7	26.0	40.3	40.3	25.0	39.3	39.3
Actuated g/C Ratio	0.12	0.43	0.43	0.01	0.32	0.32	0.18	0.28	0.28	0.17	0.27	0.27
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	5.1	5.1	2.0	5.1	5.1
Lane Grp Cap (vph)	220	1513	677	21	1115	499	616	984	440	305	959	429
v/s Ratio Prot	c0.26	0.25		0.01	0.34		c0.38	c0.39		c0.36	0.24	
v/s Ratio Perm			0.30			c0.50			0.00			0.18
v/c Ratio	2.05	0.58	0.71	0.62	1.08	1.57	2.13	1.39	0.02	2.11	0.87	0.65
Uniform Delay, d1	63.5	31.5	34.1	71.3	49.6	49.6	59.5	52.4	38.0	60.0	50.4	46.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	490.0	0.3	2.8	32.5	50.9	268.0	513.9	181.9	0.1	509.7	10.6	7.6
Delay (s)	553.5	31.9	36.9	103.9	100.6	317.7	573.4	234.3	38.0	569.7	61.0	54.4
Level of Service	F	C	D	F	F	F	F	F	D	F	E	D
Approach Delay (s)		147.2			199.9			398.5			232.9	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	254.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.82		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	131.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱	↰	↰	↱	↰	↑↑↱		↰	↑↑	↱
Volume (vph)	12	25	12	185	25	517	25	1895	234	529	923	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected		0.98	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1834	1529	1681	1704	1562	1770	5001		1770	3539	1550
Flt Permitted		0.98	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1834	1529	1681	1704	1562	1770	5001		1770	3539	1550
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	28	13	206	28	574	28	2106	260	588	1026	28
RTOR Reduction (vph)	0	0	13	0	0	347	0	10	0	0	0	9
Lane Group Flow (vph)	0	41	0	115	119	227	28	2356	0	588	1026	19
Confl. Bikes (#/hr)			2			1						2
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)		2.5	2.5	23.4	23.4	23.4	3.8	58.0		46.1	100.3	100.3
Effective Green, g (s)		3.0	3.0	23.9	23.9	23.9	4.3	60.5		46.6	102.8	102.8
Actuated g/C Ratio		0.02	0.02	0.16	0.16	0.16	0.03	0.40		0.31	0.69	0.69
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	4.5	6.5		4.5	6.5	6.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	4.6		2.0	5.1	5.1
Lane Grp Cap (vph)		37	31	268	272	249	51	2017		550	2425	1062
v/s Ratio Prot		c0.02		0.07	0.07		0.02	c0.47		c0.33	0.29	
v/s Ratio Perm			0.00			c0.15						0.01
v/c Ratio		1.11	0.01	0.43	0.44	0.91	0.55	1.17		1.07	0.42	0.02
Uniform Delay, d1		73.5	72.0	56.9	57.0	62.0	71.9	44.8		51.7	10.5	7.5
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		182.0	0.0	0.4	0.4	33.7	6.3	81.4		58.2	0.5	0.0
Delay (s)		255.5	72.1	57.3	57.4	95.7	78.2	126.1		109.9	11.0	7.6
Level of Service		F	E	E	E	F	E	F		F	B	A
Approach Delay (s)		211.3			84.6			125.6			46.3	
Approach LOS		F			F			F			D	

Intersection Summary			
HCM Average Control Delay	93.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	25	25	1993	25	12	1366
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.95		1.00	1.00
Frt	0.93		1.00		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1695		3533		1770	1863
Flt Permitted	0.98		1.00		0.95	1.00
Satd. Flow (perm)	1695		3533		1770	1863
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	28	2214	28	13	1518
RTOR Reduction (vph)	26	0	0	0	0	0
Lane Group Flow (vph)	30	0	2242	0	13	1518
Turn Type					Prot	
Protected Phases	8		6		5	2
Permitted Phases						
Actuated Green, G (s)	8.2		102.6		7.2	113.8
Effective Green, g (s)	8.2		102.6		7.2	113.8
Actuated g/C Ratio	0.06		0.79		0.06	0.88
Clearance Time (s)	4.0		4.0		4.0	4.0
Vehicle Extension (s)	3.0		2.8		2.4	2.8
Lane Grp Cap (vph)	107		2788		98	1631
v/s Ratio Prot	c0.02		0.63		0.01	c0.81
v/s Ratio Perm						
v/c Ratio	0.28		0.80		0.13	0.93
Uniform Delay, d1	58.1		7.9		58.4	5.4
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	1.4		2.6		0.4	11.0
Delay (s)	59.5		10.5		58.8	16.4
Level of Service	E		B		E	B
Approach Delay (s)	59.5		10.5			16.8
Approach LOS	E		B			B

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰↱			↑↑	↑	↱
Volume (vph)	234	25	0	1784	1304	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.97			0.95	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	0.96			1.00	1.00	1.00
Satd. Flow (prot)	3407			3539	1863	1583
Flt Permitted	0.96			1.00	1.00	1.00
Satd. Flow (perm)	3407			3539	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	260	28	0	1982	1449	96
RTOR Reduction (vph)	9	0	0	0	0	20
Lane Group Flow (vph)	279	0	0	1982	1449	76
Turn Type						Perm
Protected Phases	4			2	2	
Permitted Phases						2
Actuated Green, G (s)	13.2			78.8	78.8	78.8
Effective Green, g (s)	13.2			78.8	78.8	78.8
Actuated g/C Ratio	0.13			0.79	0.79	0.79
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	2.8			2.8	2.8	2.8
Lane Grp Cap (vph)	450			2789	1468	1247
v/s Ratio Prot	c0.08			0.56	c0.78	
v/s Ratio Perm						0.05
v/c Ratio	0.62			0.71	0.99	0.06
Uniform Delay, d1	41.0			5.1	10.1	2.4
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	2.5			1.6	20.6	0.1
Delay (s)	43.5			6.7	30.7	2.5
Level of Service	D			A	C	A
Approach Delay (s)	43.5			6.7	29.0	
Approach LOS	D			A	C	

Intersection Summary			
HCM Average Control Delay	18.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰↑↱			✥			✥	
Volume (vph)	12	1279	37	12	1698	25	37	123	62	50	50	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1710	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			0%			0%	
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		0.95			1.00			1.00	
Frpb, ped/bikes		1.00	0.95		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.96			0.96	
Flt Protected		1.00	1.00		1.00			0.99			0.98	
Satd. Flow (prot)		1815	1460		3093			1765			1742	
Flt Permitted		0.97	1.00		0.73			0.86			0.52	
Satd. Flow (perm)		1753	1460		2252			1535			925	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	1421	41	13	1887	28	41	137	69	56	56	56
RTOR Reduction (vph)	0	0	8	0	1	0	0	10	0	0	13	0
Lane Group Flow (vph)	0	1434	33	0	1927	0	0	237	0	0	155	0
Confl. Peds. (#/hr)			9			2						
Confl. Bikes (#/hr)						1			2			1
Parking (#/hr)				0	0	0						
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		110.0	110.0		110.0			22.0			22.0	
Effective Green, g (s)		110.0	110.0		110.0			22.0			22.0	
Actuated g/C Ratio		0.79	0.79		0.79			0.16			0.16	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)		2.8	2.8		2.8			2.0			2.0	
Lane Grp Cap (vph)		1377	1147		1769			241			145	
v/s Ratio Prot												
v/s Ratio Perm		0.82	0.02		c0.86			0.15			c0.17	
v/c Ratio		1.04	0.03		1.09			0.98			1.07	
Uniform Delay, d1		15.0	3.3		15.0			58.8			59.0	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		35.8	0.0		50.2			52.7			95.1	
Delay (s)		50.8	3.3		65.2			111.5			154.1	
Level of Service		D	A		E			F			F	
Approach Delay (s)		49.4			65.2			111.5			154.1	
Approach LOS		D			E			F			F	

Intersection Summary			
HCM Average Control Delay	66.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	99.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↑	↗
Volume (vph)	615	751	25	50	886	12	25	542	135	123	419	824
Ideal Flow (vphpl)	1900	1900	1900	1900	1596	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1854		1770	1562		1770	1807		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1854		1770	1562		1770	1807		1770	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	683	834	28	56	984	13	28	602	150	137	466	916
RTOR Reduction (vph)	0	1	0	0	1	0	0	6	0	0	0	19
Lane Group Flow (vph)	683	861	0	56	996	0	28	746	0	137	466	897
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												6
Actuated Green, G (s)	30.0	81.2		5.6	56.8		2.4	41.8		7.0	46.4	76.4
Effective Green, g (s)	30.0	81.2		5.6	56.8		2.4	41.8		7.0	46.4	76.4
Actuated g/C Ratio	0.20	0.54		0.04	0.37		0.02	0.28		0.05	0.31	0.50
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.1		2.0	4.1		2.0	4.1		2.0	4.1	2.0
Lane Grp Cap (vph)	350	993		65	585		28	498		82	570	840
v/s Ratio Prot	c0.39	0.46		0.03	c0.64		0.02	c0.41		c0.08	0.25	0.21
v/s Ratio Perm												0.36
v/c Ratio	1.95	0.87		0.86	1.70		1.00	1.50		1.67	0.82	1.07
Uniform Delay, d1	60.8	30.5		72.6	47.4		74.6	54.9		72.3	48.7	37.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	438.4	8.4		63.7	323.7		170.1	234.7		349.1	9.4	50.9
Delay (s)	499.2	38.9		136.3	371.1		244.7	289.6		421.4	58.1	88.5
Level of Service	F	D		F	F		F	F		F	E	F
Approach Delay (s)		242.4			358.6			288.0			109.2	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	233.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.69		
Actuated Cycle Length (s)	151.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	147.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰	↱
Volume (vph)	394	591	505	283	209	419
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1565	1770	1543
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	3539	1565	1770	1543
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	438	657	561	314	232	466
RTOR Reduction (vph)	0	0	0	67	0	366
Lane Group Flow (vph)	438	657	561	247	232	100
Confl. Peds. (#/hr)				8		7
Confl. Bikes (#/hr)				8		8
Turn Type	Prot			pm+ov		Perm
Protected Phases	1	6	2	4	4	
Permitted Phases				2		4
Actuated Green, G (s)	16.8	32.4	11.6	22.6	11.0	11.0
Effective Green, g (s)	16.8	32.4	11.6	22.6	11.0	11.0
Actuated g/C Ratio	0.33	0.63	0.23	0.44	0.21	0.21
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.1	3.1	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	579	1174	799	810	379	330
v/s Ratio Prot	c0.25	0.35	c0.16	0.07	c0.13	
v/s Ratio Perm				0.09		0.06
v/c Ratio	0.76	0.56	0.70	0.31	0.61	0.30
Uniform Delay, d1	15.5	5.4	18.3	9.3	18.3	17.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.6	0.6	2.3	0.1	2.1	0.2
Delay (s)	21.1	6.0	20.6	9.4	20.3	17.2
Level of Service	C	A	C	A	C	B
Approach Delay (s)		12.1	16.6		18.2	
Approach LOS		B	B		B	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	51.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	37	62	12	295	123	160	12	1119	37	74	1059	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.92		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1817		1770	1705		1770	1854		1770	1844	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1817		1770	1705		1770	1854		1770	1844	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	40	67	13	317	132	172	13	1203	40	80	1139	80
RTOR Reduction (vph)	0	5	0	0	32	0	0	1	0	0	1	0
Lane Group Flow (vph)	40	75	0	317	272	0	13	1242	0	80	1218	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	4.9	12.0		23.2	30.3		1.0	90.0		6.2	95.2	
Effective Green, g (s)	4.7	11.8		23.0	30.1		0.8	89.8		6.0	95.0	
Actuated g/C Ratio	0.03	0.08		0.16	0.21		0.01	0.61		0.04	0.65	
Clearance Time (s)	3.8	3.8		3.8	3.8		3.8	3.8		3.8	3.8	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	57	146		278	350		10	1136		72	1195	
v/s Ratio Prot	0.02	0.04		c0.18	c0.16		0.01	c0.67		c0.05	0.66	
v/s Ratio Perm												
v/c Ratio	0.70	0.52		1.14	0.78		1.30	1.09		1.11	1.02	
Uniform Delay, d1	70.3	64.7		61.8	55.1		72.9	28.4		70.3	25.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	27.2	1.3		97.3	9.5		398.9	56.0		139.6	30.9	
Delay (s)	97.4	65.9		159.1	64.6		471.8	84.4		209.9	56.7	
Level of Service	F	E		F	E		F	F		F	E	
Approach Delay (s)		76.4			112.8			88.4			66.1	
Approach LOS		E			F			F			E	

Intersection Summary			
HCM Average Control Delay	83.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	146.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↑↱		↰	↑↑↱	
Volume (vph)	25	37	12	222	12	222	12	1194	74	110	947	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1786		1770	1556		1770	3503		1770	3532	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1786		1770	1556		1770	3503		1770	3532	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	27	41	13	244	13	244	13	1312	81	121	1041	13
RTOR Reduction (vph)	0	12	0	0	122	0	0	4	0	0	1	0
Lane Group Flow (vph)	27	42	0	244	135	0	13	1389	0	121	1053	0
Confl. Peds. (#/hr)			1			1			1			1
Confl. Bikes (#/hr)			3			3			2			1
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	1.8	6.8		12.2	17.2		0.5	37.9		6.1	43.5	
Effective Green, g (s)	1.8	6.8		12.2	17.2		0.5	38.9		6.1	44.5	
Actuated g/C Ratio	0.02	0.08		0.15	0.22		0.01	0.49		0.08	0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	40	152		270	335		11	1703		135	1965	
v/s Ratio Prot	0.02	0.02		c0.14	c0.09		0.01	c0.40		c0.07	0.30	
v/s Ratio Perm												
v/c Ratio	0.68	0.28		0.90	0.40		1.18	0.82		0.90	0.54	
Uniform Delay, d1	38.8	34.3		33.3	27.0		39.8	17.5		36.6	11.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	29.9	0.4		30.2	0.3		338.7	3.2		46.4	0.3	
Delay (s)	68.8	34.7		63.5	27.3		378.5	20.6		83.0	11.5	
Level of Service	E	C		E	C		F	C		F	B	
Approach Delay (s)		46.0			44.9			24.0			18.9	
Approach LOS		D			D			C			B	

Intersection Summary			
HCM Average Control Delay	26.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱		↑↑	Y	
Volume (veh/h)	1292	123	0	1268	0	443
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	1520	145	0	1492	0	521
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1283		
pX, platoon unblocked						
vC, conflicting volume			1665		2266	1520
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1665		2266	1520
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	0
cM capacity (veh/h)			382		34	108

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	1520	145	746	746	521
Volume Left	0	0	0	0	0
Volume Right	0	145	0	0	521
cSH	1700	1700	1700	1700	108
Volume to Capacity	0.89	0.09	0.44	0.44	4.84
Queue Length 95th (ft)	0	0	0	0	Err
Control Delay (s)	0.0	0.0	0.0	0.0	Err
Lane LOS					F
Approach Delay (s)	0.0		0.0		Err
Approach LOS					F

Intersection Summary			
Average Delay	1417.0		
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations						
Volume (vph)	1132	357	911	911	664	1071
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	0.88	0.97	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3433	1562	3433	2723	3433	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3433	1562	3433	2723	3433	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1204	380	969	969	706	1139
RTOR Reduction (vph)	0	260	0	620	0	2
Lane Group Flow (vph)	1204	120	969	349	706	1137
Confl. Peds. (#/hr)		1		2		
Turn Type		Perm		Perm		custom
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	33.5	33.5	38.1	38.1	24.4	66.5
Effective Green, g (s)	34.0	33.5	39.6	39.6	24.4	68.0
Actuated g/C Ratio	0.31	0.30	0.36	0.36	0.22	0.62
Clearance Time (s)	4.5	4.5	5.5	5.5	4.0	5.5
Vehicle Extension (s)	2.0	2.0	3.0	3.0	2.0	3.0
Lane Grp Cap (vph)	1061	476	1236	980	762	979
v/s Ratio Prot	c0.35		0.28		0.21	c0.72
v/s Ratio Perm		0.08		0.13		
v/c Ratio	1.13	0.25	0.78	0.36	0.93	1.16
Uniform Delay, d1	38.0	28.8	31.4	25.8	41.9	21.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	72.6	0.1	3.3	0.2	16.9	84.1
Delay (s)	110.6	28.9	34.7	26.1	58.8	105.1
Level of Service	F	C	C	C	E	F
Approach Delay (s)	91.0		30.4		87.4	
Approach LOS	F		C		F	

Intersection Summary			
HCM Average Control Delay	67.9	HCM Level of Service	E
HCM Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
18: Natoma St & Green Valley Rd

3/1/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1231	222	74	197	172	148	98	1021	160	123	467	972
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1368	247	82	219	191	164	109	1134	178	137	519	1080
RTOR Reduction (vph)	0	0	47	0	0	60	0	0	77	0	0	0
Lane Group Flow (vph)	1368	247	35	219	191	104	109	1134	101	137	519	1080
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			Free
Actuated Green, G (s)	46.8	52.7	52.7	11.6	17.5	17.5	7.4	37.5	37.5	5.1	34.7	126.9
Effective Green, g (s)	47.3	54.2	54.2	12.1	19.0	19.0	7.9	39.0	39.0	5.6	36.7	126.9
Actuated g/C Ratio	0.37	0.43	0.43	0.10	0.15	0.15	0.06	0.31	0.31	0.04	0.29	1.00
Clearance Time (s)	4.5	5.5	5.5	4.5	5.5	5.5	4.5	5.5	5.5	4.5	6.0	
Vehicle Extension (s)	2.0	4.1	4.1	2.0	4.5	4.5	2.0	4.5	4.5	2.0	3.7	
Lane Grp Cap (vph)	1280	1512	676	327	530	237	214	1088	857	151	1023	1583
v/s Ratio Prot	c0.40	0.07		0.06	0.05		0.03	c0.32		0.04	0.15	
v/s Ratio Perm			0.02			0.07			0.04			c0.68
v/c Ratio	1.07	0.16	0.05	0.67	0.36	0.44	0.51	1.04	0.12	0.91	0.51	0.68
Uniform Delay, d1	39.8	22.4	21.3	55.5	48.5	49.1	57.6	44.0	31.6	60.4	37.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	45.7	0.1	0.0	4.0	0.7	2.2	0.7	38.9	0.1	45.7	0.5	2.4
Delay (s)	85.5	22.5	21.3	59.5	49.2	51.3	58.3	82.9	31.7	106.1	38.1	2.4
Level of Service	F	C	C	E	D	D	E	F	C	F	D	A
Approach Delay (s)		73.2			53.7			74.6			21.2	
Approach LOS		E			D			E			C	

Intersection Summary			
HCM Average Control Delay	54.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	126.9	Sum of lost time (s)	4.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
19: Green Valley Rd & Access Rd.

3/1/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰	↰↑	↱		✥	
Volume (vph)	12	2313	74	86	1489	12	62	12	86	12	12	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.7	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.98	
Satd. Flow (prot)	1770	3539	1583	1770	3535		1681	1711	1583		1750	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.98	
Satd. Flow (perm)	1770	3539	1583	1770	3535		1681	1711	1583		1750	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	12	2385	76	89	1535	12	64	12	89	12	12	12
RTOR Reduction (vph)	0	0	12	0	0	0	0	0	82	0	12	0
Lane Group Flow (vph)	12	2385	64	89	1547	0	38	38	7	0	24	0
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						8			
Actuated Green, G (s)	2.1	98.1	98.1	8.6	104.6		10.7	10.7	10.7		3.9	
Effective Green, g (s)	1.7	99.8	98.1	8.2	106.3		10.5	10.5	10.5		3.7	
Actuated g/C Ratio	0.01	0.72	0.71	0.06	0.77		0.08	0.08	0.08		0.03	
Clearance Time (s)	3.6	5.7	5.7	3.6	5.7		3.8	3.8	3.8		3.8	
Vehicle Extension (s)	2.2	3.2	3.2	2.2	3.2		3.1	3.1	3.1		3.1	
Lane Grp Cap (vph)	22	2556	1124	105	2719		128	130	120		47	
v/s Ratio Prot	0.01	c0.67		c0.05	0.44		c0.02	0.02			c0.01	
v/s Ratio Perm			0.04						0.00			
v/c Ratio	0.55	0.93	0.06	0.85	0.57		0.30	0.29	0.06		0.52	
Uniform Delay, d1	67.9	16.4	6.1	64.4	6.5		60.4	60.3	59.3		66.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	16.4	7.1	0.0	42.4	0.3		1.3	1.3	0.2		9.6	
Delay (s)	84.3	23.5	6.1	106.8	6.8		61.7	61.6	59.5		76.0	
Level of Service	F	C	A	F	A		E	E	E		E	
Approach Delay (s)		23.2			12.3			60.5			76.0	
Approach LOS		C			B			E			E	

Intersection Summary			
HCM Average Control Delay	20.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	138.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

INTERSECTION SYNCHRO ANALYSIS

YR-2010 BUILD AM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱	↰	↑↑	↱
Volume (vph)	175	175	667	120	393	109	1180	339	44	87	592	459
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.91	0.91	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1553	1770	3539	1554	1610	3286	1548	1770	3539	1563
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1553	1770	3539	1554	1610	3286	1548	1770	3539	1563
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	194	194	741	133	437	121	1311	377	49	97	658	510
RTOR Reduction (vph)	0	0	524	0	0	103	0	0	29	0	0	139
Lane Group Flow (vph)	194	194	217	133	437	18	655	1033	20	97	658	371
Confl. Peds. (#/hr)						2			5			
Confl. Bikes (#/hr)			6			2			1			1
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2			6			8			7
Actuated Green, G (s)	17.0	24.3	24.3	12.0	20.1	20.1	56.2	56.2	56.2	30.1	30.1	30.1
Effective Green, g (s)	16.0	26.0	26.0	11.0	21.0	21.0	57.5	57.5	57.5	31.4	31.4	31.4
Actuated g/C Ratio	0.11	0.18	0.18	0.08	0.15	0.15	0.41	0.41	0.41	0.22	0.22	0.22
Clearance Time (s)	3.0	5.7	5.7	3.0	4.9	4.9	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	200	648	285	137	524	230	652	1332	627	392	783	346
v/s Ratio Prot	c0.11	0.05		0.08	0.12		c0.41	0.31		0.05	0.19	
v/s Ratio Perm			c0.14			0.01			0.01			c0.24
v/c Ratio	0.97	0.30	0.76	0.97	0.83	0.08	1.00	0.96dl	0.03	0.25	0.84	1.07
Uniform Delay, d1	62.7	50.1	55.0	65.3	58.8	52.1	42.2	36.6	25.4	45.5	52.9	55.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	54.6	0.1	10.2	67.4	10.5	0.1	36.4	2.6	0.0	0.1	7.8	68.6
Delay (s)	117.3	50.2	65.2	132.7	69.3	52.2	78.6	39.2	25.4	45.6	60.6	123.8
Level of Service	F	D	E	F	E	D	E	D	C	D	E	F
Approach Delay (s)		71.6			78.5			53.7			85.0	
Approach LOS		E			E			D			F	

Intersection Summary			
HCM Average Control Delay	69.6	HCM Level of Service	E
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	141.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.4%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	175	0	132	0	0	0	164	1344	0	0	1335	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	0.98
Flpb, ped/bikes		1.00	1.00				1.00	1.00			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1770	1547				1770	1863			1863	1551
Flt Permitted		0.76	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1410	1547				1770	1863			1863	1551
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	194	0	147	0	0	0	182	1493	0	0	1483	146
RTOR Reduction (vph)	0	0	128	0	0	0	0	0	0	0	0	21
Lane Group Flow (vph)	0	194	19	0	0	0	182	1493	0	0	1483	125
Confl. Bikes (#/hr)			1			1						1
Turn Type	Perm		Perm	Perm			Prot			Prot		Perm
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4								6
Actuated Green, G (s)		19.0	19.0				13.0	121.5			104.5	104.5
Effective Green, g (s)		19.0	19.0				13.0	123.0			106.0	106.0
Actuated g/C Ratio		0.13	0.13				0.09	0.82			0.71	0.71
Clearance Time (s)		4.0	4.0				4.0	5.5			5.5	5.5
Vehicle Extension (s)		3.0	3.0				1.0	2.5			2.5	2.5
Lane Grp Cap (vph)		179	196				153	1528			1317	1096
v/s Ratio Prot							c0.10	0.80			c0.80	
v/s Ratio Perm		c0.14	0.01									0.08
v/c Ratio		1.08	0.10				1.19	0.98			1.13	0.11
Uniform Delay, d1		65.5	57.9				68.5	12.2			22.0	7.0
Progression Factor		1.00	1.00				1.00	1.00			1.00	1.00
Incremental Delay, d2		91.4	0.2				132.7	17.6			67.0	0.0
Delay (s)		156.9	58.1				201.2	29.9			89.0	7.1
Level of Service		F	E				F	C			F	A
Approach Delay (s)		114.3			0.0			48.5			81.7	
Approach LOS		F			A			D			F	

Intersection Summary			
HCM Average Control Delay	69.5	HCM Level of Service	E
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	99.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	22	11	470	11	11	11	382	1431	11	11	1424	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	5.7	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1803	1544		1736		1770	3539	1549	1770	3539	1583
Flt Permitted		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1803	1544		1736		1770	3539	1549	1770	3539	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	23	12	500	12	12	12	406	1522	12	12	1515	35
RTOR Reduction (vph)	0	0	392	0	12	0	0	0	3	0	0	10
Lane Group Flow (vph)	0	35	108	0	24	0	406	1522	9	12	1515	25
Confl. Peds. (#/hr)			3			2						
Confl. Bikes (#/hr)			3			1			3			
Turn Type	Split		Perm	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)		11.3	11.3		4.1		29.8	75.9	75.9	3.9	50.0	50.0
Effective Green, g (s)		10.7	10.7		3.5		28.8	77.6	75.9	2.9	51.7	51.7
Actuated g/C Ratio		0.10	0.10		0.03		0.26	0.70	0.69	0.03	0.47	0.47
Clearance Time (s)		3.4	3.4		3.4		3.0	5.7	5.7	3.0	5.7	5.7
Vehicle Extension (s)		1.0	1.0		0.5		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		174	149		55		460	2481	1062	46	1653	739
v/s Ratio Prot		0.02			c0.01		c0.23	0.43		0.01	c0.43	
v/s Ratio Perm			c0.07						0.01			0.02
v/c Ratio		0.20	0.72		0.44		0.88	0.61	0.01	0.26	0.92	0.03
Uniform Delay, d1		46.1	48.6		52.6		39.3	8.7	5.5	52.8	27.5	16.0
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.2	13.7		2.1		17.4	0.3	0.0	1.1	8.2	0.0
Delay (s)		46.3	62.3		54.7		56.7	9.0	5.5	54.0	35.7	16.0
Level of Service		D	E		D		E	A	A	D	D	B
Approach Delay (s)		61.2			54.7			19.0			35.4	
Approach LOS		E			D			B			D	

Intersection Summary			
HCM Average Control Delay	31.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	110.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↱↱		✥		↰	↑↑	↱		↓↓↓↓	
Volume (vph)	0	0	109	0	0	0	22	1792	0	0	1817	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0				4.0	4.0			4.0	
Lane Util. Factor			0.88				1.00	0.95			0.86	
Frt			0.85				1.00	1.00			0.99	
Flt Protected			1.00				0.95	1.00			1.00	
Satd. Flow (prot)			2787				1770	3539			6374	
Flt Permitted			1.00				0.08	1.00			1.00	
Satd. Flow (perm)			2787				148	3539			6374	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	128	0	0	0	26	2108	0	0	2138	78
RTOR Reduction (vph)	0	0	16	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	0	112	0	0	0	26	2108	0	0	2211	0
Turn Type			custom	Perm			Perm		Perm			
Protected Phases					8			2			6	
Permitted Phases			4	8			2		2			
Actuated Green, G (s)			6.8				50.2	50.2			50.2	
Effective Green, g (s)			6.8				50.2	50.2			50.2	
Actuated g/C Ratio			0.10				0.77	0.77			0.77	
Clearance Time (s)			4.0				4.0	4.0			4.0	
Vehicle Extension (s)			3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)			292				114	2733			4923	
v/s Ratio Prot								c0.60			0.35	
v/s Ratio Perm			c0.04				0.18					
v/c Ratio			0.38				0.23	0.77			0.45	
Uniform Delay, d1			27.1				2.0	4.2			2.6	
Progression Factor			1.00				1.00	1.00			1.00	
Incremental Delay, d2			0.8				4.6	2.2			0.3	
Delay (s)			28.0				6.6	6.3			2.9	
Level of Service			C				A	A			A	
Approach Delay (s)		28.0			0.0			6.3			2.9	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	5.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↰↑↱	↱	↰	↑↑	↱	↰↰	↑↱	
Volume (vph)	33	22	33	175	22	1027	22	754	340	888	962	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.5	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.91	0.86	0.91	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.91		1.00	0.86	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1693		1610	2753	1441	1770	3539	1583	3433	3528	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1693		1610	2753	1441	1770	3539	1583	3433	3528	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	37	24	37	194	24	1141	24	838	378	987	1069	24
RTOR Reduction (vph)	0	34	0	0	509	508	0	0	260	0	1	0
Lane Group Flow (vph)	37	27	0	175	105	62	24	838	118	987	1092	0
Turn Type	Split			Split		Perm	Prot		Perm	Prot		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases						3			6			
Actuated Green, G (s)	8.2	8.2		12.0	12.0	12.0	3.2	34.2	34.2	38.1	69.1	
Effective Green, g (s)	8.2	8.2		12.0	12.0	12.0	3.2	35.7	34.2	38.1	70.6	
Actuated g/C Ratio	0.07	0.07		0.11	0.11	0.11	0.03	0.32	0.31	0.35	0.64	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.5	5.5	4.0	5.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0	1.0	1.0	4.7	4.7	1.5	5.4	
Lane Grp Cap (vph)	132	126		176	300	157	51	1149	492	1189	2264	
v/s Ratio Prot	c0.02	0.02		c0.11	0.04		0.01	c0.24		c0.29	0.31	
v/s Ratio Perm						0.04			0.07			
v/c Ratio	0.28	0.21		0.99	0.86dr	0.40	0.47	0.73	0.24	0.83	0.48	
Uniform Delay, d1	48.1	47.9		49.0	45.4	45.6	52.6	32.9	28.2	33.0	10.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	0.3		65.8	0.3	0.6	2.5	4.1	1.1	4.8	0.7	
Delay (s)	48.5	48.2		114.7	45.7	46.2	55.1	37.0	29.4	37.8	11.0	
Level of Service	D	D		F	D	D	E	D	C	D	B	
Approach Delay (s)		48.3			54.8			35.0			23.7	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	36.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↱		↰	↑↱	
Volume (vph)	186	11	863	44	11	11	208	941	11	11	1071	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.89			0.98		1.00	1.00		1.00	0.98	
Flt Protected		0.99			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1644			1758		1770	3532		1770	3478	
Flt Permitted		0.99			0.45		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1644			809		1770	3532		1770	3478	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	196	12	908	46	12	12	219	991	12	12	1127	126
RTOR Reduction (vph)	0	107	0	0	5	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	1009	0	0	65	0	219	1002	0	12	1248	0
Confl. Peds. (#/hr)									1			
Confl. Bikes (#/hr)						1						2
Turn Type	Split			Perm			Prot			Prot		
Protected Phases	4!	4			8!		5	2		1	6	
Permitted Phases				8								
Actuated Green, G (s)		73.3			73.3		15.3	61.4		1.6	47.7	
Effective Green, g (s)		75.0			75.0		16.0	63.6		2.3	49.9	
Actuated g/C Ratio		0.49			0.49		0.10	0.42		0.02	0.33	
Clearance Time (s)		5.7			5.7		4.7	6.2		4.7	6.2	
Vehicle Extension (s)		3.0			3.0		2.0	3.8		2.0	3.8	
Lane Grp Cap (vph)		806			397		185	1469		27	1135	
v/s Ratio Prot		c0.61					c0.12	0.28		0.01	c0.36	
v/s Ratio Perm					0.08							
v/c Ratio		1.25			0.16		1.18	0.68		0.44	1.10	
Uniform Delay, d1		38.9			21.6		68.4	36.4		74.7	51.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		123.5			0.2		124.4	1.4		4.2	58.1	
Delay (s)		162.5			21.8		192.8	37.8		78.9	109.6	
Level of Service		F			C		F	D		E	F	
Approach Delay (s)		162.5			21.8			65.6			109.3	
Approach LOS		F			C			E			F	

Intersection Summary			
HCM Average Control Delay	109.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.19		
Actuated Cycle Length (s)	152.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	117.9%	ICU Level of Service	H
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	236	841	907	22	809	514	328	366	11	317	1650	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	262	934	1008	24	899	571	364	407	12	352	1833	194
RTOR Reduction (vph)	0	0	102	0	0	355	0	0	9	0	0	55
Lane Group Flow (vph)	262	934	906	24	899	216	364	407	3	352	1833	139
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	20.9	58.8	58.8	1.6	39.5	39.5	9.5	35.5	35.5	30.1	56.1	56.1
Effective Green, g (s)	21.4	59.3	59.3	2.1	40.0	40.0	10.0	37.0	37.0	30.6	57.6	57.6
Actuated g/C Ratio	0.15	0.41	0.41	0.01	0.28	0.28	0.07	0.26	0.26	0.21	0.40	0.40
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	5.1	5.1	2.0	5.1	5.1
Lane Grp Cap (vph)	261	1447	647	26	976	437	237	903	404	374	1406	629
v/s Ratio Prot	c0.15	0.26		0.01	0.25		c0.11	0.11		0.20	c0.52	
v/s Ratio Perm			c0.57			0.14			0.00			0.09
v/c Ratio	1.00	0.65	1.40	0.92	0.92	0.49	1.54	0.45	0.01	0.94	1.30	0.22
Uniform Delay, d1	61.8	34.4	42.8	71.4	51.0	44.0	67.5	45.4	40.3	56.3	43.7	28.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	56.7	0.7	189.6	140.5	13.4	0.3	261.2	1.6	0.0	31.4	142.0	0.8
Delay (s)	118.5	35.2	232.5	211.9	64.4	44.3	328.7	47.1	40.3	87.7	185.7	29.7
Level of Service	F	D	F	F	E	D	F	D	D	F	F	C
Approach Delay (s)		135.3			59.1			177.9			158.4	
Approach LOS		F			E			F			F	

Intersection Summary			
HCM Average Control Delay	131.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.37		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	115.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱	↰	↰↑	↱	↰	↑↑↱		↰	↑↑	↱
Volume (vph)	11	22	22	219	0	175	11	519	219	120	2470	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected		0.98	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1832	1529	1681	1681	1561	1770	4859		1770	3539	1550
Flt Permitted		0.98	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1832	1529	1681	1681	1561	1770	4859		1770	3539	1550
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	24	24	243	0	194	12	577	243	133	2744	12
RTOR Reduction (vph)	0	0	24	0	0	127	0	38	0	0	0	2
Lane Group Flow (vph)	0	36	0	121	122	67	12	782	0	133	2744	10
Confl. Bikes (#/hr)			2			1						2
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)		2.5	2.5	17.0	17.0	17.0	1.7	95.3		15.2	108.8	108.8
Effective Green, g (s)		3.0	3.0	17.5	17.5	17.5	2.2	97.8		15.7	111.3	111.3
Actuated g/C Ratio		0.02	0.02	0.12	0.12	0.12	0.01	0.65		0.10	0.74	0.74
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	4.5	6.5		4.5	6.5	6.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	4.6		2.0	5.1	5.1
Lane Grp Cap (vph)		37	31	196	196	182	26	3168		185	2626	1150
v/s Ratio Prot		c0.02		0.07	c0.07		0.01	0.16		c0.08	c0.78	
v/s Ratio Perm			0.00			0.04						0.01
v/c Ratio		0.97	0.02	0.62	0.62	0.37	0.46	0.25		0.72	1.04	0.01
Uniform Delay, d1		73.5	72.1	63.1	63.1	61.1	73.3	10.8		65.0	19.4	5.0
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		136.0	0.1	4.0	4.4	0.5	4.7	0.2		10.6	30.7	0.0
Delay (s)		209.5	72.1	67.1	67.5	61.6	78.0	11.0		75.6	50.1	5.0
Level of Service		F	E	E	E	E	E	B		E	D	A
Approach Delay (s)		154.5			64.8			12.0			51.1	
Approach LOS		F			E			B			D	

Intersection Summary			
HCM Average Control Delay	46.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	94.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	11	11	1333	11	11	1158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.95		1.00	1.00
Frt	0.93		1.00		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1695		3535		1770	1863
Flt Permitted	0.98		1.00		0.95	1.00
Satd. Flow (perm)	1695		3535		1770	1863
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	12	1481	12	12	1287
RTOR Reduction (vph)	11	0	0	0	0	0
Lane Group Flow (vph)	13	0	1493	0	12	1287
Turn Type					Prot	
Protected Phases	8		6		5	2
Permitted Phases						
Actuated Green, G (s)	5.0		59.4		3.6	67.0
Effective Green, g (s)	5.0		59.4		3.6	67.0
Actuated g/C Ratio	0.06		0.74		0.04	0.84
Clearance Time (s)	4.0		4.0		4.0	4.0
Vehicle Extension (s)	3.0		2.8		2.4	2.8
Lane Grp Cap (vph)	106		2625		80	1560
v/s Ratio Prot	c0.01		0.42		0.01	c0.69
v/s Ratio Perm						
v/c Ratio	0.12		0.57		0.15	0.82
Uniform Delay, d1	35.4		4.6		36.7	3.4
Progression Factor	1.00		0.77		1.00	1.00
Incremental Delay, d2	0.5		0.8		0.6	5.1
Delay (s)	35.9		4.3		37.3	8.5
Level of Service	D		A		D	A
Approach Delay (s)	35.9		4.3			8.8
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	6.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↱			↑↑	↑	↱
Volume (vph)	33	11	0	1311	1082	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.97			0.95	1.00	1.00
Frt	0.96			1.00	1.00	0.85
Flt Protected	0.96			1.00	1.00	1.00
Satd. Flow (prot)	3354			3539	1863	1583
Flt Permitted	0.96			1.00	1.00	1.00
Satd. Flow (perm)	3354			3539	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	37	12	0	1457	1202	97
RTOR Reduction (vph)	11	0	0	0	0	17
Lane Group Flow (vph)	38	0	0	1457	1202	80
Turn Type						Perm
Protected Phases	4			2	2	
Permitted Phases						2
Actuated Green, G (s)	6.0			66.0	66.0	66.0
Effective Green, g (s)	6.0			66.0	66.0	66.0
Actuated g/C Ratio	0.08			0.82	0.82	0.82
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	2.8			2.8	2.8	2.8
Lane Grp Cap (vph)	252			2920	1537	1306
v/s Ratio Prot	c0.01			0.41	c0.65	
v/s Ratio Perm						0.05
v/c Ratio	0.15			0.50	0.78	0.06
Uniform Delay, d1	34.6			2.1	3.5	1.3
Progression Factor	1.00			0.23	1.13	2.15
Incremental Delay, d2	0.2			0.5	2.6	0.1
Delay (s)	34.9			1.0	6.5	2.8
Level of Service	C			A	A	A
Approach Delay (s)	34.9			1.0	6.2	
Approach LOS	C			A	A	

Intersection Summary			
HCM Average Control Delay	4.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

3/2/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰↑↱			✥			✥	
Volume (vph)	11	1071	11	11	1289	11	11	22	11	11	11	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1710	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			0%			0%	
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		0.95			1.00			1.00	
Frpb, ped/bikes		1.00	0.96		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.97			0.96	
Flt Protected		1.00	1.00		1.00			0.99			0.98	
Satd. Flow (prot)		1815	1483		3096			1765			1741	
Flt Permitted		0.98	1.00		0.94			0.91			0.88	
Satd. Flow (perm)		1783	1483		2924			1633			1565	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	1190	12	12	1432	12	12	24	12	12	12	12
RTOR Reduction (vph)	0	0	2	0	0	0	0	11	0	0	11	0
Lane Group Flow (vph)	0	1202	10	0	1456	0	0	37	0	0	25	0
Confl. Peds. (#/hr)			9			2						
Confl. Bikes (#/hr)						1			2			1
Parking (#/hr)				0	0	0						
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		65.1	65.1		65.1			6.9			6.9	
Effective Green, g (s)		65.1	65.1		65.1			6.9			6.9	
Actuated g/C Ratio		0.81	0.81		0.81			0.09			0.09	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)		2.8	2.8		2.8			2.0			2.0	
Lane Grp Cap (vph)		1451	1207		2379			141			135	
v/s Ratio Prot												
v/s Ratio Perm		c0.67	0.01		0.50			c0.02			0.02	
v/c Ratio		0.83	0.01		0.61			0.26			0.19	
Uniform Delay, d1		4.3	1.4		2.8			34.2			33.9	
Progression Factor		0.28	0.21		1.00			1.00			1.00	
Incremental Delay, d2		3.7	0.0		1.2			0.4			0.2	
Delay (s)		4.9	0.3		3.9			34.5			34.2	
Level of Service		A	A		A			C			C	
Approach Delay (s)		4.9			3.9			34.5			34.2	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	5.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	350	732	11	22	415	24	22	404	87	55	361	874
Ideal Flow (vphpl)	1900	1900	1900	1900	1596	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1859		1770	1552		1770	1813		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1859		1770	1552		1770	1813		1770	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	389	813	12	24	461	27	24	449	97	61	401	971
RTOR Reduction (vph)	0	0	0	0	2	0	0	7	0	0	0	53
Lane Group Flow (vph)	389	825	0	24	486	0	24	539	0	61	401	918
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												6
Actuated Green, G (s)	27.2	57.0		1.8	31.6		1.2	33.6		4.0	36.4	63.6
Effective Green, g (s)	27.2	57.0		1.8	31.6		1.2	33.6		4.0	36.4	63.6
Actuated g/C Ratio	0.24	0.51		0.02	0.28		0.01	0.30		0.04	0.32	0.57
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.1		2.0	4.1		2.0	4.1		2.0	4.1	2.0
Lane Grp Cap (vph)	428	943		28	436		19	542		63	603	952
v/s Ratio Prot	0.22	0.44		0.01	c0.31		0.01	0.30		c0.03	0.22	c0.23
v/s Ratio Perm												0.35
v/c Ratio	0.91	0.87		0.86	1.11		1.26	0.99		0.97	0.67	0.96
Uniform Delay, d1	41.4	24.5		55.2	40.4		55.6	39.3		54.1	32.7	23.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	22.3	9.4		106.2	78.0		298.7	37.1		100.6	3.1	20.8
Delay (s)	63.7	33.9		161.4	118.4		354.3	76.4		154.7	35.8	44.1
Level of Service	E	C		F	F		F	E		F	D	D
Approach Delay (s)		43.4			120.4			88.1			46.5	
Approach LOS		D			F			F			D	

Intersection Summary			
HCM Average Control Delay	62.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	112.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	95.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰	↱
Volume (vph)	426	437	197	153	328	264
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1570	1770	1546
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	3539	1570	1770	1546
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	473	486	219	170	364	293
RTOR Reduction (vph)	0	0	0	58	0	216
Lane Group Flow (vph)	473	486	219	112	364	77
Confl. Peds. (#/hr)				8		7
Confl. Bikes (#/hr)				8		8
Turn Type	Prot			pm+ov		Perm
Protected Phases	1	6	2	4	4	
Permitted Phases				2		4
Actuated Green, G (s)	17.4	29.2	7.8	21.1	13.3	13.3
Effective Green, g (s)	17.4	29.2	7.8	21.1	13.3	13.3
Actuated g/C Ratio	0.34	0.58	0.15	0.42	0.26	0.26
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.1	3.1	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	610	1077	547	780	466	407
v/s Ratio Prot	c0.27	c0.26	0.06	0.04	c0.21	
v/s Ratio Perm				0.03		0.05
v/c Ratio	0.78	0.45	0.40	0.14	0.78	0.19
Uniform Delay, d1	14.8	6.1	19.2	9.1	17.3	14.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.2	0.3	0.2	0.0	7.7	0.1
Delay (s)	21.0	6.4	19.4	9.1	24.9	14.5
Level of Service	C	A	B	A	C	B
Approach Delay (s)		13.6	14.9		20.3	
Approach LOS		B	B		C	

Intersection Summary			
HCM Average Control Delay	16.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	50.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Volume (vph)	22	55	11	98	33	55	11	712	44	55	1202	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.91		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1816		1770	1687		1770	1847		1770	1858	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1816		1770	1687		1770	1847		1770	1858	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	24	59	12	105	35	59	12	766	47	59	1292	24
RTOR Reduction (vph)	0	6	0	0	42	0	0	1	0	0	0	0
Lane Group Flow (vph)	24	65	0	105	52	0	12	812	0	59	1316	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	3.5	9.5		9.9	15.9		0.9	99.5		6.8	105.4	
Effective Green, g (s)	3.3	9.3		9.7	15.7		0.7	99.3		6.6	105.2	
Actuated g/C Ratio	0.02	0.07		0.07	0.11		0.00	0.70		0.05	0.75	
Clearance Time (s)	3.8	3.8		3.8	3.8		3.8	3.8		3.8	3.8	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	41	120		122	188		9	1302		83	1387	
v/s Ratio Prot	0.01	c0.04		c0.06	0.03		0.01	0.44		c0.03	c0.71	
v/s Ratio Perm												
v/c Ratio	0.59	0.54		0.86	0.28		1.33	0.62		0.71	0.95	
Uniform Delay, d1	68.1	63.8		64.9	57.4		70.1	11.0		66.2	15.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	13.0	2.7		41.2	0.3		429.4	0.9		21.1	13.7	
Delay (s)	81.1	66.4		106.1	57.7		499.5	11.9		87.3	29.2	
Level of Service	F	E		F	E		F	B		F	C	
Approach Delay (s)		70.1			83.2			19.0			31.7	
Approach LOS		E			F			B			C	

Intersection Summary			
HCM Average Control Delay	33.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	140.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	83.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↱		↰	↑↱	
Volume (vph)	11	11	11	87	11	109	11	767	33	98	1180	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1703		1770	1567		1770	3514		1770	3534	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1703		1770	1567		1770	3514		1770	3534	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	12	12	12	96	12	120	12	843	36	108	1297	12
RTOR Reduction (vph)	0	11	0	0	102	0	0	3	0	0	0	0
Lane Group Flow (vph)	12	13	0	96	30	0	12	876	0	108	1309	0
Confl. Peds. (#/hr)			1			1			1			1
Confl. Bikes (#/hr)			3			3			2			1
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	0.4	3.7		5.4	8.7		0.7	26.1		5.8	31.2	
Effective Green, g (s)	0.4	3.7		5.4	8.7		0.7	27.1		5.8	32.2	
Actuated g/C Ratio	0.01	0.06		0.09	0.15		0.01	0.47		0.10	0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	12	109		165	235		21	1642		177	1962	
v/s Ratio Prot	0.01	0.01		c0.05	c0.02		0.01	0.25		c0.06	c0.37	
v/s Ratio Perm												
v/c Ratio	1.00	0.12		0.58	0.13		0.57	0.53		0.61	0.67	
Uniform Delay, d1	28.8	25.6		25.2	21.4		28.5	11.0		25.0	9.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	259.8	0.2		3.3	0.1		21.2	0.3		4.3	0.9	
Delay (s)	288.6	25.8		28.6	21.5		49.7	11.3		29.3	10.0	
Level of Service	F	C		C	C		D	B		C	A	
Approach Delay (s)		113.4			24.4			11.8			11.5	
Approach LOS		F			C			B			B	

Intersection Summary			
HCM Average Control Delay	14.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	58.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
	→	↘	↙	←	↖	↗
Lane Configurations	↑	↱		↑↑	Y	
Volume (veh/h)	734	109	0	1410	0	219
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	864	128	0	1659	0	258
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1283		
pX, platoon unblocked						
vC, conflicting volume			992		1693	864
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			992		1693	864
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	13
cM capacity (veh/h)			693		84	298

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	864	128	829	829	258
Volume Left	0	0	0	0	0
Volume Right	0	128	0	0	258
cSH	1700	1700	1700	1700	298
Volume to Capacity	0.51	0.08	0.49	0.49	0.87
Queue Length 95th (ft)	0	0	0	0	191
Control Delay (s)	0.0	0.0	0.0	0.0	61.9
Lane LOS					F
Approach Delay (s)	0.0		0.0		61.9
Approach LOS					F

Intersection Summary			
Average Delay	5.5		
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations						
Volume (vph)	896	306	1104	859	374	579
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	0.88	0.97	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3433	1563	3433	2724	3433	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3433	1563	3433	2724	3433	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	953	326	1174	914	398	616
RTOR Reduction (vph)	0	207	0	559	0	7
Lane Group Flow (vph)	953	119	1174	355	398	609
Confl. Peds. (#/hr)		1		2		
Turn Type		Perm		Perm		custom
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	21.0	21.0	25.5	25.5	9.0	38.5
Effective Green, g (s)	21.5	21.0	27.0	27.0	9.0	40.0
Actuated g/C Ratio	0.31	0.30	0.39	0.39	0.13	0.58
Clearance Time (s)	4.5	4.5	5.5	5.5	4.0	5.5
Vehicle Extension (s)	2.0	2.0	3.0	3.0	2.0	3.0
Lane Grp Cap (vph)	1062	472	1334	1058	445	911
v/s Ratio Prot	c0.28		c0.34		c0.12	0.38
v/s Ratio Perm		0.08		0.13		
v/c Ratio	0.90	0.25	0.88	0.34	0.89	0.67
Uniform Delay, d1	22.9	18.3	19.7	14.9	29.8	10.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.8	0.1	7.1	0.2	19.5	1.9
Delay (s)	32.7	18.4	26.8	15.1	49.3	12.0
Level of Service	C	B	C	B	D	B
Approach Delay (s)	29.1		21.7		26.7	
Approach LOS	C		C		C	

Intersection Summary			
HCM Average Control Delay	25.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	69.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱↱	↰↰	↑↑	↱
Volume (vph)	787	120	55	175	240	66	104	208	142	109	885	1116
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	874	133	61	194	267	73	116	231	158	121	983	1240
RTOR Reduction (vph)	0	0	38	0	0	60	0	0	106	0	0	0
Lane Group Flow (vph)	874	133	23	194	267	13	116	231	52	121	983	1240
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			Free
Actuated Green, G (s)	30.9	38.5	38.5	9.9	17.5	17.5	4.5	33.6	33.6	4.7	33.3	106.7
Effective Green, g (s)	31.4	40.0	40.0	10.4	19.0	19.0	5.0	35.1	35.1	5.2	35.3	106.7
Actuated g/C Ratio	0.29	0.37	0.37	0.10	0.18	0.18	0.05	0.33	0.33	0.05	0.33	1.00
Clearance Time (s)	4.5	5.5	5.5	4.5	5.5	5.5	4.5	5.5	5.5	4.5	6.0	
Vehicle Extension (s)	2.0	4.1	4.1	2.0	4.5	4.5	2.0	4.5	4.5	2.0	3.7	
Lane Grp Cap (vph)	1010	1327	593	335	630	282	161	1164	917	167	1171	1583
v/s Ratio Prot	c0.25	0.04		0.06	0.08		0.03	0.07		0.04	0.28	
v/s Ratio Perm			0.01			0.01			0.02			c0.78
v/c Ratio	0.87	0.10	0.04	0.58	0.42	0.05	0.72	0.20	0.06	0.72	0.84	0.78
Uniform Delay, d1	35.6	21.7	21.2	46.1	39.0	36.3	50.2	25.7	24.5	50.0	33.1	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.6	0.0	0.0	1.5	0.8	0.1	12.6	0.1	0.0	12.4	5.6	4.0
Delay (s)	43.3	21.7	21.2	47.6	39.8	36.5	62.7	25.8	24.5	62.4	38.7	4.0
Level of Service	D	C	C	D	D	D	E	C	C	E	D	A
Approach Delay (s)		39.3			42.2			33.9			21.5	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	29.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	106.7	Sum of lost time (s)	0.0
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰	↰↑	↱		↰↑↱	
Volume (vph)	11	973	76	33	2012	11	87	11	55	11	11	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.7	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (prot)	1770	3539	1583	1770	3536		1681	1703	1583		1750	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (perm)	1770	3539	1583	1770	3536		1681	1703	1583		1750	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	11	1003	78	34	2074	11	90	11	57	11	11	11
RTOR Reduction (vph)	0	0	28	0	0	0	0	0	52	0	11	0
Lane Group Flow (vph)	11	1003	50	34	2085	0	50	51	5	0	22	0
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						8			
Actuated Green, G (s)	0.7	57.5	57.5	3.8	60.6		8.8	8.8	8.8		2.9	
Effective Green, g (s)	0.3	59.2	57.5	3.4	62.3		8.6	8.6	8.6		2.7	
Actuated g/C Ratio	0.00	0.66	0.64	0.04	0.69		0.10	0.10	0.10		0.03	
Clearance Time (s)	3.6	5.7	5.7	3.6	5.7		3.8	3.8	3.8		3.8	
Vehicle Extension (s)	2.2	3.2	3.2	2.2	3.2		3.1	3.1	3.1		3.1	
Lane Grp Cap (vph)	6	2330	1012	67	2450		161	163	151		53	
v/s Ratio Prot	0.01	0.28		c0.02	c0.59		0.03	c0.03			c0.01	
v/s Ratio Perm			0.03						0.00			
v/c Ratio	1.83	0.43	0.05	0.51	0.85		0.31	0.31	0.04		0.42	
Uniform Delay, d1	44.8	7.3	6.0	42.4	10.3		37.9	37.9	36.9		42.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	719.2	0.1	0.0	3.1	3.1		1.1	1.1	0.1		5.5	
Delay (s)	764.0	7.5	6.1	45.5	13.4		39.0	39.0	37.0		48.4	
Level of Service	F	A	A	D	B		D	D	D		D	
Approach Delay (s)		15.0			13.9			38.3			48.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM Average Control Delay	15.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	89.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

INTERSECTION SYNCHRO ANALYSIS

YR-2010 BUILD PM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱	↰	↑↑	↱
Volume (vph)	426	437	994	131	339	87	896	548	109	175	481	306
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.91	0.91	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1559	1770	3539	1555	1610	3318	1548	1770	3539	1562
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1559	1770	3539	1555	1610	3318	1548	1770	3539	1562
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	473	486	1104	146	377	97	996	609	121	194	534	340
RTOR Reduction (vph)	0	0	369	0	0	78	0	0	88	0	0	271
Lane Group Flow (vph)	473	486	735	146	377	19	528	1077	33	194	534	69
Confl. Peds. (#/hr)						2			5			
Confl. Bikes (#/hr)			6			2			1			1
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2			6			8			7
Actuated Green, G (s)	39.0	55.0	55.0	10.0	26.8	26.8	38.7	38.7	38.7	21.8	21.8	21.8
Effective Green, g (s)	38.0	56.7	56.7	9.0	27.7	27.7	40.0	40.0	40.0	23.1	23.1	23.1
Actuated g/C Ratio	0.26	0.39	0.39	0.06	0.19	0.19	0.28	0.28	0.28	0.16	0.16	0.16
Clearance Time (s)	3.0	5.7	5.7	3.0	4.9	4.9	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	465	1386	610	110	677	297	445	917	428	282	565	249
v/s Ratio Prot	0.27	0.14		c0.08	0.11		c0.33	0.32		0.11	c0.15	
v/s Ratio Perm			c0.47			0.01			0.02			0.04
v/c Ratio	1.02	0.35	1.20	1.33	0.56	0.06	1.19	1.17	0.08	0.69	0.95	0.28
Uniform Delay, d1	53.4	31.1	44.0	67.9	53.0	47.9	52.4	52.4	38.8	57.4	60.2	53.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	46.1	0.1	106.9	196.9	0.6	0.0	104.6	90.0	0.0	5.5	24.5	0.2
Delay (s)	99.5	31.1	151.0	264.8	53.6	48.0	157.0	142.4	38.8	62.9	84.8	53.7
Level of Service	F	C	F	F	D	D	F	F	D	E	F	D
Approach Delay (s)		111.0			102.4			139.6			70.9	
Approach LOS		F			F			F			E	

Intersection Summary			
HCM Average Control Delay	111.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	144.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	109	0	219	0	0	0	143	1499	0	0	1322	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	0.98
Flpb, ped/bikes		1.00	1.00				1.00	1.00			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1770	1546				1770	1863			1863	1551
Flt Permitted		0.76	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1410	1546				1770	1863			1863	1551
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	121	0	243	0	0	0	159	1666	0	0	1469	121
RTOR Reduction (vph)	0	0	127	0	0	0	0	0	0	0	0	17
Lane Group Flow (vph)	0	121	116	0	0	0	159	1666	0	0	1469	104
Confl. Bikes (#/hr)			1			1						1
Turn Type	Perm		Perm	Perm			Prot			Prot		Perm
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4								6
Actuated Green, G (s)		16.4	16.4				11.0	121.6			106.6	106.6
Effective Green, g (s)		16.4	16.4				11.0	123.1			108.1	108.1
Actuated g/C Ratio		0.11	0.11				0.07	0.83			0.73	0.73
Clearance Time (s)		4.0	4.0				4.0	5.5			5.5	5.5
Vehicle Extension (s)		3.0	3.0				1.0	2.5			2.5	2.5
Lane Grp Cap (vph)		157	172				132	1555			1365	1137
v/s Ratio Prot							0.09	c0.89			0.79	
v/s Ratio Perm		c0.09	0.07									0.07
v/c Ratio		0.77	0.67				1.20	1.07			1.08	0.09
Uniform Delay, d1		63.7	63.0				68.2	12.2			19.7	5.6
Progression Factor		1.00	1.00				1.00	1.00			1.00	1.00
Incremental Delay, d2		20.5	10.0				143.5	44.6			47.7	0.0
Delay (s)		84.2	72.9				211.8	56.8			67.4	5.7
Level of Service		F	E				F	E			E	A
Approach Delay (s)		76.7			0.0			70.3			62.7	
Approach LOS		E			A			E			E	

Intersection Summary			
HCM Average Control Delay	67.7	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	147.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	98.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	22	11	382	22	11	22	481	1533	11	11	1377	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	5.7	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97		0.99		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1803	1535		1713		1770	3539	1549	1770	3539	1583
Flt Permitted		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1803	1535		1713		1770	3539	1549	1770	3539	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	23	12	406	23	12	23	512	1631	12	12	1465	23
RTOR Reduction (vph)	0	0	383	0	16	0	0	0	2	0	0	6
Lane Group Flow (vph)	0	35	23	0	42	0	512	1631	10	12	1465	17
Confl. Peds. (#/hr)			3			2						
Confl. Bikes (#/hr)			3			1			3			
Turn Type	Split		Perm	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)		7.8	7.8		5.8		42.8	95.0	95.0	4.5	56.7	56.7
Effective Green, g (s)		7.2	7.2		5.2		41.8	96.7	95.0	3.5	58.4	58.4
Actuated g/C Ratio		0.06	0.06		0.04		0.33	0.75	0.74	0.03	0.45	0.45
Clearance Time (s)		3.4	3.4		3.4		3.0	5.7	5.7	3.0	5.7	5.7
Vehicle Extension (s)		1.0	1.0		0.5		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		101	86		69		575	2661	1144	48	1607	719
v/s Ratio Prot		c0.02			c0.02		c0.29	0.46		0.01	c0.41	
v/s Ratio Perm			0.01						0.01			0.01
v/c Ratio		0.35	0.26		0.60		0.89	0.61	0.01	0.25	0.91	0.02
Uniform Delay, d1		58.4	58.2		60.7		41.2	7.3	4.4	61.3	32.7	19.4
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.8	0.6		9.8		15.5	0.3	0.0	1.0	8.1	0.0
Delay (s)		59.2	58.8		70.5		56.7	7.6	4.4	62.3	40.7	19.4
Level of Service		E	E		E		E	A	A	E	D	B
Approach Delay (s)		58.8			70.5			19.3			40.6	
Approach LOS		E			E			B			D	

Intersection Summary			
HCM Average Control Delay	31.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	128.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↱↱		✥		↰	↑↑	↱		↑↑↑↑	
Volume (vph)	0	0	120	0	0	0	66	1937	0	0	1694	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0				4.0	4.0			4.0	
Lane Util. Factor			0.88				1.00	0.95			0.86	
Frt			0.85				1.00	1.00			0.99	
Flt Protected			1.00				0.95	1.00			1.00	
Satd. Flow (prot)			2787				1770	3539			6372	
Flt Permitted			1.00				0.07	1.00			1.00	
Satd. Flow (perm)			2787				135	3539			6372	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	141	0	0	0	78	2279	0	0	1993	78
RTOR Reduction (vph)	0	0	43	0	0	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	0	98	0	0	0	78	2279	0	0	2067	0
Turn Type			custom	Perm			Perm		Perm			
Protected Phases					8			2			6	
Permitted Phases			4	8			2		2			
Actuated Green, G (s)			8.5				73.5	73.5			73.5	
Effective Green, g (s)			8.5				73.5	73.5			73.5	
Actuated g/C Ratio			0.09				0.82	0.82			0.82	
Clearance Time (s)			4.0				4.0	4.0			4.0	
Vehicle Extension (s)			3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)			263				110	2890			5204	
v/s Ratio Prot								c0.64			0.32	
v/s Ratio Perm			c0.04				0.58					
v/c Ratio			0.37				0.71	0.79			0.40	
Uniform Delay, d1			38.2				3.6	4.2			2.2	
Progression Factor			1.00				1.00	1.00			1.00	
Incremental Delay, d2			0.9				32.0	2.3			0.2	
Delay (s)			39.1				35.6	6.5			2.5	
Level of Service			D				D	A			A	
Approach Delay (s)		39.1			0.0			7.5			2.5	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM Average Control Delay	6.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↰↑↱	↱	↰	↑↑	↱	↰↰	↑↱	
Volume (vph)	55	22	44	427	22	998	33	951	251	1049	667	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.5	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.91	0.86	0.91	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.90		1.00	0.88	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1675		1610	2791	1441	1770	3539	1583	3433	3506	
Flt Permitted	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1675		1610	2791	1441	1770	3539	1583	3433	3506	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	61	24	49	474	24	1109	37	1057	279	1166	741	49
RTOR Reduction (vph)	0	45	0	0	455	454	0	0	204	0	2	0
Lane Group Flow (vph)	61	28	0	374	224	100	37	1057	75	1166	788	0
Turn Type	Split			Split		Perm	Prot		Perm	Prot		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases						3			6			
Actuated Green, G (s)	10.9	10.9		27.0	27.0	27.0	5.5	40.5	40.5	54.1	89.1	
Effective Green, g (s)	10.9	10.9		27.0	27.0	27.0	5.5	42.0	40.5	54.1	90.6	
Actuated g/C Ratio	0.07	0.07		0.18	0.18	0.18	0.04	0.28	0.27	0.36	0.60	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.5	5.5	4.0	5.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0	1.0	1.0	4.7	4.7	1.5	5.4	
Lane Grp Cap (vph)	129	122		290	502	259	65	991	427	1238	2118	
v/s Ratio Prot	c0.03	0.02		c0.23	0.08		0.02	c0.30		c0.34	0.22	
v/s Ratio Perm						0.07			0.05			
v/c Ratio	0.47	0.23		1.29	0.45	0.39	0.57	1.07	0.18	0.94	0.37	
Uniform Delay, d1	66.8	65.6		61.5	54.8	54.2	71.1	54.0	42.0	46.4	15.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	0.3		153.8	0.2	0.3	6.7	48.1	0.9	13.8	0.5	
Delay (s)	67.8	65.9		215.3	55.1	54.5	77.7	102.1	42.9	60.2	15.7	
Level of Service	E	E		F	E	D	E	F	D	E	B	
Approach Delay (s)		66.8			92.2			89.4			42.2	
Approach LOS		E			F			F			D	

Intersection Summary			
HCM Average Control Delay	71.5	HCM Level of Service	E
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	89.2%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↑↱		↰	↑↑↱	
Volume (vph)	153	11	612	33	22	11	830	1093	44	11	799	273
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.89			0.98		1.00	0.99		1.00	0.96	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1648			1771		1770	3516		1770	3384	
Flt Permitted		0.99			0.52		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1648			947		1770	3516		1770	3384	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	161	12	644	35	23	12	874	1151	46	12	841	287
RTOR Reduction (vph)	0	113	0	0	6	0	0	2	0	0	27	0
Lane Group Flow (vph)	0	704	0	0	64	0	874	1195	0	12	1101	0
Confl. Peds. (#/hr)									1			
Confl. Bikes (#/hr)						1						2
Turn Type	Split			Perm			Prot			Prot		
Protected Phases	4!	4			8!		5	2		1	6	
Permitted Phases				8								
Actuated Green, G (s)		37.3			37.3		39.3	67.8		1.1	29.6	
Effective Green, g (s)		39.0			39.0		40.0	70.0		1.8	31.8	
Actuated g/C Ratio		0.32			0.32		0.33	0.57		0.01	0.26	
Clearance Time (s)		5.7			5.7		4.7	6.2		4.7	6.2	
Vehicle Extension (s)		3.0			3.0		2.0	3.8		2.0	3.8	
Lane Grp Cap (vph)		523			301		577	2004		26	876	
v/s Ratio Prot		c0.43					c0.49	0.34		0.01	c0.33	
v/s Ratio Perm					0.07							
v/c Ratio		1.35			0.21		1.51	0.60		0.46	1.26	
Uniform Delay, d1		41.9			30.7		41.4	17.2		60.0	45.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		168.5			0.4		240.5	0.5		4.7	124.7	
Delay (s)		210.4			31.0		281.9	17.7		64.7	170.2	
Level of Service		F			C		F	B		E	F	
Approach Delay (s)		210.4			31.0			129.2			169.1	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM Average Control Delay	154.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.38		
Actuated Cycle Length (s)	122.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	135.4%	ICU Level of Service	H
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	361	699	601	11	962	820	1049	1093	11	514	683	335
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	401	777	668	12	1069	911	1166	1214	12	571	759	372
RTOR Reduction (vph)	0	0	291	0	0	261	0	0	7	0	0	139
Lane Group Flow (vph)	401	777	377	12	1069	650	1166	1214	5	571	759	233
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	18.5	60.7	60.7	1.0	43.2	43.2	27.5	37.8	37.8	26.5	36.8	36.8
Effective Green, g (s)	19.0	61.2	61.2	1.5	43.7	43.7	28.0	39.3	39.3	27.0	38.3	38.3
Actuated g/C Ratio	0.13	0.42	0.42	0.01	0.30	0.30	0.19	0.27	0.27	0.19	0.26	0.26
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	5.1	5.1	2.0	5.1	5.1
Lane Grp Cap (vph)	232	1494	668	18	1067	477	663	959	429	330	935	418
v/s Ratio Prot	c0.23	0.22		0.01	0.30		c0.34	c0.34		c0.32	0.21	
v/s Ratio Perm			0.24			c0.41			0.00			0.15
v/c Ratio	1.73	0.52	0.56	0.67	1.00	1.36	1.76	1.27	0.01	1.73	0.81	0.56
Uniform Delay, d1	63.0	31.0	31.8	71.5	50.6	50.6	58.5	52.8	38.7	59.0	50.0	46.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	345.3	0.2	0.7	54.1	28.0	176.7	347.6	128.0	0.1	341.1	7.6	5.3
Delay (s)	408.3	31.2	32.4	125.6	78.7	227.4	406.1	180.9	38.7	400.1	57.6	51.3
Level of Service	F	C	C	F	E	F	F	F	D	F	E	D
Approach Delay (s)		113.5			146.9			289.9			171.1	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	187.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.56		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	118.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	22	11	164	22	459	22	1683	208	470	836	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected		0.98	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1832	1530	1681	1704	1561	1770	5001		1770	3539	1550
Flt Permitted		0.98	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1832	1530	1681	1704	1561	1770	5001		1770	3539	1550
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	24	12	182	24	510	24	1870	231	522	929	24
RTOR Reduction (vph)	0	0	12	0	0	393	0	10	0	0	0	7
Lane Group Flow (vph)	0	36	0	102	104	117	24	2091	0	522	929	17
Confl. Bikes (#/hr)			2			1						2
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)		2.6	2.6	16.8	16.8	16.8	4.0	59.6		51.0	106.6	106.6
Effective Green, g (s)		3.1	3.1	17.3	17.3	17.3	4.5	62.1		51.5	109.1	109.1
Actuated g/C Ratio		0.02	0.02	0.12	0.12	0.12	0.03	0.41		0.34	0.73	0.73
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	4.5	6.5		4.5	6.5	6.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	4.6		2.0	5.1	5.1
Lane Grp Cap (vph)		38	32	194	197	180	53	2070		608	2574	1127
v/s Ratio Prot		c0.02		0.06	0.06		0.01	c0.42		c0.29	0.26	
v/s Ratio Perm			0.00			c0.08						0.01
v/c Ratio		0.95	0.01	0.53	0.53	0.65	0.45	1.01		0.86	0.36	0.02
Uniform Delay, d1		73.4	71.9	62.5	62.5	63.5	71.5	43.9		45.9	7.6	5.6
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		122.9	0.0	1.2	1.2	6.3	2.2	22.3		11.2	0.4	0.0
Delay (s)		196.3	72.0	63.7	63.7	69.7	73.8	66.2		57.0	8.0	5.7
Level of Service		F	E	E	E	E	E	E		E	A	A
Approach Delay (s)		165.2			68.0			66.3			25.3	
Approach LOS		F			E			E			C	

Intersection Summary			
HCM Average Control Delay	53.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	85.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	22	22	1770	22	11	1213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.95		1.00	1.00
Frt	0.93		1.00		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1695		3533		1770	1863
Flt Permitted	0.98		1.00		0.95	1.00
Satd. Flow (perm)	1695		3533		1770	1863
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	24	24	1967	24	12	1348
RTOR Reduction (vph)	22	0	0	0	0	0
Lane Group Flow (vph)	26	0	1991	0	12	1348
Turn Type					Prot	
Protected Phases	8		6		5	2
Permitted Phases						
Actuated Green, G (s)	6.6		77.8		3.6	85.4
Effective Green, g (s)	6.6		77.8		3.6	85.4
Actuated g/C Ratio	0.07		0.78		0.04	0.85
Clearance Time (s)	4.0		4.0		4.0	4.0
Vehicle Extension (s)	3.0		2.8		2.4	2.8
Lane Grp Cap (vph)	112		2749		64	1591
v/s Ratio Prot	c0.02		0.56		0.01	c0.72
v/s Ratio Perm						
v/c Ratio	0.23		0.72		0.19	0.85
Uniform Delay, d1	44.3		5.6		46.8	3.9
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	1.0		1.7		0.9	5.8
Delay (s)	45.3		7.3		47.7	9.6
Level of Service	D		A		D	A
Approach Delay (s)	45.3		7.3			10.0
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	8.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	208	22	0	1584	1158	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.97			0.95	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	0.96			1.00	1.00	1.00
Satd. Flow (prot)	3408			3539	1863	1583
Flt Permitted	0.96			1.00	1.00	1.00
Satd. Flow (perm)	3408			3539	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	231	24	0	1760	1287	84
RTOR Reduction (vph)	10	0	0	0	0	19
Lane Group Flow (vph)	245	0	0	1760	1287	65
Turn Type						Perm
Protected Phases	4			2	2	
Permitted Phases						2
Actuated Green, G (s)	12.0			70.0	70.0	70.0
Effective Green, g (s)	12.0			70.0	70.0	70.0
Actuated g/C Ratio	0.13			0.78	0.78	0.78
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	2.8			2.8	2.8	2.8
Lane Grp Cap (vph)	454			2753	1449	1231
v/s Ratio Prot	c0.07			0.50	c0.69	
v/s Ratio Perm						0.04
v/c Ratio	0.54			0.64	0.89	0.05
Uniform Delay, d1	36.4			4.4	7.2	2.3
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	1.2			1.2	8.4	0.1
Delay (s)	37.6			5.6	15.6	2.4
Level of Service	D			A	B	A
Approach Delay (s)	37.6			5.6	14.8	
Approach LOS	D			A	B	

Intersection Summary			
HCM Average Control Delay	11.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰↑↱			✣			✣	
Volume (vph)	11	1136	33	11	1508	22	33	109	55	44	44	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1710	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			0%			0%	
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		0.95			1.00			1.00	
Frpb, ped/bikes		1.00	0.96		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.96			0.96	
Flt Protected		1.00	1.00		1.00			0.99			0.98	
Satd. Flow (prot)		1815	1475		3093			1765			1742	
Flt Permitted		0.98	1.00		0.90			0.91			0.64	
Satd. Flow (perm)		1771	1475		2781			1613			1132	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	12	1262	37	12	1676	24	37	121	61	49	49	49
RTOR Reduction (vph)	0	0	9	0	1	0	0	15	0	0	19	0
Lane Group Flow (vph)	0	1274	28	0	1711	0	0	204	0	0	128	0
Confl. Peds. (#/hr)			9			2						
Confl. Bikes (#/hr)						1			2			1
Parking (#/hr)				0	0	0						
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		76.0	76.0		76.0			16.0			16.0	
Effective Green, g (s)		76.0	76.0		76.0			16.0			16.0	
Actuated g/C Ratio		0.76	0.76		0.76			0.16			0.16	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)		2.8	2.8		2.8			2.0			2.0	
Lane Grp Cap (vph)		1346	1121		2114			258			181	
v/s Ratio Prot												
v/s Ratio Perm		c0.72	0.02		0.62			c0.13			0.11	
v/c Ratio		0.95	0.03		0.81			0.79			0.71	
Uniform Delay, d1		10.3	2.9		7.5			40.4			39.8	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		14.7	0.0		3.5			14.2			9.8	
Delay (s)		25.0	3.0		11.0			54.6			49.5	
Level of Service		C	A		B			D			D	
Approach Delay (s)		24.3			11.0			54.6			49.5	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑	↱
Volume (vph)	546	667	22	44	787	11	22	481	120	111	372	732
Ideal Flow (vphpl)	1900	1900	1900	1900	1596	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1854		1770	1562		1770	1807		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1854		1770	1562		1770	1807		1770	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	607	741	24	49	874	12	24	534	133	123	413	813
RTOR Reduction (vph)	0	1	0	0	1	0	0	6	0	0	0	28
Lane Group Flow (vph)	607	764	0	49	885	0	24	661	0	123	413	785
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												6
Actuated Green, G (s)	31.0	82.2		5.6	56.8		2.4	41.8		6.0	45.4	76.4
Effective Green, g (s)	31.0	82.2		5.6	56.8		2.4	41.8		6.0	45.4	76.4
Actuated g/C Ratio	0.20	0.54		0.04	0.37		0.02	0.28		0.04	0.30	0.50
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.1		2.0	4.1		2.0	4.1		2.0	4.1	2.0
Lane Grp Cap (vph)	362	1005		65	585		28	498		70	558	840
v/s Ratio Prot	c0.34	0.41		0.03	c0.57		0.01	c0.37		c0.07	0.22	c0.19
v/s Ratio Perm												0.30
v/c Ratio	1.68	0.76		0.75	1.51		0.86	1.33		1.76	0.74	0.93
Uniform Delay, d1	60.3	27.0		72.3	47.4		74.4	54.9		72.8	47.8	35.3
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	316.4	3.7		34.8	239.8		106.2	160.9		392.5	5.6	17.0
Delay (s)	376.7	30.7		107.2	287.2		180.6	215.8		465.3	53.4	52.3
Level of Service	F	C		F	F		F	F		F	D	D
Approach Delay (s)		183.8			277.8			214.6			90.3	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	179.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.53		
Actuated Cycle Length (s)	151.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	132.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰	↱
Volume (vph)	352	525	448	251	186	372
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1566	1770	1544
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	3539	1566	1770	1544
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	391	583	498	279	207	413
RTOR Reduction (vph)	0	0	0	45	0	323
Lane Group Flow (vph)	391	583	498	234	207	90
Confl. Peds. (#/hr)				8		7
Confl. Bikes (#/hr)				8		8
Turn Type	Prot			pm+ov		Perm
Protected Phases	1	6	2	4	4	
Permitted Phases				2		4
Actuated Green, G (s)	12.4	26.3	9.9	19.4	9.5	9.5
Effective Green, g (s)	12.4	26.3	9.9	19.4	9.5	9.5
Actuated g/C Ratio	0.28	0.60	0.23	0.44	0.22	0.22
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.1	3.1	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	501	1119	800	837	384	335
v/s Ratio Prot	c0.22	c0.31	0.14	0.06	c0.12	
v/s Ratio Perm				0.09		0.06
v/c Ratio	0.78	0.52	0.62	0.28	0.54	0.27
Uniform Delay, d1	14.4	5.1	15.3	7.8	15.2	14.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.8	0.5	1.1	0.1	0.7	0.2
Delay (s)	22.2	5.5	16.4	7.8	15.9	14.4
Level of Service	C	A	B	A	B	B
Approach Delay (s)		12.2	13.3		14.9	
Approach LOS		B	B		B	

Intersection Summary			
HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	43.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Volume (vph)	33	55	11	262	109	142	11	994	33	66	942	66
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.92		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1816		1770	1704		1770	1854		1770	1844	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1816		1770	1704		1770	1854		1770	1844	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	35	59	12	282	117	153	12	1069	35	71	1013	71
RTOR Reduction (vph)	0	5	0	0	33	0	0	1	0	0	1	0
Lane Group Flow (vph)	35	66	0	282	237	0	12	1103	0	71	1083	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	4.2	8.9		24.3	29.0		0.9	88.5		7.0	94.6	
Effective Green, g (s)	4.0	8.7		24.1	28.8		0.7	88.3		6.8	94.4	
Actuated g/C Ratio	0.03	0.06		0.17	0.20		0.00	0.61		0.05	0.66	
Clearance Time (s)	3.8	3.8		3.8	3.8		3.8	3.8		3.8	3.8	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	49	110		296	341		9	1138		84	1210	
v/s Ratio Prot	0.02	0.04		c0.16	c0.14		0.01	c0.60		c0.04	0.59	
v/s Ratio Perm												
v/c Ratio	0.71	0.60		0.95	0.70		1.33	0.97		0.85	0.89	
Uniform Delay, d1	69.4	65.9		59.3	53.5		71.6	26.5		68.0	20.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	33.5	6.2		39.2	4.9		429.4	19.5		48.9	8.8	
Delay (s)	102.9	72.2		98.6	58.4		501.0	46.0		117.0	29.4	
Level of Service	F	E		F	E		F	D		F	C	
Approach Delay (s)		82.3			78.9			50.9			34.8	
Approach LOS		F			E			D			C	

Intersection Summary			
HCM Average Control Delay	51.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	143.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↱		↰	↑↱	
Volume (vph)	22	33	11	197	11	197	11	1060	66	98	843	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1784		1770	1557		1770	3503		1770	3531	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1784		1770	1557		1770	3503		1770	3531	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	24	36	12	216	12	216	12	1165	73	108	926	12
RTOR Reduction (vph)	0	11	0	0	130	0	0	4	0	0	1	0
Lane Group Flow (vph)	24	37	0	216	98	0	12	1234	0	108	937	0
Confl. Peds. (#/hr)			1			1			1			1
Confl. Bikes (#/hr)			3			3			2			1
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	1.7	6.4		11.8	16.5		0.5	33.5		6.3	39.3	
Effective Green, g (s)	1.7	6.4		11.8	16.5		0.5	34.5		6.3	40.3	
Actuated g/C Ratio	0.02	0.09		0.16	0.22		0.01	0.46		0.08	0.54	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	40	152		278	343		12	1611		149	1897	
v/s Ratio Prot	0.01	0.02		c0.12	c0.06		0.01	c0.35		c0.06	0.27	
v/s Ratio Perm												
v/c Ratio	0.60	0.24		0.78	0.28		1.00	0.77		0.72	0.49	
Uniform Delay, d1	36.3	32.0		30.3	24.3		37.2	16.9		33.5	10.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	16.1	0.3		11.7	0.2		259.8	2.2		13.7	0.2	
Delay (s)	52.4	32.3		42.1	24.5		297.1	19.1		47.3	11.1	
Level of Service	D	C		D	C		F	B		D	B	
Approach Delay (s)		39.0			33.0			21.8			14.9	
Approach LOS		D			C			C			B	

Intersection Summary			
HCM Average Control Delay	21.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱		↑↑	Y	
Volume (veh/h)	1147	109	0	1128	0	393
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	1349	128	0	1327	0	462
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1283		
pX, platoon unblocked						
vC, conflicting volume			1478		2013	1349
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1478		2013	1349
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	0
cM capacity (veh/h)			452		51	141

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	1349	128	664	664	462
Volume Left	0	0	0	0	0
Volume Right	0	128	0	0	462
cSH	1700	1700	1700	1700	141
Volume to Capacity	0.79	0.08	0.39	0.39	3.29
Queue Length 95th (ft)	0	0	0	0	Err
Control Delay (s)	0.0	0.0	0.0	0.0	Err
Lane LOS					F
Approach Delay (s)	0.0		0.0		Err
Approach LOS					F

Intersection Summary			
Average Delay	1415.1		
Intersection Capacity Utilization	91.4%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations						
Volume (vph)	1012	319	809	809	590	951
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	0.88	0.97	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3433	1563	3433	2723	3433	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3433	1563	3433	2723	3433	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1077	339	861	861	628	1012
RTOR Reduction (vph)	0	239	0	565	0	3
Lane Group Flow (vph)	1077	100	861	296	628	1009
Confl. Peds. (#/hr)		1		2		
Turn Type		Perm		Perm		custom
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	23.5	23.5	26.0	26.0	16.5	46.5
Effective Green, g (s)	24.0	23.5	27.5	27.5	16.5	48.0
Actuated g/C Ratio	0.30	0.29	0.34	0.34	0.21	0.60
Clearance Time (s)	4.5	4.5	5.5	5.5	4.0	5.5
Vehicle Extension (s)	2.0	2.0	3.0	3.0	2.0	3.0
Lane Grp Cap (vph)	1030	459	1180	936	708	950
v/s Ratio Prot	c0.31		0.25		0.18	c0.64
v/s Ratio Perm		0.06		0.11		
v/c Ratio	1.05	0.22	0.73	0.32	0.89	1.06
Uniform Delay, d1	28.0	21.3	23.0	19.3	30.8	16.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	40.7	0.1	2.3	0.2	12.5	47.1
Delay (s)	68.7	21.4	25.3	19.5	43.4	63.1
Level of Service	E	C	C	B	D	E
Approach Delay (s)	57.4		22.4		55.5	
Approach LOS	E		C		E	

Intersection Summary			
HCM Average Control Delay	44.1	HCM Level of Service	D
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱↱	↰↰	↑↑	↱
Volume (vph)	1094	197	72	175	153	131	87	907	142	109	415	863
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1216	219	80	194	170	146	97	1008	158	121	461	959
RTOR Reduction (vph)	0	0	46	0	0	63	0	0	77	0	0	0
Lane Group Flow (vph)	1216	219	34	194	170	83	97	1008	81	121	461	959
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			Free
Actuated Green, G (s)	46.8	52.3	52.3	11.0	16.5	16.5	7.2	37.5	37.5	5.1	34.9	125.9
Effective Green, g (s)	47.3	53.8	53.8	11.5	18.0	18.0	7.7	39.0	39.0	5.6	36.9	125.9
Actuated g/C Ratio	0.38	0.43	0.43	0.09	0.14	0.14	0.06	0.31	0.31	0.04	0.29	1.00
Clearance Time (s)	4.5	5.5	5.5	4.5	5.5	5.5	4.5	5.5	5.5	4.5	6.0	
Vehicle Extension (s)	2.0	4.1	4.1	2.0	4.5	4.5	2.0	4.5	4.5	2.0	3.7	
Lane Grp Cap (vph)	1290	1512	676	314	506	226	210	1096	863	153	1037	1583
v/s Ratio Prot	c0.35	0.06		0.06	0.05		0.03	c0.28		0.04	0.13	
v/s Ratio Perm			0.02			0.05			0.03			c0.61
v/c Ratio	0.94	0.14	0.05	0.62	0.34	0.37	0.46	0.92	0.09	0.79	0.44	0.61
Uniform Delay, d1	38.0	22.0	21.1	55.1	48.6	48.8	57.1	41.9	30.9	59.6	36.2	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.4	0.1	0.0	2.5	0.7	1.7	0.6	12.5	0.1	22.3	0.4	1.7
Delay (s)	51.4	22.1	21.1	57.6	49.3	50.5	57.7	54.4	31.0	81.9	36.6	1.7
Level of Service	D	C	C	E	D	D	E	D	C	F	D	A
Approach Delay (s)		45.6			52.8			51.7			18.4	
Approach LOS		D			D			D			B	

Intersection Summary			
HCM Average Control Delay	39.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	125.9	Sum of lost time (s)	4.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↱		↰	↰↑	↱		✥	
Volume (vph)	11	2055	66	76	1322	11	55	11	76	11	11	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.7	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.98	
Satd. Flow (prot)	1770	3539	1583	1770	3535		1681	1712	1583		1750	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.98	
Satd. Flow (perm)	1770	3539	1583	1770	3535		1681	1712	1583		1750	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	11	2119	68	78	1363	11	57	11	78	11	11	11
RTOR Reduction (vph)	0	0	13	0	0	0	0	0	72	0	11	0
Lane Group Flow (vph)	11	2119	55	78	1374	0	34	34	6	0	22	0
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						8			
Actuated Green, G (s)	0.6	75.6	75.6	7.1	82.1		8.5	8.5	8.5		2.7	
Effective Green, g (s)	0.2	77.3	75.6	6.7	83.8		8.3	8.3	8.3		2.5	
Actuated g/C Ratio	0.00	0.70	0.68	0.06	0.76		0.07	0.07	0.07		0.02	
Clearance Time (s)	3.6	5.7	5.7	3.6	5.7		3.8	3.8	3.8		3.8	
Vehicle Extension (s)	2.2	3.2	3.2	2.2	3.2		3.1	3.1	3.1		3.1	
Lane Grp Cap (vph)	3	2469	1080	107	2674		126	128	119		39	
v/s Ratio Prot	0.01	c0.60		c0.04	0.39		c0.02	0.02			c0.01	
v/s Ratio Perm			0.03						0.00			
v/c Ratio	3.67	0.86	0.05	0.73	0.51		0.27	0.27	0.05		0.57	
Uniform Delay, d1	55.3	12.6	5.8	51.2	5.4		48.4	48.4	47.6		53.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	1761.9	3.2	0.0	19.5	0.2		1.2	1.2	0.2		18.8	
Delay (s)	1817.2	15.8	5.8	70.7	5.6		49.6	49.5	47.8		72.5	
Level of Service	F	B	A	E	A		D	D	D		E	
Approach Delay (s)		24.6			9.1			48.6			72.5	
Approach LOS		C			A			D			E	

Intersection Summary			
HCM Average Control Delay	20.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	110.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

INTERSECTION SYNCHRO ANALYSIS

YR-2016 BUILD AM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱	↰	↑↑	↱
Volume (vph)	197	197	748	135	443	123	1329	382	50	98	666	517
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.91	0.91	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1554	1770	3539	1554	1610	3286	1548	1770	3539	1563
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1554	1770	3539	1554	1610	3286	1548	1770	3539	1563
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	219	219	831	150	492	137	1477	424	56	109	740	574
RTOR Reduction (vph)	0	0	487	0	0	111	0	0	35	0	0	120
Lane Group Flow (vph)	219	219	344	150	492	26	738	1163	21	109	740	454
Confl. Peds. (#/hr)						2			5			
Confl. Bikes (#/hr)			6			2			1			1
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2			6			8			7
Actuated Green, G (s)	15.0	29.3	29.3	11.0	26.1	26.1	53.7	53.7	53.7	31.7	31.7	31.7
Effective Green, g (s)	14.0	31.0	31.0	10.0	27.0	27.0	55.0	55.0	55.0	33.0	33.0	33.0
Actuated g/C Ratio	0.10	0.21	0.21	0.07	0.19	0.19	0.38	0.38	0.38	0.23	0.23	0.23
Clearance Time (s)	3.0	5.7	5.7	3.0	4.9	4.9	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	171	757	332	122	659	289	611	1246	587	403	805	356
v/s Ratio Prot	c0.12	0.06		0.08	0.14		c0.46	0.35		0.06	0.21	
v/s Ratio Perm			c0.22			0.02			0.01			c0.29
v/c Ratio	1.28	0.29	1.04	1.23	0.75	0.09	1.21	1.16dl	0.04	0.27	0.92	1.28
Uniform Delay, d1	65.5	47.8	57.0	67.5	55.8	48.8	45.0	43.2	28.3	46.1	54.7	56.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	163.4	0.1	59.4	155.7	4.0	0.0	108.3	12.5	0.0	0.1	15.1	144.3
Delay (s)	228.9	47.8	116.4	223.2	59.8	48.9	153.3	55.7	28.3	46.2	69.8	200.3
Level of Service	F	D	F	F	E	D	F	E	C	D	E	F
Approach Delay (s)		124.0			89.3			91.7			120.6	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	106.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		✥		↰	↑↱		↰	↑	↱
Volume (vph)	197	0	149	0	0	0	185	1514	0	0	1500	148
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	0.98
Flpb, ped/bikes		1.00	1.00				1.00	1.00			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1770	1547				1770	1863			1863	1551
Flt Permitted		0.76	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1410	1547				1770	1863			1863	1551
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	219	0	166	0	0	0	206	1682	0	0	1667	164
RTOR Reduction (vph)	0	0	127	0	0	0	0	0	0	0	0	21
Lane Group Flow (vph)	0	219	39	0	0	0	206	1682	0	0	1667	143
Confl. Bikes (#/hr)			1			1						1
Turn Type	Perm		Perm	Perm			Prot			Prot		Perm
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4								6
Actuated Green, G (s)		19.0	19.0				14.0	121.5			103.5	103.5
Effective Green, g (s)		19.0	19.0				14.0	123.0			105.0	105.0
Actuated g/C Ratio		0.13	0.13				0.09	0.82			0.70	0.70
Clearance Time (s)		4.0	4.0				4.0	5.5			5.5	5.5
Vehicle Extension (s)		3.0	3.0				1.0	2.5			2.5	2.5
Lane Grp Cap (vph)		179	196				165	1528			1304	1086
v/s Ratio Prot							c0.12	0.90			c0.89	
v/s Ratio Perm		c0.16	0.03									0.09
v/c Ratio		1.22	0.20				1.25	1.10			1.28	0.13
Uniform Delay, d1		65.5	58.7				68.0	13.5			22.5	7.4
Progression Factor		1.00	1.00				1.00	1.00			1.00	1.00
Incremental Delay, d2		140.1	0.5				152.1	55.8			131.3	0.0
Delay (s)		205.6	59.2				220.1	69.3			153.8	7.5
Level of Service		F	E				F	E			F	A
Approach Delay (s)		142.5			0.0			85.8			140.7	
Approach LOS		F			A			F			F	

Intersection Summary			
HCM Average Control Delay	115.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	110.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	25	12	529	12	12	12	430	1612	12	12	1601	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	5.7	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1802	1545		1735		1770	3539	1549	1770	3539	1583
Flt Permitted		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1802	1545		1735		1770	3539	1549	1770	3539	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	27	13	563	13	13	13	457	1715	13	13	1703	39
RTOR Reduction (vph)	0	0	374	0	13	0	0	0	3	0	0	9
Lane Group Flow (vph)	0	40	189	0	26	0	457	1715	10	13	1703	30
Confl. Peds. (#/hr)			3			2						
Confl. Bikes (#/hr)			3			1			3			
Turn Type	Split		Perm	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)		19.4	19.4		5.5		36.1	97.0	97.0	4.6	65.5	65.5
Effective Green, g (s)		18.8	18.8		4.9		35.1	98.7	97.0	3.6	67.2	67.2
Actuated g/C Ratio		0.13	0.13		0.03		0.25	0.70	0.68	0.03	0.47	0.47
Clearance Time (s)		3.4	3.4		3.4		3.0	5.7	5.7	3.0	5.7	5.7
Vehicle Extension (s)		1.0	1.0		0.5		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		239	205		60		438	2460	1058	45	1675	749
v/s Ratio Prot		0.02			c0.02		c0.26	0.48		0.01	c0.48	
v/s Ratio Perm			c0.12						0.01			0.02
v/c Ratio		0.17	0.92		0.44		1.04	0.70	0.01	0.29	1.02	0.04
Uniform Delay, d1		54.7	60.9		67.2		53.4	12.8	7.2	67.9	37.4	20.1
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.1	41.0		1.9		54.8	0.7	0.0	1.3	26.3	0.0
Delay (s)		54.8	101.9		69.1		108.2	13.5	7.2	69.2	63.7	20.1
Level of Service		D	F		E		F	B	A	E	E	C
Approach Delay (s)		98.8			69.1			33.3			62.7	
Approach LOS		F			E			C			E	

Intersection Summary			
HCM Average Control Delay	53.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	142.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	91.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↱↱		✥		↰	↑↑	↱		↓↓↓↓	
Volume (vph)	0	0	123	0	0	0	25	2018	0	0	2043	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0				4.0	4.0			4.0	
Lane Util. Factor			0.88				1.00	0.95			0.86	
Frt			0.85				1.00	1.00			0.99	
Flt Protected			1.00				0.95	1.00			1.00	
Satd. Flow (prot)			2787				1770	3539			6374	
Flt Permitted			1.00				0.06	1.00			1.00	
Satd. Flow (perm)			2787				118	3539			6374	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	145	0	0	0	29	2374	0	0	2404	87
RTOR Reduction (vph)	0	0	15	0	0	0	0	0	0	0	4	0
Lane Group Flow (vph)	0	0	130	0	0	0	29	2374	0	0	2487	0
Turn Type			custom	Perm			Perm		Perm			
Protected Phases					8			2			6	
Permitted Phases			4	8			2		2			
Actuated Green, G (s)			9.0				63.0	63.0			63.0	
Effective Green, g (s)			9.0				63.0	63.0			63.0	
Actuated g/C Ratio			0.11				0.79	0.79			0.79	
Clearance Time (s)			4.0				4.0	4.0			4.0	
Vehicle Extension (s)			3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)			314				93	2787			5020	
v/s Ratio Prot								c0.67			0.39	
v/s Ratio Perm			c0.05				0.25					
v/c Ratio			0.41				0.31	0.85			0.50	
Uniform Delay, d1			33.0				2.4	5.5			3.0	
Progression Factor			1.00				1.00	1.00			1.00	
Incremental Delay, d2			0.9				8.5	3.5			0.4	
Delay (s)			33.9				10.9	9.0			3.3	
Level of Service			C				B	A			A	
Approach Delay (s)		33.9			0.0			9.0			3.3	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↰↑↱	↱	↰	↑↑	↱	↰↰	↑↑↱	
Volume (vph)	37	25	37	197	25	1157	25	849	380	997	1083	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.5	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.91	0.86	0.91	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.91		1.00	0.86	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1697		1610	2754	1441	1770	3539	1583	3433	3527	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1697		1610	2754	1441	1770	3539	1583	3433	3527	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	41	28	41	219	28	1286	28	943	422	1108	1203	28
RTOR Reduction (vph)	0	38	0	0	559	559	0	0	316	0	1	0
Lane Group Flow (vph)	41	31	0	197	134	84	28	943	106	1108	1230	0
Turn Type	Split			Split		Perm	Prot		Perm	Prot		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases						3			6			
Actuated Green, G (s)	8.4	8.4		11.0	11.0	11.0	3.3	27.7	27.7	45.4	69.8	
Effective Green, g (s)	8.4	8.4		11.0	11.0	11.0	3.3	29.2	27.7	45.4	71.3	
Actuated g/C Ratio	0.08	0.08		0.10	0.10	0.10	0.03	0.27	0.25	0.41	0.65	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.5	5.5	4.0	5.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0	1.0	1.0	4.7	4.7	1.5	5.4	
Lane Grp Cap (vph)	135	130		161	275	144	53	939	399	1417	2286	
v/s Ratio Prot	c0.02	0.02		c0.12	0.05		0.02	c0.27		c0.32	0.35	
v/s Ratio Perm						0.06			0.07			
v/c Ratio	0.30	0.24		1.22	0.91dr	0.58	0.53	1.00	0.27	0.78	0.54	
Uniform Delay, d1	48.0	47.8		49.5	46.8	47.3	52.6	40.4	33.0	28.0	10.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.5	0.3		143.5	0.5	3.9	4.3	30.4	1.6	2.7	0.9	
Delay (s)	48.5	48.1		193.0	47.3	51.2	56.9	70.8	34.6	30.7	11.4	
Level of Service	D	D		F	D	D	E	E	C	C	B	
Approach Delay (s)		48.3			67.7			59.6			20.5	
Approach LOS		D			E			E			C	

Intersection Summary			
HCM Average Control Delay	44.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	84.8%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Oak Avenue Pkwy & Folsom-Auburn Rd

3/2/2010

	↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↰	↑↱		↰	↑↱	
Volume (vph)	209	12	972	50	12	12	234	1057	12	12	1206	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.89			0.98		1.00	1.00		1.00	0.98	
Flt Protected		0.99			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1644			1759		1770	3532		1770	3478	
Flt Permitted		0.99			0.40		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1644			727		1770	3532		1770	3478	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	220	13	1023	53	13	13	246	1113	13	13	1269	142
RTOR Reduction (vph)	0	99	0	0	5	0	0	1	0	0	5	0
Lane Group Flow (vph)	0	1157	0	0	74	0	246	1125	0	13	1406	0
Confl. Peds. (#/hr)									1			
Confl. Bikes (#/hr)						1						2
Turn Type	Split			Perm			Prot			Prot		
Protected Phases	4!	4			8!		5	2		1	6	
Permitted Phases				8								
Actuated Green, G (s)		74.3			74.3		14.3	60.8		1.1	47.6	
Effective Green, g (s)		76.0			76.0		15.0	63.0		1.8	49.8	
Actuated g/C Ratio		0.50			0.50		0.10	0.41		0.01	0.33	
Clearance Time (s)		5.7			5.7		4.7	6.2		4.7	6.2	
Vehicle Extension (s)		3.0			3.0		2.0	3.8		2.0	3.8	
Lane Grp Cap (vph)		818			362		174	1456		21	1134	
v/s Ratio Prot		c0.70					c0.14	0.32		0.01	c0.40	
v/s Ratio Perm					0.10							
v/c Ratio		1.42			0.20		1.41	0.77		0.62	1.24	
Uniform Delay, d1		38.4			21.5		68.9	38.7		75.2	51.5	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		194.0			0.3		216.6	2.7		32.5	115.4	
Delay (s)		232.4			21.8		285.5	41.5		107.7	166.9	
Level of Service		F			C		F	D		F	F	
Approach Delay (s)		232.4			21.8			85.2			166.4	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM Average Control Delay	156.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.35		
Actuated Cycle Length (s)	152.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	131.3%	ICU Level of Service	H
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	265	947	1021	25	911	579	369	410	12	357	1858	197
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	294	1052	1134	28	1012	643	410	456	13	397	2064	219
RTOR Reduction (vph)	0	0	101	0	0	334	0	0	9	0	0	55
Lane Group Flow (vph)	294	1052	1033	28	1012	309	410	456	4	397	2064	164
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	21.3	57.5	57.5	2.0	38.2	38.2	9.5	37.8	37.8	28.7	57.0	57.0
Effective Green, g (s)	21.8	58.0	58.0	2.5	38.7	38.7	10.0	39.3	39.3	29.2	58.5	58.5
Actuated g/C Ratio	0.15	0.40	0.40	0.02	0.27	0.27	0.07	0.27	0.27	0.20	0.40	0.40
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	5.1	5.1	2.0	5.1	5.1
Lane Grp Cap (vph)	266	1416	633	31	945	422	237	959	429	356	1428	639
v/s Ratio Prot	c0.17	0.30		0.02	0.29		c0.12	0.13		0.22	c0.58	
v/s Ratio Perm			c0.65			0.19			0.00			0.10
v/c Ratio	1.11	0.74	1.63	0.90	1.07	0.73	1.73	0.48	0.01	1.12	1.45	0.26
Uniform Delay, d1	61.6	37.1	43.5	71.1	53.2	48.4	67.5	44.2	38.6	57.9	43.2	28.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	86.3	1.9	291.2	119.0	50.2	5.6	345.6	1.7	0.0	82.6	204.4	1.0
Delay (s)	147.9	39.0	334.7	190.2	103.3	54.0	413.1	45.9	38.6	140.5	247.7	29.8
Level of Service	F	D	F	F	F	D	F	D	D	F	F	C
Approach Delay (s)		187.2			85.9			217.1			214.0	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	177.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.56		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	127.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱	↰	↰	↱	↰	↑↑↱		↰	↑↑	↱
Volume (vph)	12	25	25	247	0	197	12	582	247	135	2782	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected		0.98	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1834	1529	1681	1681	1561	1770	4858		1770	3539	1550
Flt Permitted		0.98	1.00	0.95	0.95	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1834	1529	1681	1681	1561	1770	4858		1770	3539	1550
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	28	28	274	0	219	13	647	274	150	3091	13
RTOR Reduction (vph)	0	0	27	0	0	126	0	40	0	0	0	2
Lane Group Flow (vph)	0	41	1	137	137	93	13	881	0	150	3091	11
Confl. Bikes (#/hr)			2			1						2
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)		2.5	2.5	18.0	18.0	18.0	1.7	93.3		16.2	107.8	107.8
Effective Green, g (s)		3.0	3.0	18.5	18.5	18.5	2.2	95.8		16.7	110.3	110.3
Actuated g/C Ratio		0.02	0.02	0.12	0.12	0.12	0.01	0.64		0.11	0.74	0.74
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	4.5	6.5		4.5	6.5	6.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	4.6		2.0	5.1	5.1
Lane Grp Cap (vph)		37	31	207	207	193	26	3103		197	2602	1140
v/s Ratio Prot		c0.02		c0.08	0.08		0.01	0.18		c0.08	c0.87	
v/s Ratio Perm			0.00			0.06						0.01
v/c Ratio		1.11	0.02	0.66	0.66	0.48	0.50	0.28		0.76	1.19	0.01
Uniform Delay, d1		73.5	72.1	62.8	62.8	61.3	73.4	12.0		64.7	19.9	5.3
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		182.0	0.1	6.0	6.0	0.7	5.4	0.2		14.4	88.7	0.0
Delay (s)		255.5	72.1	68.8	68.8	62.0	78.8	12.2		79.1	108.6	5.3
Level of Service		F	E	E	E	E	E	B		E	F	A
Approach Delay (s)		181.1			65.8			13.1			106.8	
Approach LOS		F			E			B			F	

Intersection Summary			
HCM Average Control Delay	85.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	103.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	12	12	1501	12	12	1304
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.95		1.00	1.00
Frt	0.93		1.00		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1695		3535		1770	1863
Flt Permitted	0.98		1.00		0.95	1.00
Satd. Flow (perm)	1695		3535		1770	1863
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	13	1668	13	13	1449
RTOR Reduction (vph)	12	0	0	0	0	0
Lane Group Flow (vph)	14	0	1681	0	13	1449
Turn Type					Prot	
Protected Phases	8		6		5	2
Permitted Phases						
Actuated Green, G (s)	6.3		84.5		7.2	95.7
Effective Green, g (s)	6.3		84.5		7.2	95.7
Actuated g/C Ratio	0.06		0.77		0.07	0.87
Clearance Time (s)	4.0		4.0		4.0	4.0
Vehicle Extension (s)	3.0		2.8		2.4	2.8
Lane Grp Cap (vph)	97		2716		116	1621
v/s Ratio Prot	c0.01		0.48		0.01	c0.78
v/s Ratio Perm						
v/c Ratio	0.14		0.62		0.11	0.89
Uniform Delay, d1	49.3		5.6		48.4	4.2
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	0.7		1.1		0.3	8.0
Delay (s)	50.0		6.7		48.7	12.2
Level of Service	D		A		D	B
Approach Delay (s)	50.0		6.7			12.5
Approach LOS	D		A			B

Intersection Summary			
HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰↰			↑↑	↑	↱
Volume (vph)	37	12	0	1476	1219	98
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.97			0.95	1.00	1.00
Frt	0.96			1.00	1.00	0.85
Flt Protected	0.96			1.00	1.00	1.00
Satd. Flow (prot)	3356			3539	1863	1583
Flt Permitted	0.96			1.00	1.00	1.00
Satd. Flow (perm)	3356			3539	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	41	13	0	1640	1354	109
RTOR Reduction (vph)	12	0	0	0	0	18
Lane Group Flow (vph)	42	0	0	1640	1354	91
Turn Type						Perm
Protected Phases	4			2	2	
Permitted Phases						2
Actuated Green, G (s)	7.2			74.8	74.8	74.8
Effective Green, g (s)	7.2			74.8	74.8	74.8
Actuated g/C Ratio	0.08			0.83	0.83	0.83
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	2.8			2.8	2.8	2.8
Lane Grp Cap (vph)	268			2941	1548	1316
v/s Ratio Prot	c0.01			0.46	c0.73	
v/s Ratio Perm						0.06
v/c Ratio	0.16			0.56	0.87	0.07
Uniform Delay, d1	38.6			2.4	4.7	1.4
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.2			0.8	7.2	0.1
Delay (s)	38.8			3.2	11.9	1.5
Level of Service	D			A	B	A
Approach Delay (s)	38.8			3.2	11.1	
Approach LOS	D			A	B	

Intersection Summary			
HCM Average Control Delay	7.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	1206	12	12	1452	12	12	25	12	12	12	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1710	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			0%			0%	
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		0.95			1.00			1.00	
Frpb, ped/bikes		1.00	0.95		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.97			0.96	
Flt Protected		1.00	1.00		1.00			0.99			0.98	
Satd. Flow (prot)		1815	1471		3096			1768			1741	
Flt Permitted		0.98	1.00		0.94			0.92			0.93	
Satd. Flow (perm)		1771	1471		2911			1645			1638	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	1340	13	13	1613	13	13	28	13	13	13	13
RTOR Reduction (vph)	0	0	2	0	0	0	0	12	0	0	12	0
Lane Group Flow (vph)	0	1353	11	0	1639	0	0	42	0	0	27	0
Confl. Peds. (#/hr)			9			2						
Confl. Bikes (#/hr)						1			2			1
Parking (#/hr)				0	0	0						
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		93.5	93.5		93.5			8.5			8.5	
Effective Green, g (s)		93.5	93.5		93.5			8.5			8.5	
Actuated g/C Ratio		0.85	0.85		0.85			0.08			0.08	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)		2.8	2.8		2.8			2.0			2.0	
Lane Grp Cap (vph)		1505	1250		2474			127			127	
v/s Ratio Prot												
v/s Ratio Perm		c0.76	0.01		0.56			c0.03			0.02	
v/c Ratio		0.90	0.01		0.66			0.33			0.21	
Uniform Delay, d1		5.2	1.2		2.8			48.1			47.6	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		8.9	0.0		1.4			0.6			0.3	
Delay (s)		14.1	1.3		4.2			48.6			47.9	
Level of Service		B	A		A			D			D	
Approach Delay (s)		14.0			4.2			48.6			47.9	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑	↱
Volume (vph)	394	824	12	25	467	27	25	455	98	62	407	984
Ideal Flow (vphpl)	1900	1900	1900	1900	1596	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	0.99		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1859		1770	1552		1770	1813		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1859		1770	1552		1770	1813		1770	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	438	916	13	28	519	30	28	506	109	69	452	1093
RTOR Reduction (vph)	0	0	0	0	1	0	0	5	0	0	0	44
Lane Group Flow (vph)	438	929	0	28	548	0	28	610	0	69	452	1049
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												6
Actuated Green, G (s)	36.0	74.4		2.4	40.8		2.4	44.8		4.0	46.4	82.4
Effective Green, g (s)	36.0	74.4		2.4	40.8		2.4	44.8		4.0	46.4	82.4
Actuated g/C Ratio	0.25	0.53		0.02	0.29		0.02	0.32		0.03	0.33	0.58
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.1		2.0	4.1		2.0	4.1		2.0	4.1	2.0
Lane Grp Cap (vph)	450	977		30	447		30	574		50	610	966
v/s Ratio Prot	0.25	0.50		0.02	c0.35		0.02	0.34		c0.04	0.24	c0.28
v/s Ratio Perm												0.39
v/c Ratio	0.97	0.95		0.93	1.23		0.93	1.06		1.38	0.74	1.09
Uniform Delay, d1	52.3	31.9		69.5	50.4		69.5	48.4		68.8	42.3	29.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	35.2	18.1		134.2	119.8		134.2	55.1		257.7	5.2	55.2
Delay (s)	87.5	50.0		203.7	170.2		203.7	103.5		326.5	47.5	84.8
Level of Service	F	D		F	F		F	F		F	D	F
Approach Delay (s)		62.0			171.8			107.8			84.7	
Approach LOS		E			F			F			F	

Intersection Summary			
HCM Average Control Delay	92.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.12		
Actuated Cycle Length (s)	141.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	105.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↑↑	↱	↰	↱
Volume (vph)	480	492	222	172	369	297
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1571	1770	1545
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	3539	1571	1770	1545
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	533	547	247	191	410	330
RTOR Reduction (vph)	0	0	0	66	0	237
Lane Group Flow (vph)	533	547	247	125	410	93
Confl. Peds. (#/hr)				8		7
Confl. Bikes (#/hr)				8		8
Turn Type	Prot			pm+ov		Perm
Protected Phases	1	6	2	4	4	
Permitted Phases				2		4
Actuated Green, G (s)	21.5	34.1	8.6	25.0	16.4	16.4
Effective Green, g (s)	21.5	34.1	8.6	25.0	16.4	16.4
Actuated g/C Ratio	0.37	0.58	0.15	0.43	0.28	0.28
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.1	3.1	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	651	1086	520	779	496	433
v/s Ratio Prot	c0.30	c0.29	0.07	0.04	c0.23	
v/s Ratio Perm				0.03		0.06
v/c Ratio	0.82	0.50	0.48	0.16	0.83	0.21
Uniform Delay, d1	16.7	7.2	22.9	10.3	19.7	16.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.0	0.4	0.3	0.0	10.3	0.1
Delay (s)	24.7	7.6	23.1	10.3	30.0	16.2
Level of Service	C	A	C	B	C	B
Approach Delay (s)		16.0	17.5		23.9	
Approach LOS		B	B		C	

Intersection Summary			
HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	58.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	ፋ		ሻ	ፋ		ሻ	ፋ		ሻ	ፋ	
Volume (vph)	25	62	12	110	37	62	12	802	50	62	1354	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.91		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1817		1770	1688		1770	1846		1770	1858	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1817		1770	1688		1770	1846		1770	1858	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	27	67	13	118	40	67	13	862	54	67	1456	27
RTOR Reduction (vph)	0	5	0	0	41	0	0	1	0	0	0	0
Lane Group Flow (vph)	27	75	0	118	66	0	13	915	0	67	1483	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	3.6	12.1		10.4	18.9		0.9	98.6		7.3	105.0	
Effective Green, g (s)	3.4	11.9		10.2	18.7		0.7	98.4		7.1	104.8	
Actuated g/C Ratio	0.02	0.08		0.07	0.13		0.00	0.69		0.05	0.73	
Clearance Time (s)	3.8	3.8		3.8	3.8		3.8	3.8		3.8	3.8	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	42	151		126	220		9	1265		88	1356	
v/s Ratio Prot	0.02	c0.04		c0.07	0.04		0.01	0.50		c0.04	c0.80	
v/s Ratio Perm												
v/c Ratio	0.64	0.50		0.94	0.30		1.44	0.72		0.76	1.09	
Uniform Delay, d1	69.5	63.0		66.4	56.5		71.4	14.1		67.4	19.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	22.5	0.9		59.6	0.3		474.2	2.1		28.8	54.1	
Delay (s)	92.0	63.9		126.0	56.8		545.6	16.2		96.2	73.5	
Level of Service	F	E		F	E		F	B		F	E	
Approach Delay (s)		71.0			93.1			23.6			74.5	
Approach LOS		E			F			C			E	

Intersection Summary			
HCM Average Control Delay	59.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	143.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	92.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↱		↰	↑↱	
Volume (vph)	12	12	12	98	12	123	12	864	37	110	1329	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1704		1770	1567		1770	3514		1770	3534	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1704		1770	1567		1770	3514		1770	3534	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	13	13	13	108	13	135	13	949	41	121	1460	13
RTOR Reduction (vph)	0	12	0	0	112	0	0	3	0	0	0	0
Lane Group Flow (vph)	13	14	0	108	36	0	13	987	0	121	1473	0
Confl. Peds. (#/hr)			1			1			1			1
Confl. Bikes (#/hr)			3			3			2			1
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	0.4	4.5		7.0	11.1		0.7	29.7		6.7	35.7	
Effective Green, g (s)	0.4	4.5		7.0	11.1		0.7	30.7		6.7	36.7	
Actuated g/C Ratio	0.01	0.07		0.11	0.17		0.01	0.47		0.10	0.57	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	11	118		191	268		19	1662		183	1998	
v/s Ratio Prot	0.01	0.01		c0.06	c0.02		0.01	0.28		c0.07	c0.42	
v/s Ratio Perm												
v/c Ratio	1.18	0.12		0.57	0.13		0.68	0.59		0.66	0.74	
Uniform Delay, d1	32.2	28.3		27.5	22.8		32.0	12.5		28.0	10.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	338.7	0.2		2.3	0.1		58.7	0.6		6.8	1.5	
Delay (s)	371.0	28.5		29.8	22.9		90.7	13.1		34.8	12.0	
Level of Service	F	C		C	C		F	B		C	B	
Approach Delay (s)		142.7			25.8			14.1			13.7	
Approach LOS		F			C			B			B	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	64.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱		↑↑	Y	
Volume (veh/h)	826	123	0	1588	0	247
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	972	145	0	1868	0	291
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1283		
pX, platoon unblocked						
vC, conflicting volume			1116		1906	972
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1116		1906	972
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	0
cM capacity (veh/h)			621		60	252

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	972	145	934	934	291
Volume Left	0	0	0	0	0
Volume Right	0	145	0	0	291
cSH	1700	1700	1700	1700	252
Volume to Capacity	0.57	0.09	0.55	0.55	1.15
Queue Length 95th (ft)	0	0	0	0	328
Control Delay (s)	0.0	0.0	0.0	0.0	146.1
Lane LOS					F
Approach Delay (s)	0.0		0.0		146.1
Approach LOS					F

Intersection Summary			
Average Delay	13.0		
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations	↰↰	↱	↰↰	↱↱	↰↰	↱
Volume (vph)	1009	345	1243	966	421	652
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	0.88	0.97	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3433	1562	3433	2724	3433	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3433	1562	3433	2724	3433	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1073	367	1322	1028	448	694
RTOR Reduction (vph)	0	195	0	607	0	5
Lane Group Flow (vph)	1073	172	1322	421	448	689
Confl. Peds. (#/hr)		1		2		
Turn Type		Perm		Perm		custom
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	28.6	28.6	35.4	35.4	12.0	51.4
Effective Green, g (s)	29.1	28.6	36.9	36.9	12.0	52.9
Actuated g/C Ratio	0.32	0.32	0.41	0.41	0.13	0.59
Clearance Time (s)	4.5	4.5	5.5	5.5	4.0	5.5
Vehicle Extension (s)	2.0	2.0	3.0	3.0	2.0	3.0
Lane Grp Cap (vph)	1110	496	1408	1117	458	930
v/s Ratio Prot	c0.31		c0.39		c0.13	0.44
v/s Ratio Perm		0.11		0.15		
v/c Ratio	0.97	0.35	0.94	0.38	0.98	0.74
Uniform Delay, d1	30.0	23.5	25.5	18.5	38.9	13.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	19.2	0.2	12.1	0.2	35.8	3.2
Delay (s)	49.1	23.7	37.6	18.7	74.7	16.8
Level of Service	D	C	D	B	E	B
Approach Delay (s)	42.6		29.3		39.5	
Approach LOS	D		C		D	

Intersection Summary			
HCM Average Control Delay	35.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰↰	↑↑	↱	↰↰	↑↑	↱	↰↰	↑↑	↱↱	↰↰	↑↑	↱
Volume (vph)	988	135	62	197	270	74	116	234	160	123	997	1257
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1098	150	69	219	300	82	129	260	178	137	1108	1397
RTOR Reduction (vph)	0	0	41	0	0	68	0	0	124	0	0	0
Lane Group Flow (vph)	1098	150	28	219	300	14	129	260	54	137	1108	1397
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			Free
Actuated Green, G (s)	42.7	50.4	50.4	12.1	19.8	19.8	5.1	37.8	37.8	8.9	41.1	129.2
Effective Green, g (s)	43.2	51.9	51.9	12.6	21.3	21.3	5.6	39.3	39.3	9.4	43.1	129.2
Actuated g/C Ratio	0.33	0.40	0.40	0.10	0.16	0.16	0.04	0.30	0.30	0.07	0.33	1.00
Clearance Time (s)	4.5	5.5	5.5	4.5	5.5	5.5	4.5	5.5	5.5	4.5	6.0	
Vehicle Extension (s)	2.0	4.1	4.1	2.0	4.5	4.5	2.0	4.5	4.5	2.0	3.7	
Lane Grp Cap (vph)	1148	1422	636	335	583	261	149	1076	848	250	1181	1583
v/s Ratio Prot	c0.32	0.04		0.06	0.08		0.04	0.07		0.04	c0.31	
v/s Ratio Perm			0.02			0.01			0.02			c0.88
v/c Ratio	0.96	0.11	0.04	0.65	0.51	0.05	0.87	0.24	0.06	0.55	0.94	0.88
Uniform Delay, d1	42.1	24.1	23.5	56.2	49.2	45.4	61.4	33.8	31.9	57.8	41.8	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.8	0.0	0.0	3.5	1.3	0.1	36.4	0.2	0.1	1.3	13.9	7.5
Delay (s)	58.9	24.2	23.6	59.7	50.5	45.6	97.8	34.0	32.0	59.2	55.7	7.5
Level of Service	E	C	C	E	D	D	F	C	C	E	E	A
Approach Delay (s)		53.1			53.2			47.9			30.4	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	40.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	129.2	Sum of lost time (s)	0.0
Intersection Capacity Utilization	79.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑↱		↰	↰↑	↱		↰↑↱	
Volume (vph)	12	1096	86	37	2266	12	98	12	62	12	12	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.7	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (prot)	1770	3539	1583	1770	3537		1681	1703	1583		1750	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	
Satd. Flow (perm)	1770	3539	1583	1770	3537		1681	1703	1583		1750	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	12	1130	89	38	2336	12	101	12	64	12	12	12
RTOR Reduction (vph)	0	0	25	0	0	0	0	0	58	0	12	0
Lane Group Flow (vph)	12	1130	64	38	2348	0	57	56	6	0	24	0
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						8			
Actuated Green, G (s)	1.5	90.0	90.0	4.3	92.8		11.3	11.3	11.3		3.0	
Effective Green, g (s)	1.1	91.7	90.0	3.9	94.5		11.1	11.1	11.1		2.8	
Actuated g/C Ratio	0.01	0.73	0.72	0.03	0.75		0.09	0.09	0.09		0.02	
Clearance Time (s)	3.6	5.7	5.7	3.6	5.7		3.8	3.8	3.8		3.8	
Vehicle Extension (s)	2.2	3.2	3.2	2.2	3.2		3.1	3.1	3.1		3.1	
Lane Grp Cap (vph)	16	2586	1135	55	2663		149	151	140		39	
v/s Ratio Prot	0.01	0.32		c0.02	c0.66		c0.03	0.03			c0.01	
v/s Ratio Perm			0.04						0.00			
v/c Ratio	0.75	0.44	0.06	0.69	0.88		0.38	0.37	0.04		0.62	
Uniform Delay, d1	62.1	6.7	5.2	60.2	11.4		54.0	53.9	52.3		60.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	99.6	0.1	0.0	27.3	3.8		1.7	1.6	0.1		27.3	
Delay (s)	161.6	6.8	5.3	87.5	15.2		55.7	55.5	52.5		88.1	
Level of Service	F	A	A	F	B		E	E	D		F	
Approach Delay (s)		8.2			16.4			54.5			88.1	
Approach LOS		A			B			D			F	

Intersection Summary			
HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	125.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

INTERSECTION SYNCHRO ANALYSIS

YR-2016 BUILD PM PEAK

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰	↰↑	↱	↰	↑↑	↱
Volume (vph)	480	492	1119	148	382	98	1006	617	123	197	542	345
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.91	0.91	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1559	1770	3539	1555	1610	3318	1548	1770	3539	1562
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	0.98	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1559	1770	3539	1555	1610	3318	1548	1770	3539	1562
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	533	547	1243	164	424	109	1118	686	137	219	602	383
RTOR Reduction (vph)	0	0	376	0	0	83	0	0	98	0	0	270
Lane Group Flow (vph)	533	547	867	164	424	26	593	1211	39	219	602	113
Confl. Peds. (#/hr)						2			5			
Confl. Bikes (#/hr)			6			2			1			1
Turn Type	Prot		Perm	Prot		Perm	Split		Perm	Split		Perm
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2			6			8			7
Actuated Green, G (s)	31.0	54.0	54.0	10.0	33.8	33.8	39.7	39.7	39.7	22.0	22.0	22.0
Effective Green, g (s)	30.0	55.7	55.7	9.0	34.7	34.7	41.0	41.0	41.0	23.3	23.3	23.3
Actuated g/C Ratio	0.21	0.38	0.38	0.06	0.24	0.24	0.28	0.28	0.28	0.16	0.16	0.16
Clearance Time (s)	3.0	5.7	5.7	3.0	4.9	4.9	5.3	5.3	5.3	5.3	5.3	5.3
Vehicle Extension (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	366	1359	599	110	847	372	455	938	438	284	569	251
v/s Ratio Prot	c0.30	0.15		0.09	0.12		c0.37	0.36		0.12	c0.17	
v/s Ratio Perm			c0.56			0.02			0.03			0.07
v/c Ratio	1.46	0.40	1.45	1.49	0.50	0.07	1.30	1.29	0.09	0.77	1.06	0.45
Uniform Delay, d1	57.5	32.5	44.6	68.0	47.7	42.7	52.0	52.0	38.3	58.3	60.8	55.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	220.0	0.1	210.9	262.7	0.2	0.0	151.8	139.0	0.0	11.2	54.0	0.5
Delay (s)	277.5	32.6	255.5	330.7	47.8	42.7	203.8	191.0	38.3	69.5	114.8	55.5
Level of Service	F	C	F	F	D	D	F	F	D	E	F	E
Approach Delay (s)		208.1			113.6			184.1			87.7	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	166.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.32		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	102.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱		↰	↑↱		↰	↑	↱
Volume (vph)	123	0	247	0	0	0	161	1685	0	0	1489	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0				4.0	4.0			4.0	4.0
Lane Util. Factor		1.00	1.00				1.00	1.00			1.00	1.00
Frpb, ped/bikes		1.00	0.98				1.00	1.00			1.00	0.98
Flpb, ped/bikes		1.00	1.00				1.00	1.00			1.00	1.00
Frt		1.00	0.85				1.00	1.00			1.00	0.85
Flt Protected		0.95	1.00				0.95	1.00			1.00	1.00
Satd. Flow (prot)		1770	1547				1770	1863			1863	1551
Flt Permitted		0.76	1.00				0.95	1.00			1.00	1.00
Satd. Flow (perm)		1410	1547				1770	1863			1863	1551
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	137	0	274	0	0	0	179	1872	0	0	1654	137
RTOR Reduction (vph)	0	0	115	0	0	0	0	0	0	0	0	17
Lane Group Flow (vph)	0	137	159	0	0	0	179	1872	0	0	1654	120
Confl. Bikes (#/hr)			1			1						1
Turn Type	Perm		Perm	Perm			Prot			Prot		Perm
Protected Phases		4			4		5	2		1	6	
Permitted Phases	4		4	4								6
Actuated Green, G (s)		17.6	17.6				12.0	121.5			105.5	105.5
Effective Green, g (s)		17.6	17.6				12.0	123.0			107.0	107.0
Actuated g/C Ratio		0.12	0.12				0.08	0.83			0.72	0.72
Clearance Time (s)		4.0	4.0				4.0	5.5			5.5	5.5
Vehicle Extension (s)		3.0	3.0				1.0	2.5			2.5	2.5
Lane Grp Cap (vph)		167	183				143	1542			1341	1117
v/s Ratio Prot							0.10	c1.00			0.89	
v/s Ratio Perm		0.10	c0.10									0.08
v/c Ratio		0.82	0.87				1.25	1.21			1.23	0.11
Uniform Delay, d1		64.0	64.4				68.3	12.8			20.8	6.3
Progression Factor		1.00	1.00				1.00	1.00			1.00	1.00
Incremental Delay, d2		26.4	33.4				158.1	102.5			111.7	0.0
Delay (s)		90.4	97.8				226.4	115.3			132.5	6.3
Level of Service		F	F				F	F			F	A
Approach Delay (s)		95.3			0.0			125.0			122.9	
Approach LOS		F			A			F			F	

Intersection Summary			
HCM Average Control Delay	121.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	148.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	108.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰	↱		↰↑↱		↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	25	12	430	25	12	25	542	1723	12	12	1551	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0	5.7	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97		0.99		1.00	1.00	0.98	1.00	1.00	1.00
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt		1.00	0.85		0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1802	1535		1710		1770	3539	1549	1770	3539	1583
Flt Permitted		0.97	1.00		0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1802	1535		1710		1770	3539	1549	1770	3539	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	27	13	457	27	13	27	577	1833	13	13	1650	27
RTOR Reduction (vph)	0	0	431	0	17	0	0	0	2	0	0	6
Lane Group Flow (vph)	0	40	26	0	50	0	577	1833	11	13	1650	21
Confl. Peds. (#/hr)			3			2						
Confl. Bikes (#/hr)			3			1			3			
Turn Type	Split		Perm	Split			Prot		Perm	Prot		Perm
Protected Phases	4	4		3	3		5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)		8.4	8.4		6.4		43.2	100.5	100.5	4.5	61.8	61.8
Effective Green, g (s)		7.8	7.8		5.8		42.2	102.2	100.5	3.5	63.5	63.5
Actuated g/C Ratio		0.06	0.06		0.04		0.31	0.76	0.74	0.03	0.47	0.47
Clearance Time (s)		3.4	3.4		3.4		3.0	5.7	5.7	3.0	5.7	5.7
Vehicle Extension (s)		1.0	1.0		0.5		1.0	1.0	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)		104	88		73		552	2673	1151	46	1661	743
v/s Ratio Prot		c0.02			c0.03		c0.33	0.52		0.01	c0.47	
v/s Ratio Perm			0.02						0.01			0.01
v/c Ratio		0.38	0.30		0.68		1.05	0.69	0.01	0.28	0.99	0.03
Uniform Delay, d1		61.4	61.1		63.8		46.6	8.4	4.5	64.7	35.7	19.3
Progression Factor		1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.9	0.7		18.9		50.7	0.6	0.0	1.2	20.4	0.0
Delay (s)		62.3	61.8		82.7		97.2	9.0	4.5	65.9	56.1	19.3
Level of Service		E	E		F		F	A	A	E	E	B
Approach Delay (s)		61.9			82.7			30.0			55.6	
Approach LOS		E			F			C			E	

Intersection Summary

HCM Average Control Delay	43.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	135.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations			↱↱		✥		↰	↑↑	↱		↓↓↓↓	
Volume (vph)	0	0	135	0	0	0	74	2178	0	0	1908	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)			4.0				4.0	4.0			4.0	
Lane Util. Factor			0.88				1.00	0.95			0.86	
Frt			0.85				1.00	1.00			0.99	
Flt Protected			1.00				0.95	1.00			1.00	
Satd. Flow (prot)			2787				1770	3539			6372	
Flt Permitted			1.00				0.06	1.00			1.00	
Satd. Flow (perm)			2787				119	3539			6372	
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	0	0	159	0	0	0	87	2562	0	0	2245	87
RTOR Reduction (vph)	0	0	21	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	0	138	0	0	0	87	2562	0	0	2327	0
Turn Type			custom	Perm			Perm		Perm			
Protected Phases					8			2			6	
Permitted Phases			4	8			2		2			
Actuated Green, G (s)			9.2				62.8	62.8			62.8	
Effective Green, g (s)			9.2				62.8	62.8			62.8	
Actuated g/C Ratio			0.12				0.78	0.78			0.78	
Clearance Time (s)			4.0				4.0	4.0			4.0	
Vehicle Extension (s)			3.0				3.0	3.0			3.0	
Lane Grp Cap (vph)			321				93	2778			5002	
v/s Ratio Prot								0.72			0.37	
v/s Ratio Perm			c0.05				c0.73					
v/c Ratio			0.43				0.94	0.92			0.47	
Uniform Delay, d1			33.0				7.0	6.7			2.9	
Progression Factor			1.00				1.00	1.00			1.00	
Incremental Delay, d2			0.9				76.9	6.5			0.3	
Delay (s)			33.9				83.9	13.2			3.2	
Level of Service			C				F	B			A	
Approach Delay (s)		33.9			0.0			15.5			3.2	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM Average Control Delay	10.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↰↑↱	↱	↰	↑↑	↱	↰↰	↑↱	
Volume (vph)	62	25	50	478	25	1121	37	1071	283	1181	751	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	5.5	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.91	0.86	0.91	1.00	0.95	1.00	0.97	0.95	
Frt	1.00	0.90		1.00	0.88	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1676		1610	2791	1441	1770	3539	1583	3433	3506	
Flt Permitted	0.95	1.00		0.95	0.99	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1676		1610	2791	1441	1770	3539	1583	3433	3506	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	69	28	56	531	28	1246	41	1190	314	1312	834	56
RTOR Reduction (vph)	0	52	0	0	441	441	0	0	229	0	2	0
Lane Group Flow (vph)	69	32	0	419	322	182	41	1190	85	1312	888	0
Turn Type	Split			Split		Perm	Prot		Perm	Prot		
Protected Phases	4	4		3	3		1	6		5	2	
Permitted Phases						3			6			
Actuated Green, G (s)	11.4	11.4		28.0	28.0	28.0	6.0	40.5	40.5	52.6	87.1	
Effective Green, g (s)	11.4	11.4		28.0	28.0	28.0	6.0	42.0	40.5	52.6	88.6	
Actuated g/C Ratio	0.08	0.08		0.19	0.19	0.19	0.04	0.28	0.27	0.35	0.59	
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.5	5.5	4.0	5.5	
Vehicle Extension (s)	1.0	1.0		1.0	1.0	1.0	1.0	4.7	4.7	1.5	5.4	
Lane Grp Cap (vph)	135	127		301	521	269	71	991	427	1204	2071	
v/s Ratio Prot	c0.04	0.02		c0.26	0.12		0.02	c0.34		c0.38	0.25	
v/s Ratio Perm						0.13			0.05			
v/c Ratio	0.51	0.25		1.39	0.88dr	0.68	0.58	1.20	0.20	1.09	0.43	
Uniform Delay, d1	66.6	65.3		61.0	56.1	56.8	70.8	54.0	42.2	48.7	16.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.4	0.4		195.6	1.5	5.2	6.9	100.2	1.0	54.0	0.7	
Delay (s)	68.0	65.7		256.6	57.6	62.0	77.6	154.2	43.3	102.7	17.5	
Level of Service	E	E		F	E	E	E	F	D	F	B	
Approach Delay (s)		66.7			105.3			129.6			68.2	
Approach LOS		E			F			F			E	

Intersection Summary				
HCM Average Control Delay	96.5	HCM Level of Service	F	
HCM Volume to Capacity ratio	1.14			
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	98.8%	ICU Level of Service	F	
Analysis Period (min)	15			

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥		↰	↑↱		↰	↑↱	
Volume (vph)	172	12	689	37	25	12	935	1231	50	12	897	307
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.89			0.98		1.00	0.99		1.00	0.96	
Flt Protected		0.99			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1648			1773		1770	3515		1770	3384	
Flt Permitted		0.99			0.49		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1648			895		1770	3515		1770	3384	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	181	13	725	39	26	13	984	1296	53	13	944	323
RTOR Reduction (vph)	0	97	0	0	5	0	0	2	0	0	24	0
Lane Group Flow (vph)	0	822	0	0	73	0	984	1347	0	13	1243	0
Confl. Peds. (#/hr)									1			
Confl. Bikes (#/hr)						1						2
Turn Type	Split			Perm			Prot			Prot		
Protected Phases	4!	4			8!		5	2		1	6	
Permitted Phases				8								
Actuated Green, G (s)		46.3			46.3		45.3	78.1		1.8	34.6	
Effective Green, g (s)		48.0			48.0		46.0	80.3		2.5	36.8	
Actuated g/C Ratio		0.34			0.34		0.32	0.56		0.02	0.26	
Clearance Time (s)		5.7			5.7		4.7	6.2		4.7	6.2	
Vehicle Extension (s)		3.0			3.0		2.0	3.8		2.0	3.8	
Lane Grp Cap (vph)		554			301		570	1977		31	872	
v/s Ratio Prot		c0.50					c0.56	0.38		0.01	c0.37	
v/s Ratio Perm					0.08							
v/c Ratio		1.48			0.24		1.73	0.68		0.42	1.43	
Uniform Delay, d1		47.4			34.2		48.4	22.2		69.4	53.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		227.3			0.4		334.2	1.0		3.3	198.3	
Delay (s)		274.7			34.7		382.6	23.2		72.7	251.3	
Level of Service		F			C		F	C		E	F	
Approach Delay (s)		274.7			34.7			174.8			249.5	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM Average Control Delay	213.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.55		
Actuated Cycle Length (s)	142.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	151.1%	ICU Level of Service	H
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑	↱	↰↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	407	787	677	12	1083	923	1181	1231	12	579	767	376
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	3539	1583	1770	3539	1583	3433	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	452	874	752	13	1203	1026	1312	1368	13	643	852	418
RTOR Reduction (vph)	0	0	271	0	0	240	0	0	6	0	0	129
Lane Group Flow (vph)	452	874	481	13	1203	786	1312	1368	7	643	852	289
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)	17.5	61.5	61.5	1.2	45.2	45.2	25.5	38.8	38.8	24.5	37.8	37.8
Effective Green, g (s)	18.0	62.0	62.0	1.7	45.7	45.7	26.0	40.3	40.3	25.0	39.3	39.3
Actuated g/C Ratio	0.12	0.43	0.43	0.01	0.32	0.32	0.18	0.28	0.28	0.17	0.27	0.27
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5.5	5.5	4.5	5.5	5.5
Vehicle Extension (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	5.1	5.1	2.0	5.1	5.1
Lane Grp Cap (vph)	220	1513	677	21	1115	499	616	984	440	305	959	429
v/s Ratio Prot	c0.26	0.25		0.01	0.34		c0.38	c0.39		c0.36	0.24	
v/s Ratio Perm			0.30			c0.50			0.00			0.18
v/c Ratio	2.05	0.58	0.71	0.62	1.08	1.57	2.13	1.39	0.02	2.11	0.89	0.67
Uniform Delay, d1	63.5	31.5	34.1	71.3	49.6	49.6	59.5	52.4	38.0	60.0	50.7	47.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	490.0	0.3	2.9	32.5	50.9	268.0	513.9	181.9	0.1	509.7	12.1	8.2
Delay (s)	553.5	31.9	37.0	103.9	100.6	317.7	573.4	234.3	38.0	569.7	62.8	55.3
Level of Service	F	C	D	F	F	F	F	F	D	F	E	E
Approach Delay (s)		147.2			199.9			398.5			231.5	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	254.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.82		
Actuated Cycle Length (s)	145.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	131.9%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱	↰	↰↑	↱	↰	↑↑↑↱		↰	↑↑	↱
Volume (vph)	12	25	12	185	25	517	25	1895	234	529	939	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.91		1.00	0.95	1.00
Frpb, ped/bikes		1.00	0.97	1.00	1.00	0.99	1.00	1.00		1.00	1.00	0.98
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected		0.98	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)		1834	1529	1681	1704	1562	1770	5001		1770	3539	1550
Flt Permitted		0.98	1.00	0.95	0.96	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)		1834	1529	1681	1704	1562	1770	5001		1770	3539	1550
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	28	13	206	28	574	28	2106	260	588	1043	28
RTOR Reduction (vph)	0	0	13	0	0	347	0	10	0	0	0	9
Lane Group Flow (vph)	0	41	0	115	119	227	28	2356	0	588	1043	19
Confl. Bikes (#/hr)			2			1						2
Turn Type	Split		Perm	Split		Perm	Prot			Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8						6
Actuated Green, G (s)		2.5	2.5	23.4	23.4	23.4	3.8	58.0		46.1	100.3	100.3
Effective Green, g (s)		3.0	3.0	23.9	23.9	23.9	4.3	60.5		46.6	102.8	102.8
Actuated g/C Ratio		0.02	0.02	0.16	0.16	0.16	0.03	0.40		0.31	0.69	0.69
Clearance Time (s)		4.5	4.5	4.5	4.5	4.5	4.5	6.5		4.5	6.5	6.5
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	4.6		2.0	5.1	5.1
Lane Grp Cap (vph)		37	31	268	272	249	51	2017		550	2425	1062
v/s Ratio Prot		c0.02		0.07	0.07		0.02	c0.47		c0.33	0.29	
v/s Ratio Perm			0.00			c0.15						0.01
v/c Ratio		1.11	0.01	0.43	0.44	0.91	0.55	1.17		1.07	0.43	0.02
Uniform Delay, d1		73.5	72.0	56.9	57.0	62.0	71.9	44.8		51.7	10.5	7.5
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2		182.0	0.0	0.4	0.4	33.7	6.3	81.4		58.2	0.6	0.0
Delay (s)		255.5	72.1	57.3	57.4	95.7	78.2	126.1		109.9	11.1	7.6
Level of Service		F	E	E	E	F	E	F		F	B	A
Approach Delay (s)		211.3			84.6			125.6			46.0	
Approach LOS		F			F			F			D	

Intersection Summary			
HCM Average Control Delay	92.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	93.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	25	25	1993	25	12	1366
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0		4.0	4.0
Lane Util. Factor	1.00		0.95		1.00	1.00
Frt	0.93		1.00		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1695		3533		1770	1863
Flt Permitted	0.98		1.00		0.95	1.00
Satd. Flow (perm)	1695		3533		1770	1863
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	28	28	2214	28	13	1518
RTOR Reduction (vph)	26	0	0	0	0	0
Lane Group Flow (vph)	30	0	2242	0	13	1518
Turn Type					Prot	
Protected Phases	8		6		5	2
Permitted Phases						
Actuated Green, G (s)	8.2		102.6		7.2	113.8
Effective Green, g (s)	8.2		102.6		7.2	113.8
Actuated g/C Ratio	0.06		0.79		0.06	0.88
Clearance Time (s)	4.0		4.0		4.0	4.0
Vehicle Extension (s)	3.0		2.8		2.4	2.8
Lane Grp Cap (vph)	107		2788		98	1631
v/s Ratio Prot	c0.02		0.63		0.01	c0.81
v/s Ratio Perm						
v/c Ratio	0.28		0.80		0.13	0.93
Uniform Delay, d1	58.1		7.9		58.4	5.4
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	1.4		2.6		0.4	11.0
Delay (s)	59.5		10.5		58.8	16.4
Level of Service	E		B		E	B
Approach Delay (s)	59.5		10.5			16.8
Approach LOS	E		B			B

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	130.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	81.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	234	25	0	1784	1304	86
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	4.0
Lane Util. Factor	0.97			0.95	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	0.96			1.00	1.00	1.00
Satd. Flow (prot)	3407			3539	1863	1583
Flt Permitted	0.96			1.00	1.00	1.00
Satd. Flow (perm)	3407			3539	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	260	28	0	1982	1449	96
RTOR Reduction (vph)	9	0	0	0	0	20
Lane Group Flow (vph)	279	0	0	1982	1449	76
Turn Type						Perm
Protected Phases	4			2	2	
Permitted Phases						2
Actuated Green, G (s)	13.2			78.8	78.8	78.8
Effective Green, g (s)	13.2			78.8	78.8	78.8
Actuated g/C Ratio	0.13			0.79	0.79	0.79
Clearance Time (s)	4.0			4.0	4.0	4.0
Vehicle Extension (s)	2.8			2.8	2.8	2.8
Lane Grp Cap (vph)	450			2789	1468	1247
v/s Ratio Prot	c0.08			0.56	c0.78	
v/s Ratio Perm						0.05
v/c Ratio	0.62			0.71	0.99	0.06
Uniform Delay, d1	41.0			5.1	10.1	2.4
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	2.5			1.6	20.6	0.1
Delay (s)	43.5			6.7	30.7	2.5
Level of Service	D			A	C	A
Approach Delay (s)	43.5			6.7	29.0	
Approach LOS	D			A	C	

Intersection Summary			
HCM Average Control Delay	18.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↰↑	↱		↰↑↱			✥			✥	
Volume (vph)	12	1279	37	12	1698	25	37	123	62	50	50	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1710	1900	1900	1900	1900	1900	1900	1900
Grade (%)		5%			-5%			0%			0%	
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		0.95			1.00			1.00	
Frpb, ped/bikes		1.00	0.95		1.00			0.99			1.00	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		1.00			0.96			0.96	
Flt Protected		1.00	1.00		1.00			0.99			0.98	
Satd. Flow (prot)		1815	1460		3093			1765			1742	
Flt Permitted		0.97	1.00		0.73			0.86			0.52	
Satd. Flow (perm)		1753	1460		2252			1535			925	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	13	1421	41	13	1887	28	41	137	69	56	56	56
RTOR Reduction (vph)	0	0	8	0	1	0	0	10	0	0	13	0
Lane Group Flow (vph)	0	1434	33	0	1927	0	0	237	0	0	155	0
Confl. Peds. (#/hr)			9			2						
Confl. Bikes (#/hr)						1			2			1
Parking (#/hr)				0	0	0						
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		2			6			8			4	
Permitted Phases	2		2	6			8			4		
Actuated Green, G (s)		110.0	110.0		110.0			22.0			22.0	
Effective Green, g (s)		110.0	110.0		110.0			22.0			22.0	
Actuated g/C Ratio		0.79	0.79		0.79			0.16			0.16	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Vehicle Extension (s)		2.8	2.8		2.8			2.0			2.0	
Lane Grp Cap (vph)		1377	1147		1769			241			145	
v/s Ratio Prot												
v/s Ratio Perm		0.82	0.02		c0.86			0.15			c0.17	
v/c Ratio		1.04	0.03		1.09			0.98			1.07	
Uniform Delay, d1		15.0	3.3		15.0			58.8			59.0	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		35.8	0.0		50.2			52.7			95.1	
Delay (s)		50.8	3.3		65.2			111.5			154.1	
Level of Service		D	A		E			F			F	
Approach Delay (s)		49.4			65.2			111.5			154.1	
Approach LOS		D			E			F			F	

Intersection Summary			
HCM Average Control Delay	66.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	99.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	615	751	25	50	886	12	25	542	135	125	419	824
Ideal Flow (vphpl)	1900	1900	1900	1900	1596	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00		1.00	1.00		1.00	0.97		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1770	1854		1770	1562		1770	1807		1770	1863	1583
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	1.00
Satd. Flow (perm)	1770	1854		1770	1562		1770	1807		1770	1863	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	683	834	28	56	984	13	28	602	150	139	466	916
RTOR Reduction (vph)	0	1	0	0	1	0	0	6	0	0	0	19
Lane Group Flow (vph)	683	861	0	56	996	0	28	746	0	139	466	897
Turn Type	Prot			Prot			Prot			Prot		pm+ov
Protected Phases	7	4		3	8		5	2		1	6	7
Permitted Phases												6
Actuated Green, G (s)	30.0	81.2		5.6	56.8		2.4	41.8		7.0	46.4	76.4
Effective Green, g (s)	30.0	81.2		5.6	56.8		2.4	41.8		7.0	46.4	76.4
Actuated g/C Ratio	0.20	0.54		0.04	0.37		0.02	0.28		0.05	0.31	0.50
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	2.0	4.1		2.0	4.1		2.0	4.1		2.0	4.1	2.0
Lane Grp Cap (vph)	350	993		65	585		28	498		82	570	840
v/s Ratio Prot	c0.39	0.46		0.03	c0.64		0.02	c0.41		c0.08	0.25	0.21
v/s Ratio Perm												0.36
v/c Ratio	1.95	0.87		0.86	1.70		1.00	1.50		1.70	0.82	1.07
Uniform Delay, d1	60.8	30.5		72.6	47.4		74.6	54.9		72.3	48.7	37.6
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	438.4	8.4		63.7	323.7		170.1	234.7		359.4	9.4	50.9
Delay (s)	499.2	38.9		136.3	371.1		244.7	289.6		431.7	58.1	88.5
Level of Service	F	D		F	F		F	F		F	E	F
Approach Delay (s)		242.4			358.6			288.0			110.5	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	233.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.69		
Actuated Cycle Length (s)	151.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	147.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	396	591	505	283	209	419
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	0.97
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1863	3539	1565	1770	1543
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1863	3539	1565	1770	1543
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	440	657	561	314	232	466
RTOR Reduction (vph)	0	0	0	66	0	366
Lane Group Flow (vph)	440	657	561	248	232	100
Confl. Peds. (#/hr)				8		7
Confl. Bikes (#/hr)				8		8
Turn Type	Prot			pm+ov		Perm
Protected Phases	1	6	2	4	4	
Permitted Phases				2		4
Actuated Green, G (s)	16.9	32.4	11.5	22.5	11.0	11.0
Effective Green, g (s)	16.9	32.4	11.5	22.5	11.0	11.0
Actuated g/C Ratio	0.33	0.63	0.22	0.44	0.21	0.21
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.1	3.1	1.0	1.0	1.0	1.0
Lane Grp Cap (vph)	582	1174	792	807	379	330
v/s Ratio Prot	c0.25	0.35	c0.16	0.07	c0.13	
v/s Ratio Perm				0.09		0.06
v/c Ratio	0.76	0.56	0.71	0.31	0.61	0.30
Uniform Delay, d1	15.4	5.4	18.4	9.4	18.3	17.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.6	0.6	2.4	0.1	2.1	0.2
Delay (s)	21.0	6.0	20.8	9.5	20.3	17.2
Level of Service	C	A	C	A	C	B
Approach Delay (s)		12.0	16.7		18.2	
Approach LOS		B	B		B	

Intersection Summary			
HCM Average Control Delay	15.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	51.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↑↱		↰	↑↱	
Volume (vph)	37	62	12	295	123	160	12	1119	37	74	1061	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.92		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1817		1770	1705		1770	1854		1770	1844	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1817		1770	1705		1770	1854		1770	1844	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	40	67	13	317	132	172	13	1203	40	80	1141	80
RTOR Reduction (vph)	0	5	0	0	32	0	0	1	0	0	1	0
Lane Group Flow (vph)	40	75	0	317	272	0	13	1242	0	80	1220	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	4.9	12.0		23.2	30.3		1.0	90.0		6.2	95.2	
Effective Green, g (s)	4.7	11.8		23.0	30.1		0.8	89.8		6.0	95.0	
Actuated g/C Ratio	0.03	0.08		0.16	0.21		0.01	0.61		0.04	0.65	
Clearance Time (s)	3.8	3.8		3.8	3.8		3.8	3.8		3.8	3.8	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	57	146		278	350		10	1136		72	1195	
v/s Ratio Prot	0.02	0.04		c0.18	c0.16		0.01	c0.67		c0.05	0.66	
v/s Ratio Perm												
v/c Ratio	0.70	0.52		1.14	0.78		1.30	1.09		1.11	1.02	
Uniform Delay, d1	70.3	64.7		61.8	55.1		72.9	28.4		70.3	25.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	27.2	1.3		97.3	9.5		398.9	56.0		139.6	31.3	
Delay (s)	97.4	65.9		159.1	64.6		471.8	84.4		209.9	57.1	
Level of Service	F	E		F	E		F	F		F	E	
Approach Delay (s)		76.4			112.8			88.4			66.5	
Approach LOS		E			F			F			E	

Intersection Summary			
HCM Average Control Delay	83.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	146.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	91.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↑↱		↰	↑↱	
Volume (vph)	25	37	12	222	12	222	12	1194	74	110	949	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.97		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.86		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1786		1770	1556		1770	3503		1770	3532	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	1786		1770	1556		1770	3503		1770	3532	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	27	41	13	244	13	244	13	1312	81	121	1043	13
RTOR Reduction (vph)	0	12	0	0	122	0	0	4	0	0	1	0
Lane Group Flow (vph)	27	42	0	244	135	0	13	1389	0	121	1055	0
Confl. Peds. (#/hr)			1			1			1			1
Confl. Bikes (#/hr)			3			3			2			1
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	1.8	6.8		12.2	17.2		0.5	37.9		6.1	43.5	
Effective Green, g (s)	1.8	6.8		12.2	17.2		0.5	38.9		6.1	44.5	
Actuated g/C Ratio	0.02	0.08		0.15	0.22		0.01	0.49		0.08	0.56	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.0	2.0		1.0	2.0		1.0	3.1		1.0	3.1	
Lane Grp Cap (vph)	40	152		270	335		11	1703		135	1965	
v/s Ratio Prot	0.02	0.02		c0.14	c0.09		0.01	c0.40		c0.07	0.30	
v/s Ratio Perm												
v/c Ratio	0.68	0.28		0.90	0.40		1.18	0.82		0.90	0.54	
Uniform Delay, d1	38.8	34.3		33.3	27.0		39.8	17.5		36.6	11.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	29.9	0.4		30.2	0.3		338.7	3.2		46.4	0.3	
Delay (s)	68.8	34.7		63.5	27.3		378.5	20.6		83.0	11.5	
Level of Service	E	C		E	C		F	C		F	B	
Approach Delay (s)		46.0			44.9			24.0			18.9	
Approach LOS		D			D			C			B	

Intersection Summary				
HCM Average Control Delay	26.0	HCM Level of Service	C	
HCM Volume to Capacity ratio	0.76			
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	12.0	
Intersection Capacity Utilization	72.2%	ICU Level of Service	C	
Analysis Period (min)	15			
c Critical Lane Group				

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱		↑↑	Y	
Volume (veh/h)	1292	123	0	1270	0	443
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	1520	145	0	1494	0	521
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				1283		
pX, platoon unblocked						
vC, conflicting volume			1665		2267	1520
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1665		2267	1520
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	0
cM capacity (veh/h)			382		34	108

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	1520	145	747	747	521
Volume Left	0	0	0	0	0
Volume Right	0	145	0	0	521
cSH	1700	1700	1700	1700	108
Volume to Capacity	0.89	0.09	0.44	0.44	4.84
Queue Length 95th (ft)	0	0	0	0	Err
Control Delay (s)	0.0	0.0	0.0	0.0	Err
Lane LOS					F
Approach Delay (s)	0.0		0.0		Err
Approach LOS					F

Intersection Summary			
Average Delay	1416.1		
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		

Movement	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations						
Volume (vph)	1139	359	911	911	664	1071
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.5	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	0.88	0.97	1.00
Frpb, ped/bikes	1.00	0.99	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3433	1562	3433	2723	3433	1583
Flt Permitted	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3433	1562	3433	2723	3433	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	1212	382	969	969	706	1139
RTOR Reduction (vph)	0	260	0	620	0	2
Lane Group Flow (vph)	1212	122	969	349	706	1137
Confl. Peds. (#/hr)		1		2		
Turn Type		Perm		Perm		custom
Protected Phases	4		2		1	6
Permitted Phases		4		2		
Actuated Green, G (s)	33.5	33.5	38.1	38.1	24.4	66.5
Effective Green, g (s)	34.0	33.5	39.6	39.6	24.4	68.0
Actuated g/C Ratio	0.31	0.30	0.36	0.36	0.22	0.62
Clearance Time (s)	4.5	4.5	5.5	5.5	4.0	5.5
Vehicle Extension (s)	2.0	2.0	3.0	3.0	2.0	3.0
Lane Grp Cap (vph)	1061	476	1236	980	762	979
v/s Ratio Prot	c0.35		0.28		0.21	c0.72
v/s Ratio Perm		0.08		0.13		
v/c Ratio	1.14	0.26	0.78	0.36	0.93	1.16
Uniform Delay, d1	38.0	28.9	31.4	25.8	41.9	21.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	75.6	0.1	3.3	0.2	16.9	84.1
Delay (s)	113.6	29.0	34.7	26.1	58.8	105.1
Level of Service	F	C	C	C	E	F
Approach Delay (s)	93.3		30.4		87.4	
Approach LOS	F		C		F	

Intersection Summary			
HCM Average Control Delay	68.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	87.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1232	222	80	197	172	148	98	1021	160	123	467	972
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.88	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	2787	3433	3539	1583
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1369	247	89	219	191	164	109	1134	178	137	519	1080
RTOR Reduction (vph)	0	0	51	0	0	60	0	0	77	0	0	0
Lane Group Flow (vph)	1369	247	38	219	191	104	109	1134	101	137	519	1080
Turn Type	Prot		Perm	Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		1	6		5	2	
Permitted Phases			4			8			6			Free
Actuated Green, G (s)	46.8	52.7	52.7	11.6	17.5	17.5	7.4	37.5	37.5	5.1	34.7	126.9
Effective Green, g (s)	47.3	54.2	54.2	12.1	19.0	19.0	7.9	39.0	39.0	5.6	36.7	126.9
Actuated g/C Ratio	0.37	0.43	0.43	0.10	0.15	0.15	0.06	0.31	0.31	0.04	0.29	1.00
Clearance Time (s)	4.5	5.5	5.5	4.5	5.5	5.5	4.5	5.5	5.5	4.5	6.0	
Vehicle Extension (s)	2.0	4.1	4.1	2.0	4.5	4.5	2.0	4.5	4.5	2.0	3.7	
Lane Grp Cap (vph)	1280	1512	676	327	530	237	214	1088	857	151	1023	1583
v/s Ratio Prot	c0.40	0.07		0.06	0.05		0.03	c0.32		0.04	0.15	
v/s Ratio Perm			0.02			0.07			0.04			c0.68
v/c Ratio	1.07	0.16	0.06	0.67	0.36	0.44	0.51	1.04	0.12	0.91	0.51	0.68
Uniform Delay, d1	39.8	22.4	21.3	55.5	48.5	49.1	57.6	44.0	31.6	60.4	37.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	46.0	0.1	0.1	4.0	0.7	2.2	0.7	38.9	0.1	45.7	0.5	2.4
Delay (s)	85.8	22.5	21.4	59.5	49.2	51.3	58.3	82.9	31.7	106.1	38.1	2.4
Level of Service	F	C	C	E	D	D	E	F	C	F	D	A
Approach Delay (s)		73.3			53.7			74.6			21.2	
Approach LOS		E			D			E			C	

Intersection Summary			
HCM Average Control Delay	54.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	126.9	Sum of lost time (s)	4.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑↱		↰	↰↑	↱		✥	
Volume (vph)	12	2314	74	86	1489	12	62	12	86	12	12	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.7	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.98	
Satd. Flow (prot)	1770	3539	1583	1770	3535		1681	1711	1583		1750	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.97	1.00		0.98	
Satd. Flow (perm)	1770	3539	1583	1770	3535		1681	1711	1583		1750	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	12	2386	76	89	1535	12	64	12	89	12	12	12
RTOR Reduction (vph)	0	0	12	0	0	0	0	0	82	0	12	0
Lane Group Flow (vph)	12	2386	64	89	1547	0	38	38	7	0	24	0
Turn Type	Prot		Perm	Prot			Split		Perm	Split		
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			2						8			
Actuated Green, G (s)	2.1	98.1	98.1	8.6	104.6		10.7	10.7	10.7		3.9	
Effective Green, g (s)	1.7	99.8	98.1	8.2	106.3		10.5	10.5	10.5		3.7	
Actuated g/C Ratio	0.01	0.72	0.71	0.06	0.77		0.08	0.08	0.08		0.03	
Clearance Time (s)	3.6	5.7	5.7	3.6	5.7		3.8	3.8	3.8		3.8	
Vehicle Extension (s)	2.2	3.2	3.2	2.2	3.2		3.1	3.1	3.1		3.1	
Lane Grp Cap (vph)	22	2556	1124	105	2719		128	130	120		47	
v/s Ratio Prot	0.01	c0.67		c0.05	0.44		c0.02	0.02			c0.01	
v/s Ratio Perm			0.04						0.00			
v/c Ratio	0.55	0.93	0.06	0.85	0.57		0.30	0.29	0.06		0.52	
Uniform Delay, d1	67.9	16.4	6.1	64.4	6.5		60.4	60.3	59.3		66.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2	16.4	7.1	0.0	42.4	0.3		1.3	1.3	0.2		9.6	
Delay (s)	84.3	23.5	6.1	106.8	6.8		61.7	61.6	59.5		76.0	
Level of Service	F	C	A	F	A		E	E	E		E	
Approach Delay (s)		23.3			12.3			60.5			76.0	
Approach LOS		C			B			E			E	

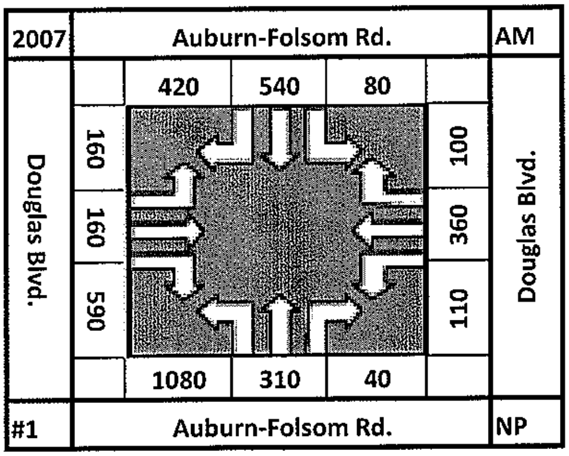
Intersection Summary			
HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	138.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	86.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX A-2

INTERSECTION TURNING MOVEMENT VOLUMES (TMVs)

INTERSECTION TMV

YR-2007 AM/PM PEAK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Auburn-Folsom Rd.
AM
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540
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160
160
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110
Douglas Blvd.
1080
310
40
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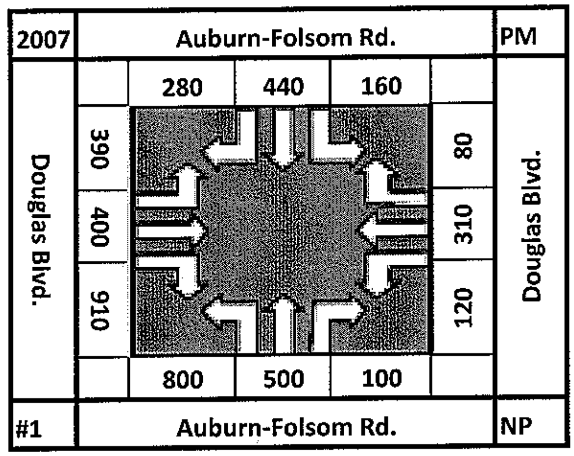
Auburn-Folsom Rd.
NP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Auburn-Folsom Rd.
PM
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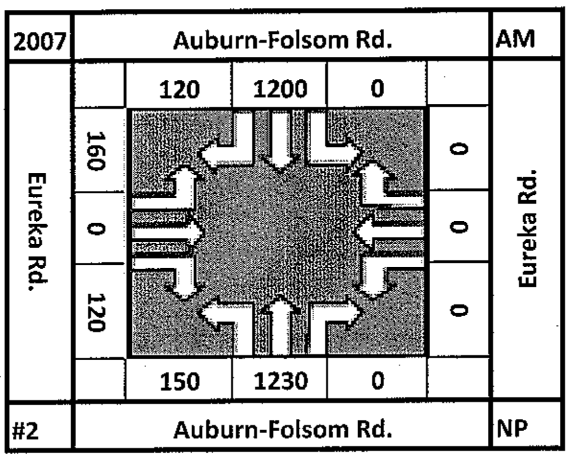
440
160
Douglas Blvd.
390
400
910
80
310
120
Douglas Blvd.
800
500
100
#1
Auburn-Folsom Rd.
NP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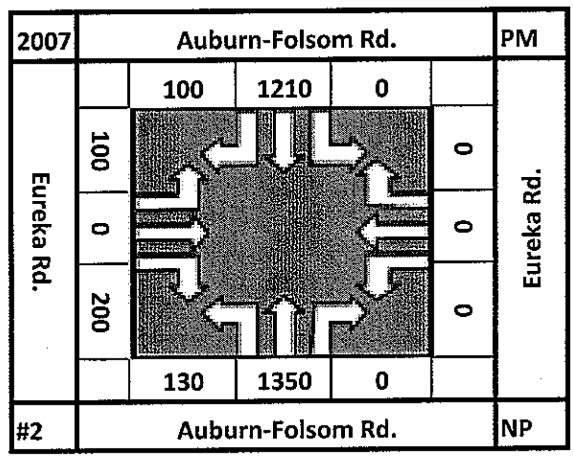
AM
120
1200
0
Eureka Rd.
160
0
120
0
0
0
Eureka Rd.
150
1230
0
#2
Auburn-Folsom Rd.
NP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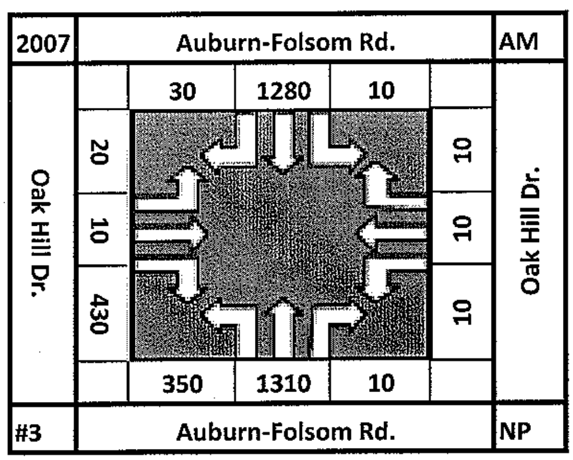
Auburn-Folsom Rd.
PM
100
1210
0
Eureka Rd.
100
0
200
0
0
0
Eureka Rd.
130
1350
0
#2
Auburn-Folsom Rd.
NP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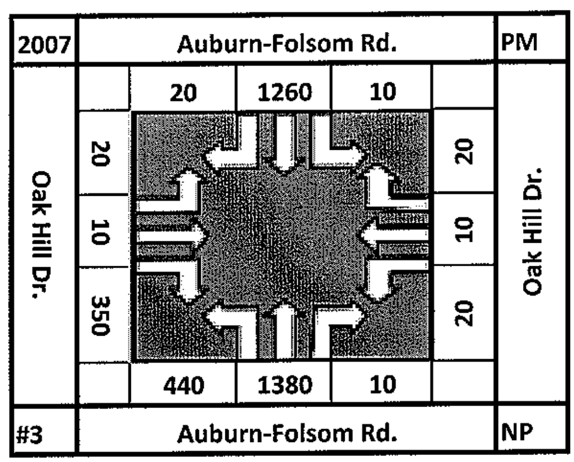
Auburn-Folsom Rd.
AM
30
1280
10
Oak Hill Dr.
20
10
430
10
10
10
Oak Hill Dr.
350
1310
10
#3
Auburn-Folsom Rd.
NP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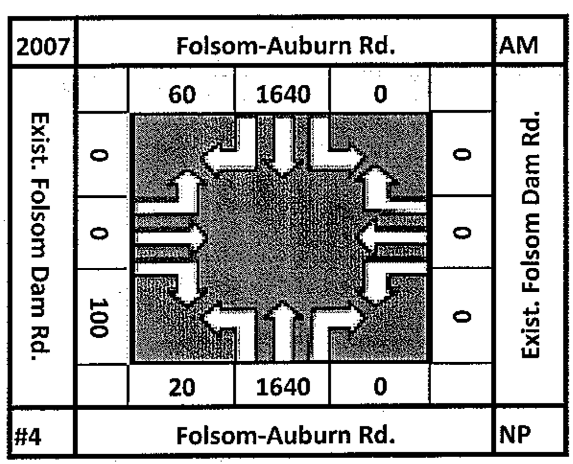
Auburn-Folsom Rd.
PM
20
1260
10
Oak Hill Dr.
20
10
350
20
10
20
Oak Hill Dr.
440
1380
10
#3
Auburn-Folsom Rd.
NP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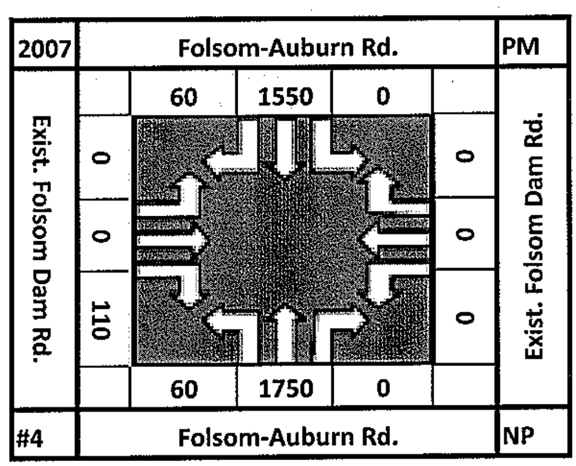
Folsom-Auburn Rd.
AM
60
1640
0
Exist. Folsom Dam Rd.
0
0
100
0
0
0
Exist. Folsom Dam Rd.
20
1640
0
#4
Folsom-Auburn Rd.
NP


2007
Folsom-Auburn Rd.
PM
60
1550
0
Exist. Folsom Dam Rd.
0
0
110
0
0
0
Exist. Folsom Dam Rd.
60
1750
0
#4
Folsom-Auburn Rd.
NP

2007	Folsom-Auburn Rd.					AM
Auto Spa Driveway		20	880	790		Folsom Lake Crossing
	30				940	
	20				20	
	30				160	
		20	690	290		
#5	Folsom-Auburn Rd.					NP

2007	Folsom-Auburn Rd.					PM
Auto Spa Driveway		40	610	960		Folsom Lake Crossing
	50				890	
	20				20	
	40				370	
		30	870	230		
#5	Folsom-Auburn Rd.					NP

2007	Folsom-Auburn Rd.					AM
Oak Avenue Pkwy.		110	980	10		Oak Avenue Pkwy.
	170				10	
	10				10	
	790				40	
		190	840	10		
#6	Folsom-Auburn Rd.					NP

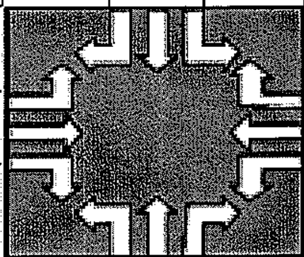
2007	Folsom-Auburn Rd.					PM
Oak Avenue Pkwy.		250	710	10		Oak Avenue Pkwy.
	140				10	
	10				20	
	560				30	
		760	1000	40		
#6	Folsom-Auburn Rd.					NP

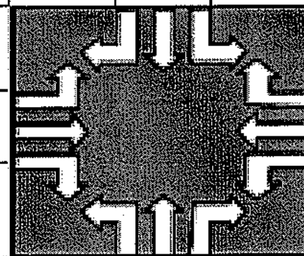
2007	Folsom-Auburn Rd.					AM
Greenback Ln.		160	1510	290		Greenback Ln.
	210				470	
	770				740	
	830				20	
		300	320	10		
#7	Folsom-Auburn Rd.					NP

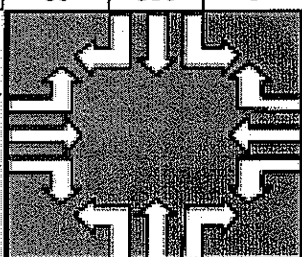
2007	Folsom-Auburn Rd.					PM
Greenback Ln.		300	610	470		Greenback Ln.
	330				750	
	640				880	
	550				10	
		960	1000	10		
#7	Folsom-Auburn Rd.					NP

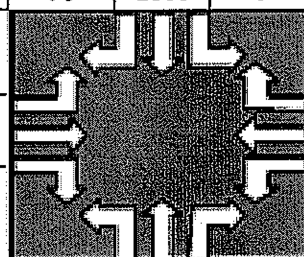
2007	Folsom-Auburn Rd.					AM
Forrest St.		10	2260	110		Natoma St.
	10				160	
	20				0	
	20				200	
		10	460	200		
#8	Folsom-Auburn Rd.					NP

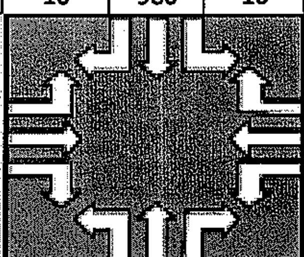
2007	Folsom-Auburn Rd.					PM
Forrest St.		20	750	430		Natoma St.
	10				420	
	20				20	
	10				150	
		20	1540	190		
#8	Folsom-Auburn Rd.					NP

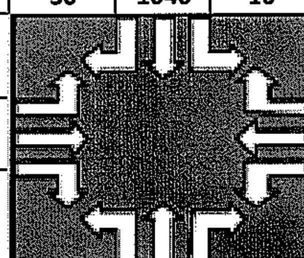
2007		Riley St.				AM
		0	1060	10		
	0				10	
	0				0	Scott St.
	0				10	
		0	1220	10		
#9			Riley St.			NP

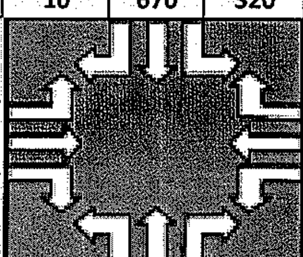
2007		Riley St.				PM
		0	1110	10		
	0				20	
	0				0	Scott St.
	0				20	
		0	1620	20		
#9			Riley St.			NP

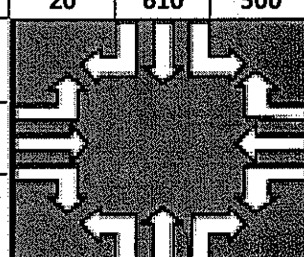
2007		Riley St.				AM
		80	990	0		
	30				0	
Leidesdorff St.	0				0	
	10				0	
		0	1200	0		
#10			Riley St.			NP

2007		Riley St.				PM
		70	1060	0		
	190				0	
Leidesdorff St.	0				0	
	20				0	
		0	1450	0		
#10			Riley St.			NP

2007		Riley St.				AM
		10	980	10		
	10				10	
Sutter St.	20				10	Sutter St.
	10				10	
		10	1180	10		
#11			Riley St.			NP

2007		Riley St.				PM
		30	1040	10		
	30				40	
Sutter St.	100				40	Sutter St.
	50				40	
		10	1380	20		
#11			Riley St.			NP

2007		Riley St.				AM
		10	670	320		
	20				800	
Natoma St.	370				330	Natoma St.
	80				50	
		20	380	20		
#12			Riley St.			NP

2007		Riley St.				PM
		20	610	500		
	20				670	
Natoma St.	440				340	Natoma St.
	110				100	
		40	720	10		
#12			Riley St.			NP

2007			Riley St.			AM
		0	400	390		
	0				240	
	0				0	E. Bidwell St.
	0				300	
		0	180	140		
#13			Riley St.			NP

2007			Riley St.			PM
		0	480	320		
	0				340	
	0				0	E. Bidwell St.
	0				170	
		0	410	230		
#13			Riley St.			NP

2007			Natoma St.			AM
		20	1100	50		
	20				50	
Coloma St.	50				30	Coloma St.
	10				90	
		10	650	40		
#14			Natoma St.			NP

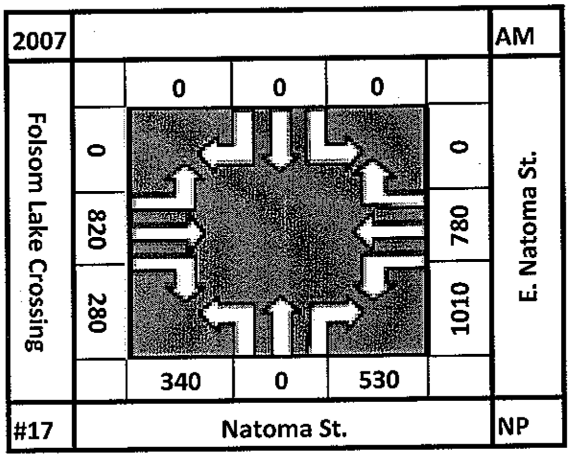
2007			Natoma St.			PM
		60	860	60		
	30				130	
Coloma St.	50				100	Coloma St.
	10				240	
		10	910	30		
#14			Natoma St.			NP

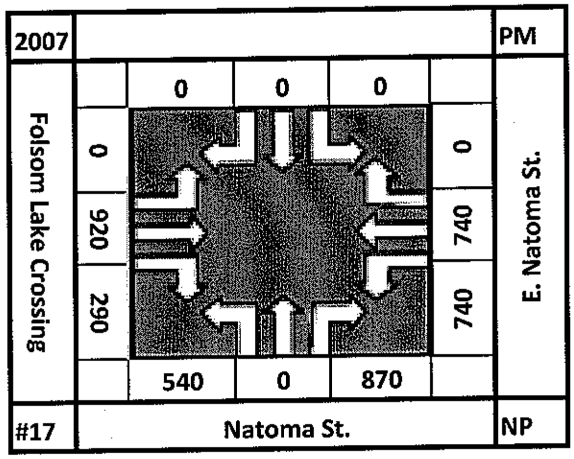
2007			Natoma St.			AM
		10	1080	90		
	10				100	
Wales Dr.	10				10	Wales Dr.
	10				80	
		10	700	30		
#15			Natoma St.			NP

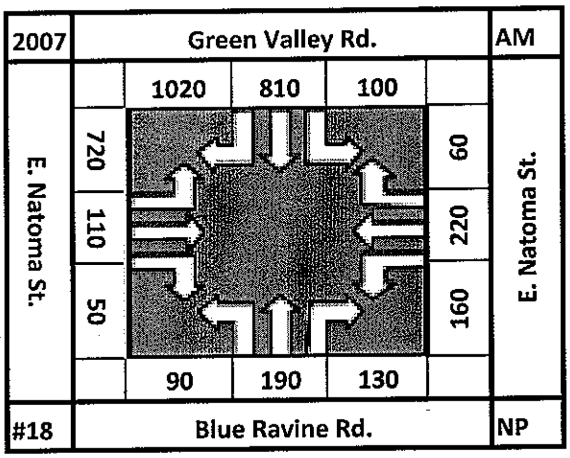
2007			Natoma St.			PM
		10	770	90		
	20				180	
Wales Dr.	30				10	Wales Dr.
	10				180	
		10	970	60		
#15			Natoma St.			NP

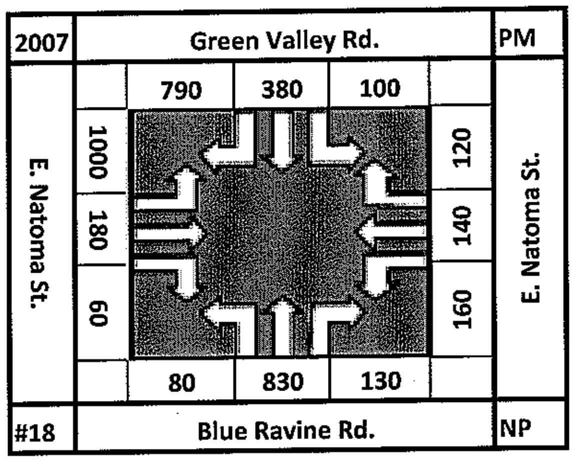
2007			Natoma St.			AM
		0	1290	0		
	0				200	
	0				0	Briggs Ranch Dr.
	0				0	
		0	670	100		
#16			Natoma St.			NP

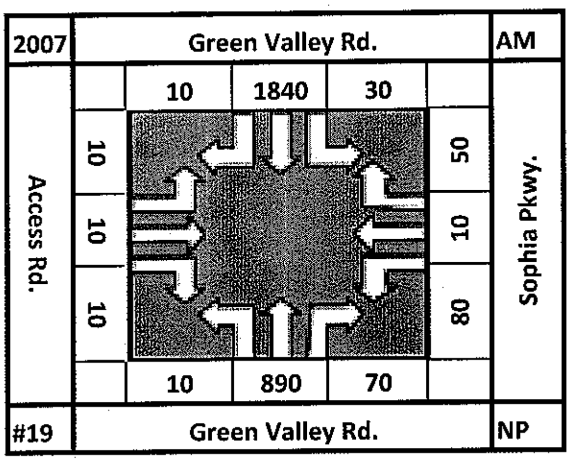
2007			Natoma St.			PM
		0	1030	0		
	0				360	
	0				0	Briggs Ranch Dr.
	0				0	
		0	1050	100		
#16			Natoma St.			NP

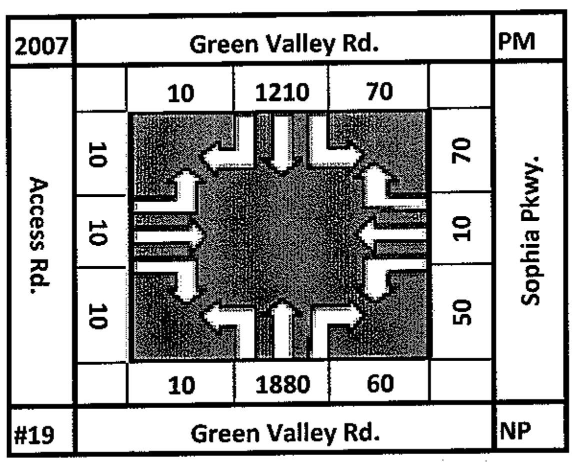

2007
AM
Folsom Lake Crossing
E. Natoma St.
0 0 0
0 820 280
0 780 1010
340 0 530
#17
Natoma St.
NP


2007
PM
Folsom Lake Crossing
E. Natoma St.
0 0 0
0 920 290
0 740 740
540 0 870
#17
Natoma St.
NP


2007
Green Valley Rd.
AM
E. Natoma St.
E. Natoma St.
1020 810 100
720 110 50
60 220 160
90 190 130
#18
Blue Ravine Rd.
NP


2007
Green Valley Rd.
PM
E. Natoma St.
E. Natoma St.
790 380 100
1000 180 60
120 140 160
80 830 130
#18
Blue Ravine Rd.
NP


2007
Green Valley Rd.
AM
Access Rd.
Sophia Pkwy.
10 1840 30
10 10 10
50 10 80
10 890 70
#19
Green Valley Rd.
NP


2007
Green Valley Rd.
PM
Access Rd.
Sophia Pkwy.
10 1210 70
10 10 10
70 10 50
10 1880 60
#19
Green Valley Rd.
NP

INTERSECTION TMV

YR-2010 NO-BUILD AM/PM PEAK

2010		Auburn-Folsom Rd.				AM
Douglas Blvd.		459	590	87		Douglas Blvd.
	175				109	
	175				393	
	645				120	
		1180	339	44		
#1		Auburn-Folsom Rd.				NP

2010		Auburn-Folsom Rd.				PM
Douglas Blvd.		306	481	175		Douglas Blvd.
	426				87	
	437				339	
	994				131	
		874	546	109		
#1		Auburn-Folsom Rd.				NP

2010		Auburn-Folsom Rd.				AM
Eureka Rd.		131	1311	0		Eureka Rd.
	175				0	
	0				0	
	131				0	
		164	1344	0		
#2		Auburn-Folsom Rd.				NP

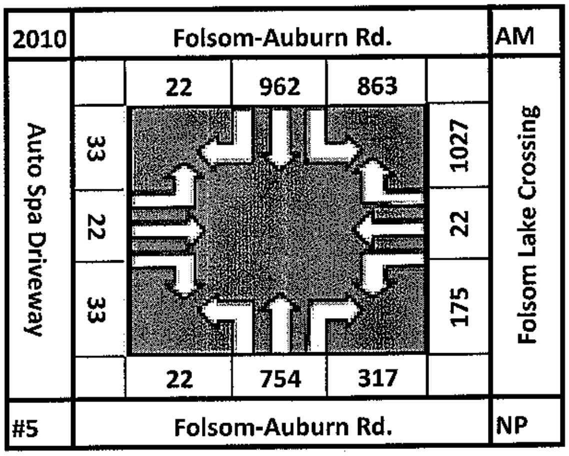
2010		Auburn-Folsom Rd.				PM
Eureka Rd.		109	1322	0		Eureka Rd.
	109				0	
	0				0	
	219				0	
		142	1475	0		
#2		Auburn-Folsom Rd.				NP

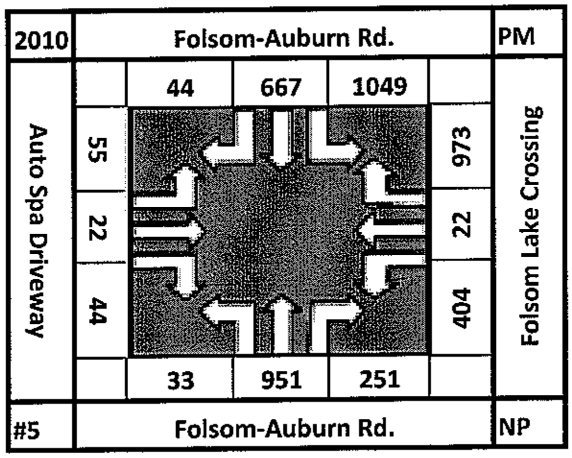
2010		Auburn-Folsom Rd.				AM
Oak Hill Dr.		33	1399	11		Oak Hill Dr.
	22				11	
	11				11	
	470				11	
		382	1431	11		
#3		Auburn-Folsom Rd.				NP

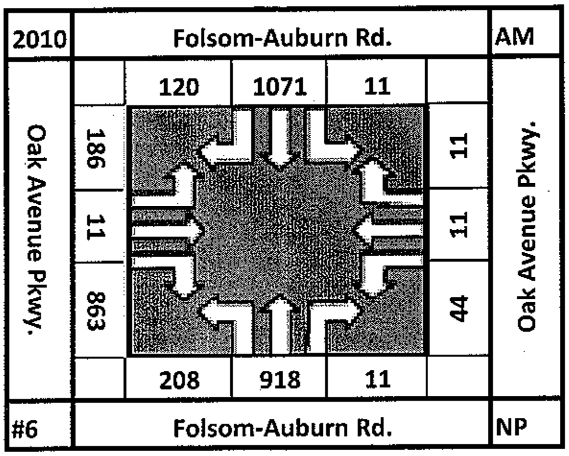
2010		Auburn-Folsom Rd.				PM
Oak Hill Dr.		22	1377	11		Oak Hill Dr.
	22				22	
	11				11	
	382				22	
		481	1508	11		
#3		Auburn-Folsom Rd.				NP

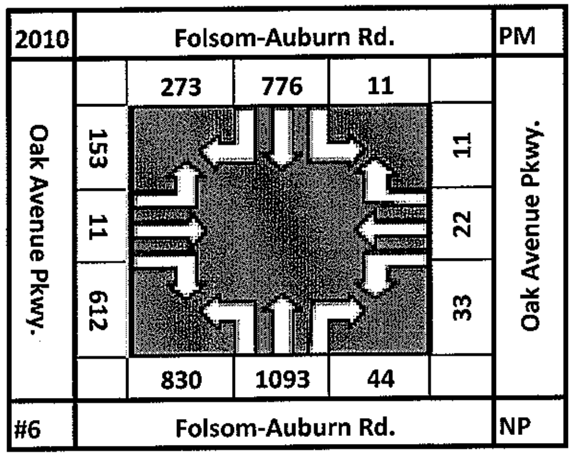
2010		Folsom-Auburn Rd.				AM
Exist. Folsom Dam Rd.		66	1792	0		Exist. Folsom Dam Rd.
	0				0	
	0				0	
	109				0	
		22	1792	0		
#4		Folsom-Auburn Rd.				NP

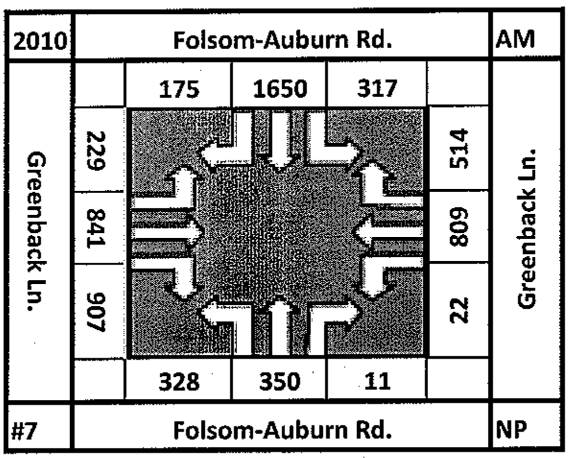
2010		Folsom-Auburn Rd.				PM
Exist. Folsom Dam Rd.		66	1694	0		Exist. Folsom Dam Rd.
	0				0	
	0				0	
	120				0	
		66	1912	0		
#4		Folsom-Auburn Rd.				NP

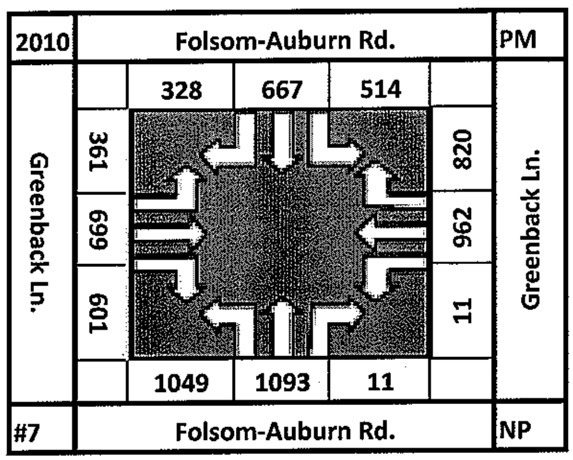

2010
Folsom-Auburn Rd.
AM
22
962
863
Auto Spa Driveway
33
22
33
1027
22
175
Folsom Lake Crossing
22
754
317
#5
Folsom-Auburn Rd.
NP

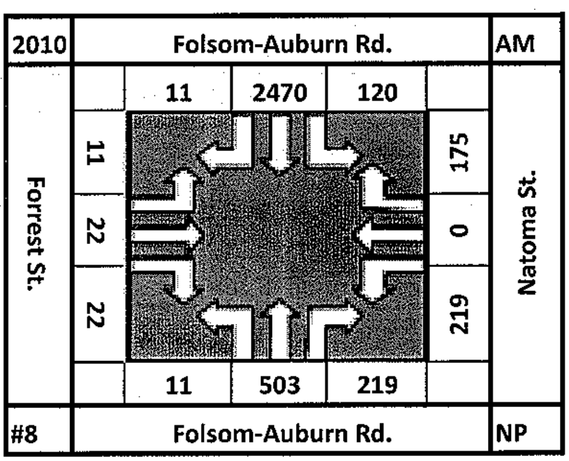

2010
Folsom-Auburn Rd.
PM
44
667
1049
Auto Spa Driveway
55
22
44
973
22
404
Folsom Lake Crossing
33
951
251
#5
Folsom-Auburn Rd.
NP

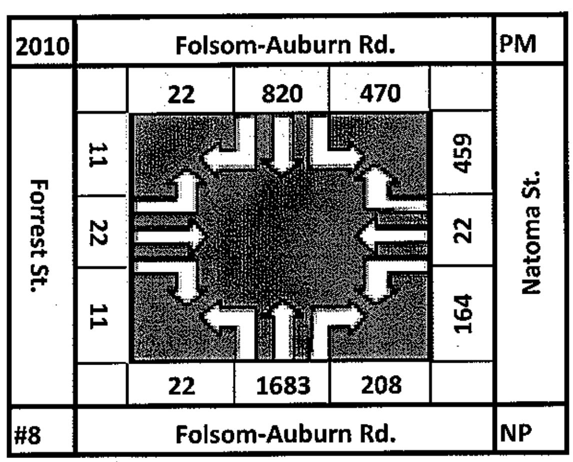

2010
Folsom-Auburn Rd.
AM
120
1071
11
Oak Avenue Pkwy.
186
11
863
11
11
44
Oak Avenue Pkwy.
208
918
11
#6
Folsom-Auburn Rd.
NP


2010
Folsom-Auburn Rd.
PM
273
776
11
Oak Avenue Pkwy.
153
11
612
11
22
33
Oak Avenue Pkwy.
830
1093
44
#6
Folsom-Auburn Rd.
NP


2010
Folsom-Auburn Rd.
AM
175
1650
317
Greenback Ln.
229
841
907
514
809
22
Greenback Ln.
328
350
11
#7
Folsom-Auburn Rd.
NP


2010
Folsom-Auburn Rd.
PM
328
667
514
Greenback Ln.
361
699
601
820
962
11
Greenback Ln.
1049
1093
11
#7
Folsom-Auburn Rd.
NP


2010
Folsom-Auburn Rd.
AM
11
2470
120
Forrest St.
11
22
22
175
0
219
Natoma St.
11
503
219
#8
Folsom-Auburn Rd.
NP


2010
Folsom-Auburn Rd.
PM
22
820
470
Forrest St.
11
22
11
459
22
164
Natoma St.
22
1683
208
#8
Folsom-Auburn Rd.
NP

2010		Riley St.				AM
		0	1158	11		
	0				11	Scott St.
	0				0	
	0				11	
		0	1333	11		
#9		Riley St.				NP

2010		Riley St.				PM
		0	1213	11		
	0				22	Scott St.
	0				0	
	0				22	
		0	1770	22		
#9		Riley St.				NP

2010		Riley St.				AM
		87	1082	0		
Leidesdorff St.	33				0	
	0				0	
	11				0	
		0	1311	0		
#10		Riley St.				NP

2010		Riley St.				PM
		76	1158	0		
Leidesdorff St.	208				0	
	0				0	
	22				0	
		0	1584	0		
#10		Riley St.				NP

2010		Riley St.				AM
		11	1071	11		
Sutter St.	11				11	Sutter St.
	22				11	
	11				11	
		11	1289	11		
#11		Riley St.				NP

2010		Riley St.				PM
		33	1136	11		
Sutter St.	33				44	Sutter St.
	109				44	
	55				44	
		11	1508	22		
#11		Riley St.				NP

2010		Riley St.				AM
		11	732	350		
Natoma St.	22				874	Natoma St.
	404				361	
	87				55	
		22	415	22		
#12		Riley St.				NP

2010		Riley St.				PM
		22	667	546		
Natoma St.	22				732	Natoma St.
	481				372	
	120				109	
		44	787	11		
#12		Riley St.				NP

2010		Riley St.				AM
		0	437	426		
	0				262	E. Bidwell St.
	0				0	
	0				328	
		0	197	153		
#13		Riley St.				NP

2010		Riley St.				PM
		0	525	350		
	0				372	E. Bidwell St.
	0				0	
	0				186	
		0	448	251		
#13		Riley St.				NP

2010		Natoma St.				AM
		22	1202	55		
Coloma St.	22				55	Coloma St.
	55				33	
	11				98	
		11	710	44		
#14		Natoma St.				NP

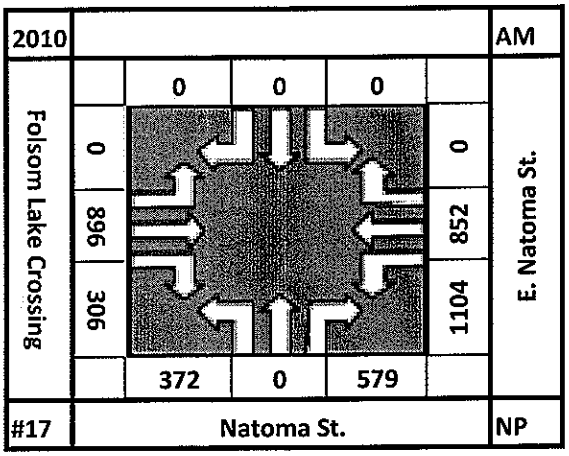
2010		Natoma St.				PM
		66	940	66		
Coloma St.	33				142	Coloma St.
	55				109	
	11				262	
		11	994	33		
#14		Natoma St.				NP

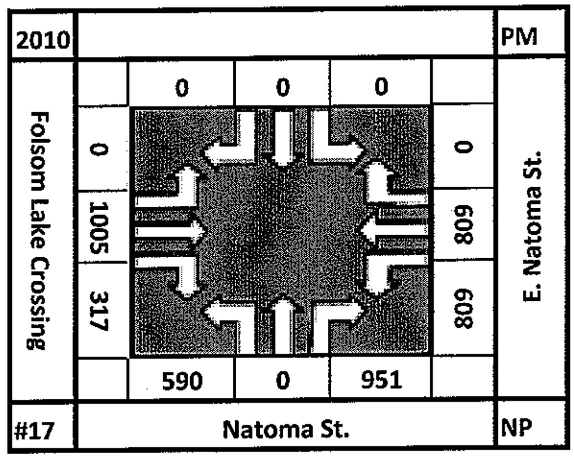
2010		Natoma St.				AM
		11	1180	98		
Wales Dr.	11				109	Wales Dr.
	11				11	
	11				87	
		11	765	33		
#15		Natoma St.				NP

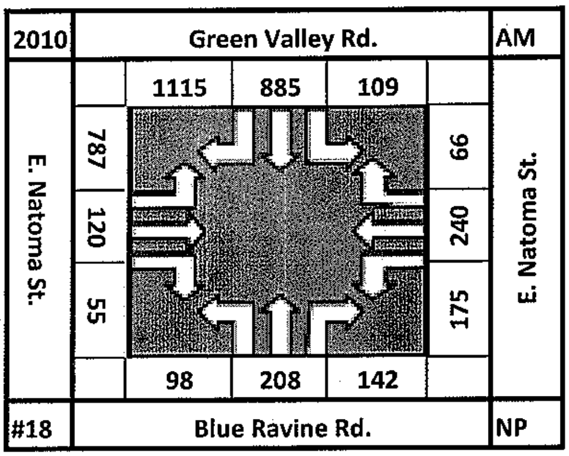
2010		Natoma St.				PM
		11	841	98		
Wales Dr.	22				197	Wales Dr.
	33				11	
	11				197	
		11	1060	66		
#15		Natoma St.				NP

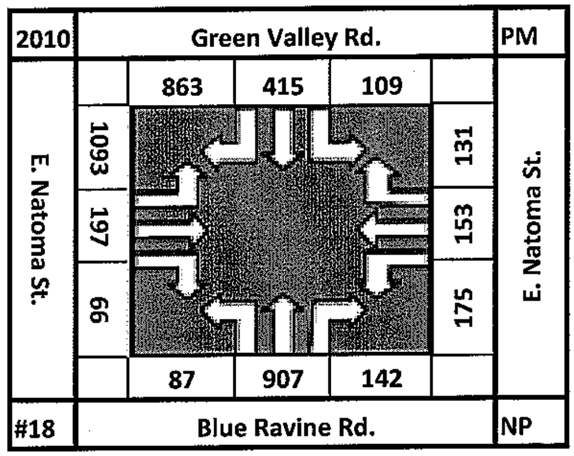
2010		Natoma St.				AM
		0	1410	0		
	0				219	Briggs Ranch Dr.
	0				0	
	0				0	
		0	732	109		
#16		Natoma St.				NP

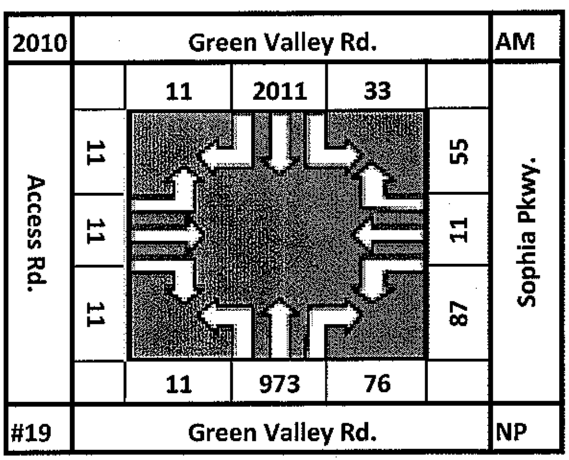
2010		Natoma St.				PM
		0	1126	0		
	0				393	Briggs Ranch Dr.
	0				0	
	0				0	
		0	1147	109		
#16		Natoma St.				NP

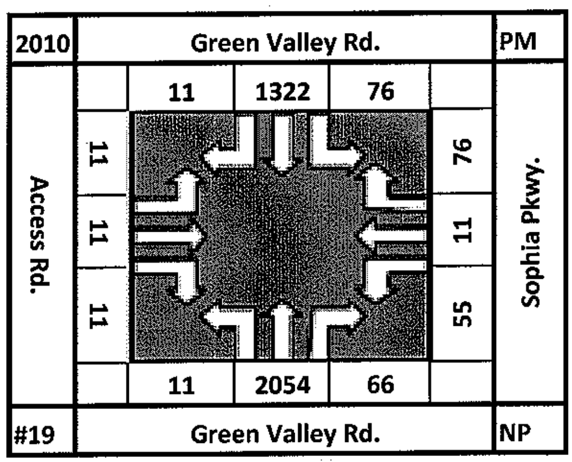

2010
AM
Folsom Lake Crossing
E. Natoma St.
0 0 0
0 896 306
0 852 1104
372 0 579
#17
Natoma St.
NP


2010
PM
Folsom Lake Crossing
E. Natoma St.
0 0 0
0 1005 317
0 809 809
590 0 951
#17
Natoma St.
NP


2010
Green Valley Rd.
AM
E. Natoma St.
E. Natoma St.
1115 885 109
787 120 55
66 240 175
98 208 142
#18
Blue Ravine Rd.
NP


2010
Green Valley Rd.
PM
E. Natoma St.
E. Natoma St.
863 415 109
1093 197 66
131 153 175
87 907 142
#18
Blue Ravine Rd.
NP


2010
Green Valley Rd.
AM
Access Rd.
Sophia Pkwy.
11 2011 33
11 11 11
55 11 87
11 973 76
#19
Green Valley Rd.
NP


2010
Green Valley Rd.
PM
Access Rd.
Sophia Pkwy.
11 1322 76
11 11 11
76 11 55
11 2054 66
#19
Green Valley Rd.
NP

INTERSECTION TMV

YR-2016 NO-BUILD AM/PM PEAK

2016	Auburn-Folsom Rd.					AM
Douglas Blvd.		517	664	98		Douglas Blvd.
	197				123	
	197				443	
	726				135	
		1329	382	50		
#1	Auburn-Folsom Rd.					NP

2016	Auburn-Folsom Rd.					PM
Douglas Blvd.		345	542	197		Douglas Blvd.
	480				98	
	492				382	
	1119				148	
		984	615	123		
#1	Auburn-Folsom Rd.					NP

2016	Auburn-Folsom Rd.					AM
Eureka Rd.		148	1476	0		Eureka Rd.
	197				0	
	0				0	
	148				0	
		185	1514	0		
#2	Auburn-Folsom Rd.					NP

2016	Auburn-Folsom Rd.					PM
Eureka Rd.		123	1489	0		Eureka Rd.
	123				0	
	0				0	
	247				0	
		160	1661	0		
#2	Auburn-Folsom Rd.					NP

2016	Auburn-Folsom Rd.					AM
Oak Hill Dr.		37	1576	12		Oak Hill Dr.
	25				12	
	12				12	
	529				12	
		430	1612	12		
#3	Auburn-Folsom Rd.					NP

2016	Auburn-Folsom Rd.					PM
Oak Hill Dr.		25	1551	12		Oak Hill Dr.
	25				25	
	12				12	
	430				25	
		542	1698	12		
#3	Auburn-Folsom Rd.					NP

2016	Folsom-Auburn Rd.					AM
Exist. Folsom Dam Rd.		74	2018	0		Exist. Folsom Dam Rd.
	0				0	
	0				0	
	123				0	
		25	2018	0		
#4	Folsom-Auburn Rd.					NP

2016	Folsom-Auburn Rd.					PM
Exist. Folsom Dam Rd.		74	1908	0		Exist. Folsom Dam Rd.
	0				0	
	0				0	
	135				0	
		74	2153	0		
#4	Folsom-Auburn Rd.					NP

2016			Folsom-Auburn Rd.			AM
Auto Spa Driveway		25	1083	972		Folsom Lake Crossing
	37				1157	
	25				25	
	37				197	
		25	849	357		
#5			Folsom-Auburn Rd.			NP

2016			Folsom-Auburn Rd.			PM
Auto Spa Driveway		50	751	1181		Folsom Lake Crossing
	62				1096	
	25				25	
	50				455	
		37	1071	283		
#5			Folsom-Auburn Rd.			NP

2016			Folsom-Auburn Rd.			AM
Oak Avenue Pkwy.		135	1206	12		Oak Avenue Pkwy.
	209				12	
	12				12	
	972				50	
		234	1034	12		
#6			Folsom-Auburn Rd.			NP

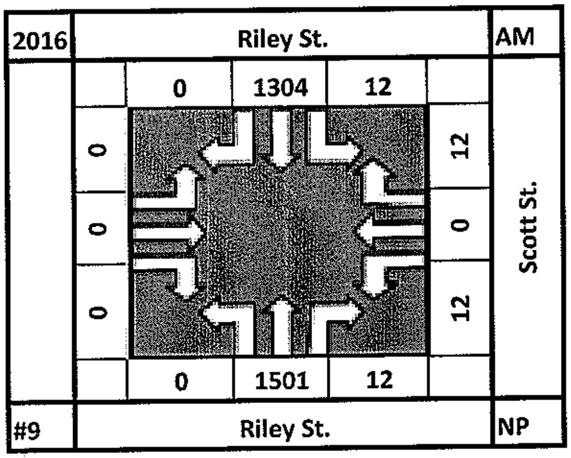
2016			Folsom-Auburn Rd.			PM
Oak Avenue Pkwy.		307	874	12		Oak Avenue Pkwy.
	172				12	
	12				25	
	689				37	
		935	1231	50		
#6			Folsom-Auburn Rd.			NP

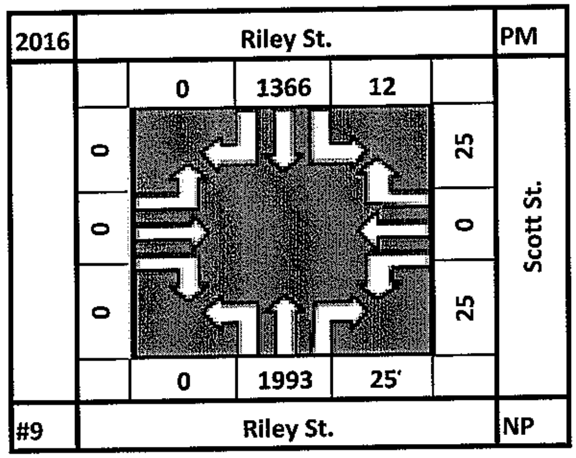
2016			Folsom-Auburn Rd.			AM
Greenback Ln.		197	1858	357		Greenback Ln.
	258				579	
	947				911	
	1021				25	
		369	394	12		
#7			Folsom-Auburn Rd.			NP

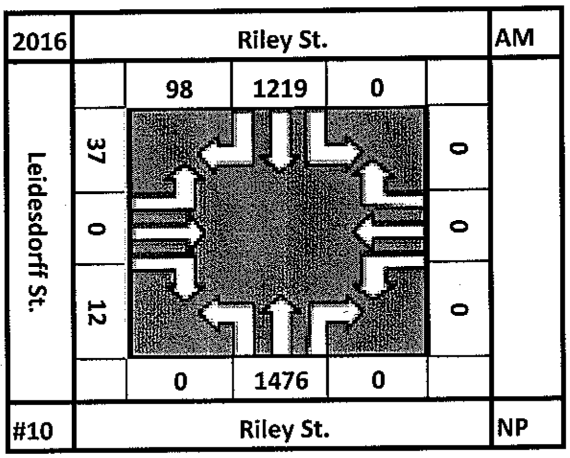
2016			Folsom-Auburn Rd.			PM
Greenback Ln.		369	751	579		Greenback Ln.
	407				923	
	787				1083	
	677				12	
		1181	1231	12		
#7			Folsom-Auburn Rd.			NP

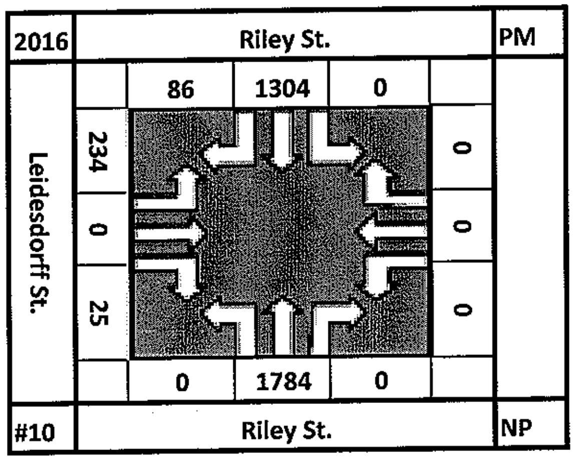
2016			Folsom-Auburn Rd.			AM
Forrest St.		12	2782	135		Natoma St.
	12				197	
	25				0	
	25				247	
		12	566	247		
#8			Folsom-Auburn Rd.			NP

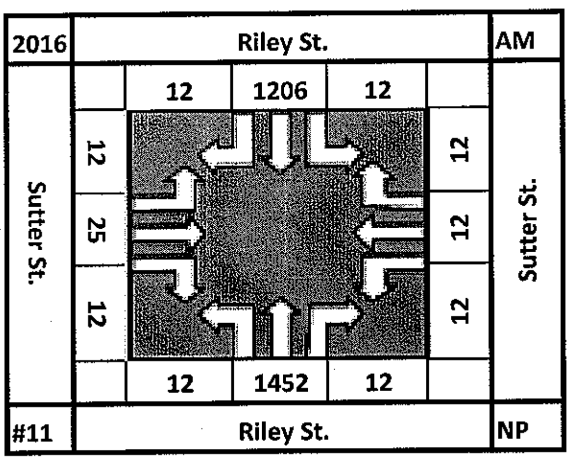
2016			Folsom-Auburn Rd.			PM
Forrest St.		25	923	529		Natoma St.
	12				517	
	25				25	
	12				185	
		25	1895	234		
#8			Folsom-Auburn Rd.			NP

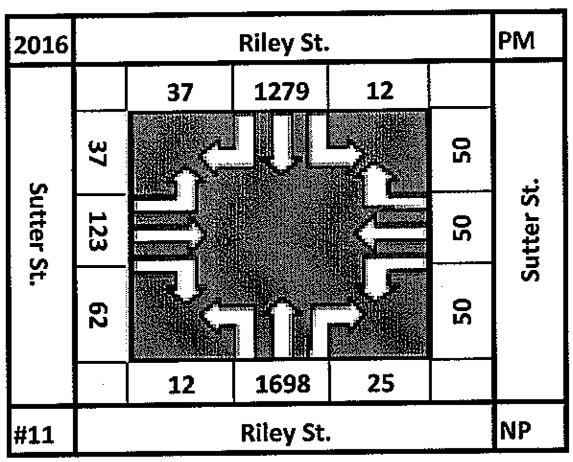

2016
Riley St.
AM
0
1304
12
0
0
0
12
0
12
Scott St.
0
1501
12
#9
Riley St.
NP

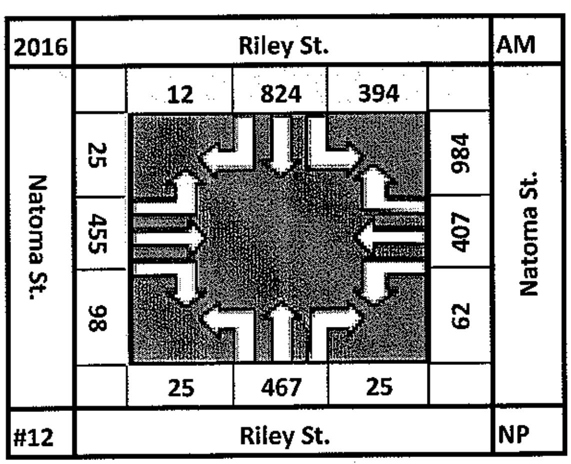

2016
Riley St.
PM
0
1366
12
0
0
0
25
0
25
Scott St.
0
1993
25
#9
Riley St.
NP

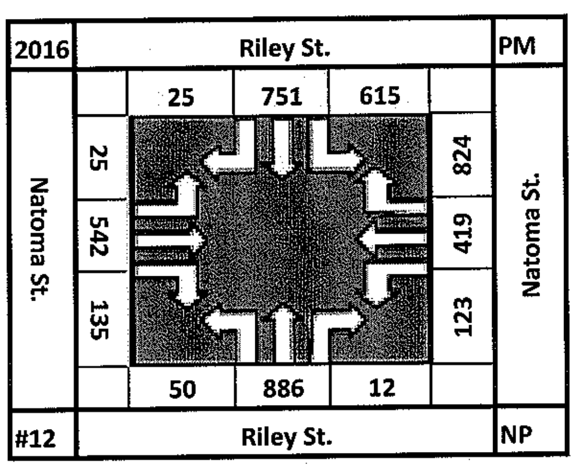

2016
Riley St.
AM
98
1219
0
Leidesdorff St.
37
0
12
0
0
0
0
1476
0
#10
Riley St.
NP


2016
Riley St.
PM
86
1304
0
Leidesdorff St.
234
0
25
0
0
0
0
1784
0
#10
Riley St.
NP


2016
Riley St.
AM
12
1206
12
Sutter St.
12
25
12
12
12
12
Sutter St.
12
1452
12
#11
Riley St.
NP


2016
Riley St.
PM
37
1279
12
Sutter St.
37
123
62
50
50
50
Sutter St.
12
1698
25
#11
Riley St.
NP


2016
Riley St.
AM
12
824
394
Natoma St.
25
455
98
984
407
62
Natoma St.
25
467
25
#12
Riley St.
NP


2016
Riley St.
PM
25
751
615
Natoma St.
25
542
135
824
419
123
Natoma St.
50
886
12
#12
Riley St.
NP

2016		Riley St.				AM
		0	492	480		E. Bidwell St.
	0				295	
	0				0	
	0				369	
		0	222	172		
#13		Riley St.				NP

2016		Riley St.				PM
		0	591	394		E. Bidwell St.
	0				419	
	0				0	
	0				209	
		0	505	283		
#13		Riley St.				NP

2016		Natoma St.				AM
Coloma St.		25	1354	62		Coloma St.
	25				62	
	62				37	
	12				110	
		12	800	50		
#14		Natoma St.				NP

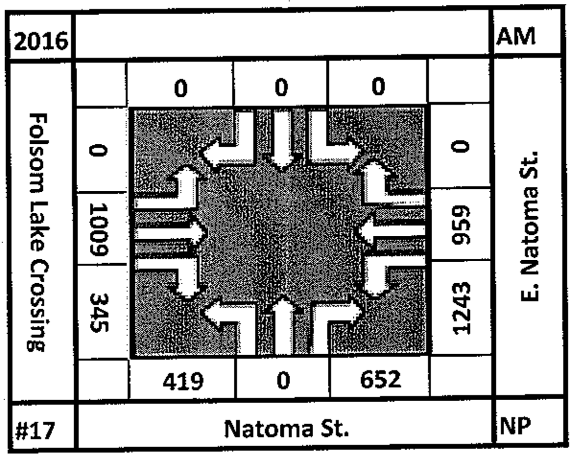
2016		Natoma St.				PM
Coloma St.		74	1059	74		Coloma St.
	37				160	
	62				123	
	12				295	
		12	1119	37		
#14		Natoma St.				NP

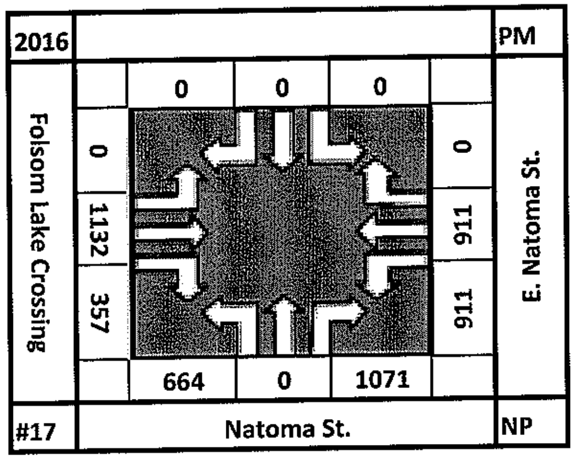
2016		Natoma St.				AM
Wales Dr.		12	1329	110		Wales Dr.
	12				123	
	12				12	
	12				98	
		12	862	37		
#15		Natoma St.				NP

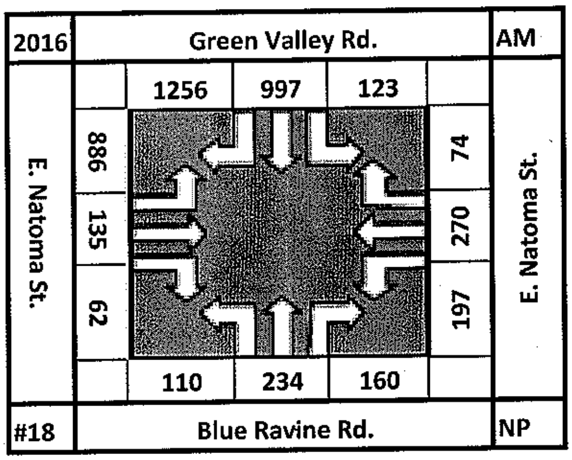
2016		Natoma St.				PM
Wales Dr.		12	947	110		Wales Dr.
	25				222	
	37				12	
	12				222	
		12	1194	74		
#15		Natoma St.				NP

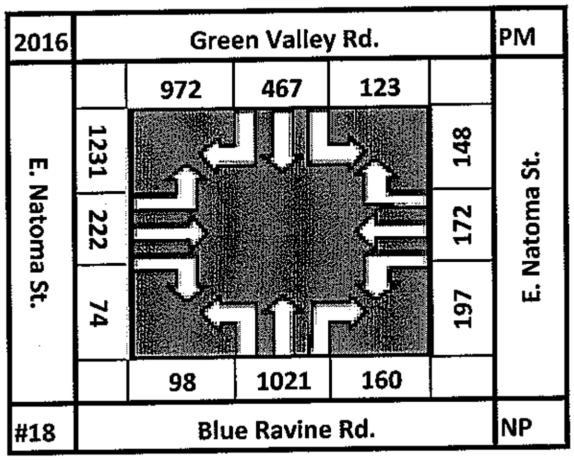
2016		Natoma St.				AM
		0	1588	0		Briggs Ranch Dr.
	0				247	
	0				0	
	0				0	
		0	824	123		
#16		Natoma St.				NP

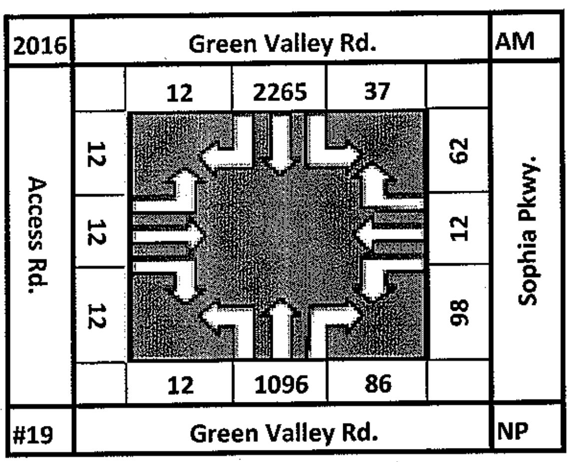
2016		Natoma St.				PM
		0	1268	0		Briggs Ranch Dr.
	0				443	
	0				0	
	0				0	
		0	1292	123		
#16		Natoma St.				NP

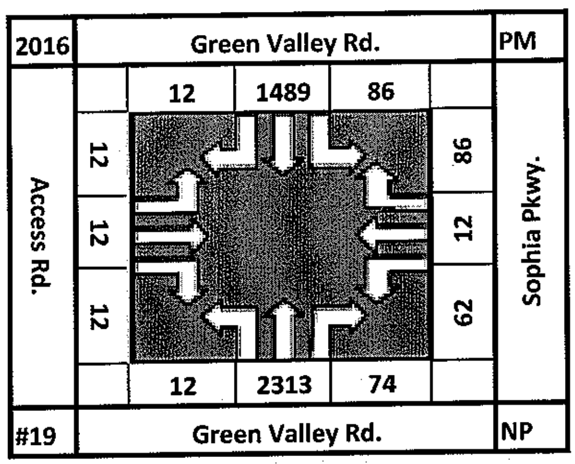

2016
AM
0 0 0
0
1009
345
0
959
1243
419 0 652
Folsom Lake Crossing
E. Natoma St.
#17
Natoma St.
NP


2016
PM
0 0 0
0
1132
357
0
911
911
664 0 1071
Folsom Lake Crossing
E. Natoma St.
#17
Natoma St.
NP


2016
Green Valley Rd.
AM
1256 997 123
886
135
62
74
270
197
110 234 160
E. Natoma St.
E. Natoma St.
#18
Blue Ravine Rd.
NP

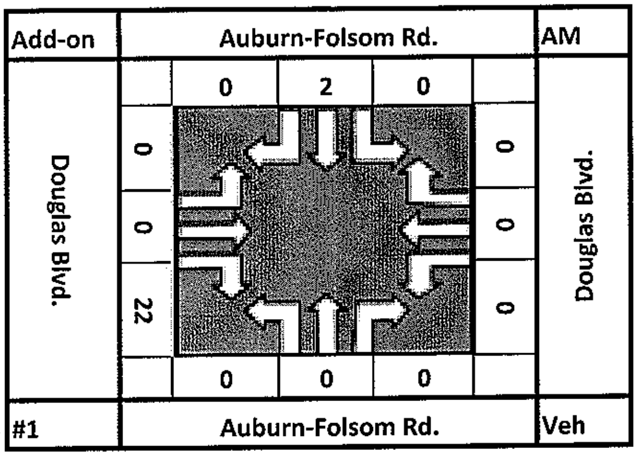

2016
Green Valley Rd.
PM
972 467 123
1231
222
74
148
172
197
98 1021 160
E. Natoma St.
E. Natoma St.
#18
Blue Ravine Rd.
NP

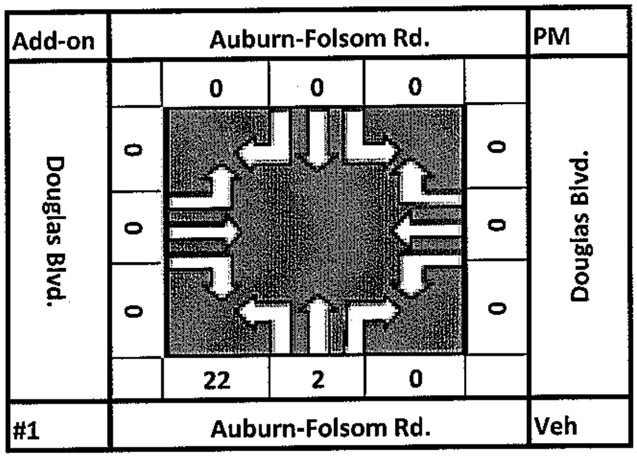

2016
Green Valley Rd.
AM
12 2265 37
12
12
12
62
12
98
12 1096 86
Access Rd.
Sophia Pkwy.
#19
Green Valley Rd.
NP

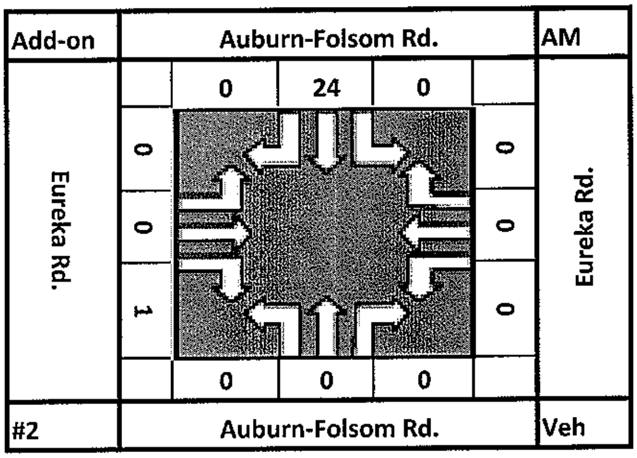

2016
Green Valley Rd.
PM
12 1489 86
12
12
12
86
12
62
12 2313 74
Access Rd.
Sophia Pkwy.
#19
Green Valley Rd.
NP

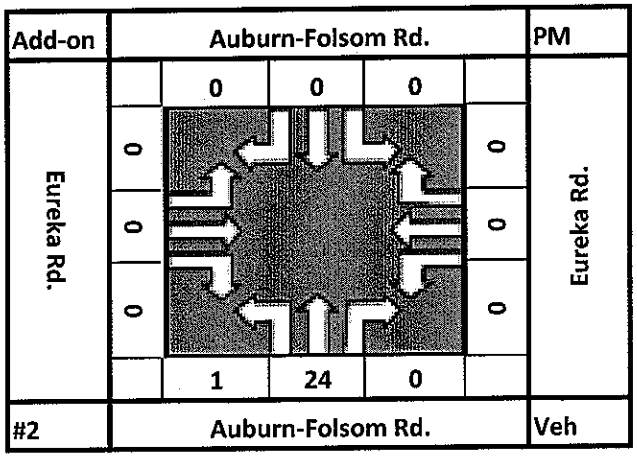
INTERSECTION TMV

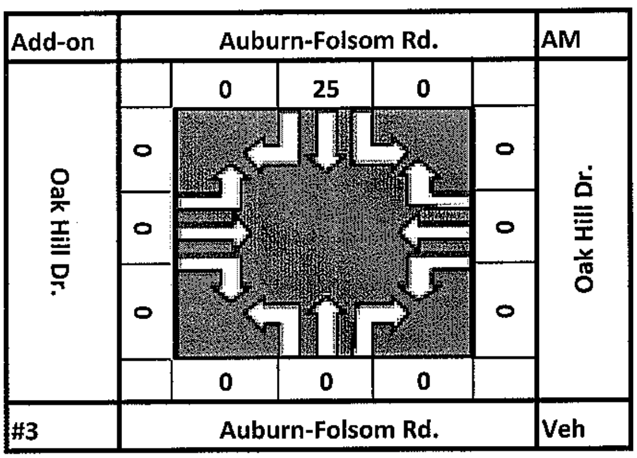
BUILD CONDITIONS ADD-ON TMV AM/PM PEAK

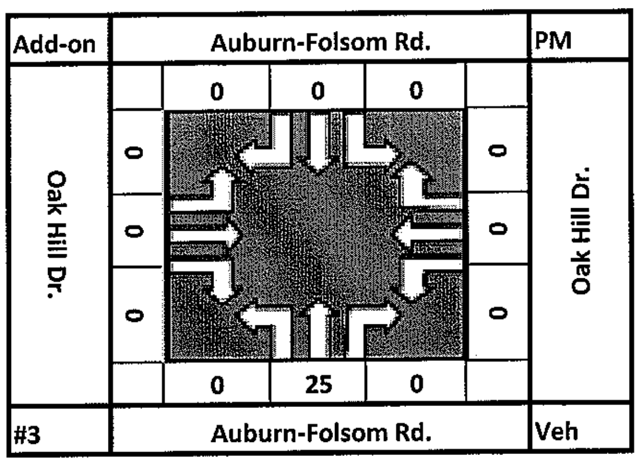

Add-on
Auburn-Folsom Rd.
AM
0 2 0
0 0 22
0 0 0
Douglas Blvd.
Douglas Blvd.
0 0 0
#1
Auburn-Folsom Rd.
Veh

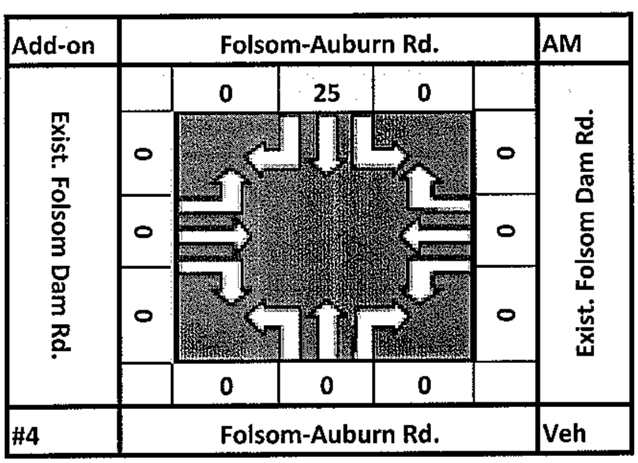

Add-on
Auburn-Folsom Rd.
PM
0 0 0
0 0 0
0 0 0
Douglas Blvd.
Douglas Blvd.
22 2 0
#1
Auburn-Folsom Rd.
Veh

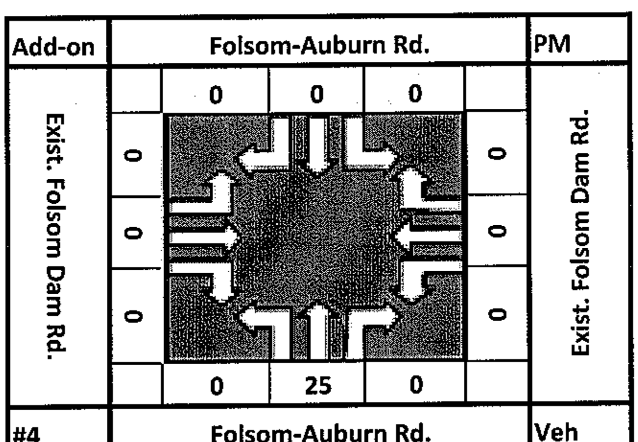

Add-on
Auburn-Folsom Rd.
AM
0 24 0
0 0 1
0 0 0
Eureka Rd.
Eureka Rd.
0 0 0
#2
Auburn-Folsom Rd.
Veh


Add-on
Auburn-Folsom Rd.
PM
0 0 0
0 0 0
0 0 0
Eureka Rd.
Eureka Rd.
1 24 0
#2
Auburn-Folsom Rd.
Veh


Add-on
Auburn-Folsom Rd.
AM
0 25 0
0 0 0
0 0 0
Oak Hill Dr.
Oak Hill Dr.
0 0 0
#3
Auburn-Folsom Rd.
Veh


Add-on
Auburn-Folsom Rd.
PM
0 0 0
0 0 0
0 0 0
Oak Hill Dr.
Oak Hill Dr.
0 25 0
#3
Auburn-Folsom Rd.
Veh


Add-on
Folsom-Auburn Rd.
AM
0 25 0
0 0 0
0 0 0
Exist. Folsom Dam Rd.
Exist. Folsom Dam Rd.
0 0 0
#4
Folsom-Auburn Rd.
Veh


Add-on
Folsom-Auburn Rd.
PM
0 0 0
0 0 0
0 0 0
Exist. Folsom Dam Rd.
Exist. Folsom Dam Rd.
0 25 0
#4
Folsom-Auburn Rd.
Veh

Add-on		Folsom-Auburn Rd.				AM
		0	0	25		
Auto Spa Driveway	0				0	Folsom Lake Crossing
	0				0	
	0				0	
		0	0	23		
#5		Folsom-Auburn Rd.				Veh

Add-on		Folsom-Auburn Rd.				PM
		0	0	0		
Auto Spa Driveway	0				25	Folsom Lake Crossing
	0				0	
	0				23	
		0	0	0		
#5		Folsom-Auburn Rd.				Veh

Add-on		Folsom-Auburn Rd.				AM
		0	0	0		
Oak Avenue Pkwy.	0				0	Oak Avenue Pkwy.
	0				0	
	0				0	
		0	23	0		
#6		Folsom-Auburn Rd.				Veh

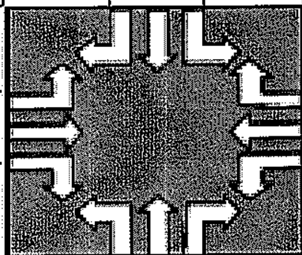
Add-on		Folsom-Auburn Rd.				PM
		0	23	0		
Oak Avenue Pkwy.	0				0	Oak Avenue Pkwy.
	0				0	
	0				0	
		0	0	0		
#6		Folsom-Auburn Rd.				Veh

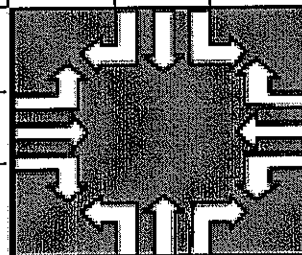
Add-on		Folsom-Auburn Rd.				AM
		0	0	0		
Greenback Ln.	7				0	Greenback Ln.
	0				0	
	0				0	
		0	16	0		
#7		Folsom-Auburn Rd.				Veh

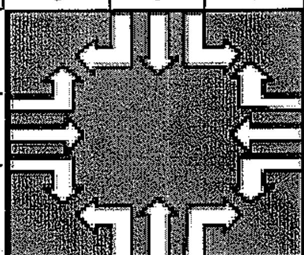
Add-on		Folsom-Auburn Rd.				PM
		7	16	0		
Greenback Ln.	0				0	Greenback Ln.
	0				0	
	0				0	
		0	0	0		
#7		Folsom-Auburn Rd.				Veh

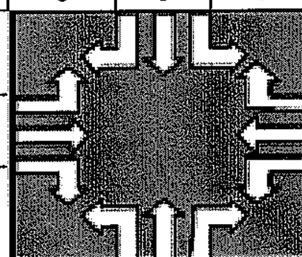
Add-on		Folsom-Auburn Rd.				AM
		0	0	0		
Forrest St.	0				0	Natoma St.
	0				0	
	0				0	
		0	16	0		
#8		Folsom-Auburn Rd.				Veh

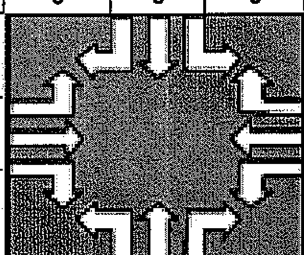
Add-on		Folsom-Auburn Rd.				PM
		0	16	0		
Forrest St.	0				0	Natoma St.
	0				0	
	0				0	
		0	0	0		
#8		Folsom-Auburn Rd.				Veh

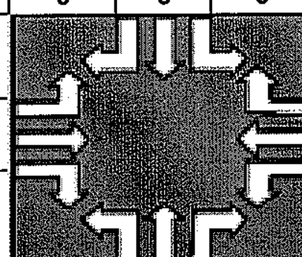
Add-on			Riley St.			AM
		0	0	0		
	0				0	Scott St.
	0				0	
	0				0	
		0	0	0		
#9			Riley St.			Veh

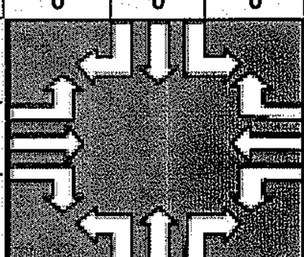
Add-on			Riley St.			PM
		0	0	0		
	0				0	Scott St.
	0				0	
	0				0	
		0	0	0		
#9			Riley St.			Veh

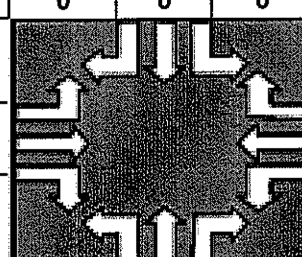
Add-on			Riley St.			AM
		0	0	0		
Leidesdorff St.	0				0	
	0				0	
	0				0	
		0	0	0		
#10			Riley St.			Veh

Add-on			Riley St.			PM
		0	0	0		
Leidesdorff St.	0				0	
	0				0	
	0				0	
		0	0	0		
#10			Riley St.			Veh

Add-on			Riley St.			AM
		0	0	0		
Sutter St.	0				0	Sutter St.
	0				0	
	0				0	
		0	0	0		
#11			Riley St.			Veh

Add-on			Riley St.			PM
		0	0	0		
Sutter St.	0				0	Sutter St.
	0				0	
	0				0	
		0	0	0		
#11			Riley St.			Veh

Add-on			Riley St.			AM
		0	0	0		
Natoma St.	0				0	Natoma St.
	0				0	
	0				0	
		0	0	2		
#12			Riley St.			Veh

Add-on			Riley St.			PM
		0	0	0		
Natoma St.	0				0	Natoma St.
	0				0	
	0				2	
		0	0	0		
#12			Riley St.			Veh

Add-on			Riley St.			AM
		0	0	0		
	0				2	E. Bidwell St.
	0				0	
	0				0	
		0	0	0		
#13			Riley St.			Veh

Add-on			Riley St.			PM
		0	0	2		
	0				0	E. Bidwell St.
	0				0	
	0				0	
		0	0	0		
#13			Riley St.			Veh

Add-on			Natoma St.			AM
		0	0	0		
Coloma St.	0				0	Coloma St.
	0				0	
	0				0	
		0	2	0		
#14			Natoma St.			Veh

Add-on			Natoma St.			PM
		0	2	0		
Coloma St.	0				0	Coloma St.
	0				0	
	0				0	
		0	0	0		
#14			Natoma St.			Veh

Add-on			Natoma St.			AM
		0	0	0		
Wales Dr.	0				0	Wales Dr.
	0				0	
	0				0	
		0	2	0		
#15			Natoma St.			Veh

Add-on			Natoma St.			PM
		0	2	0		
Wales Dr.	0				0	Wales Dr.
	0				0	
	0				0	
		0	0	0		
#15			Natoma St.			Veh

Add-on			Natoma St.			AM
		0	0	0		
	0				0	Briggs Ranch Dr.
	0				0	
	0				0	
		0	2	0		
#16			Natoma St.			Veh

Add-on			Natoma St.			PM
		0	2	0		
	0				0	Briggs Ranch Dr.
	0				0	
	0				0	
		0	0	0		
#16			Natoma St.			Veh

Add-on						AM
		0	0	0		
Folsom Lake Crossing	0				0	E. Natoma St.
	0				7	
	0				0	
		2	0	0		
#17			Natoma St.			Veh

Add-on						PM
		0	0	0		
Folsom Lake Crossing	0				0	E. Natoma St.
	7				0	
	2				0	
		0	0	0		
#17			Natoma St.			Veh

Add-on			Green Valley Rd.			AM
		1	0	0		
E. Natoma St.	0				0	E. Natoma St.
	0				0	
	0				0	
		6	0	0		
#18			Blue Ravine Rd.			Veh

Add-on			Green Valley Rd.			PM
		0	0	0		
E. Natoma St.	1				0	E. Natoma St.
	0				0	
	6				0	
		0	0	0		
#18			Blue Ravine Rd.			Veh

Add-on			Green Valley Rd.			AM
		0	1	0		
Access Rd.	0				0	Sophia Pkwy.
	0				0	
	0				0	
		0	0	0		
#19			Green Valley Rd.			Veh

Add-on			Green Valley Rd.			PM
		0	0	0		
Access Rd.	0				0	Sophia Pkwy.
	0				0	
	0				0	
		0	1	0		
#19			Green Valley Rd.			Veh

APPENDIX A-3

ROADWAY SEGMENTS TRAFFIC VOLUMES

ROADWAY SEGMENT TRAFFIC VOLUMES
YR-2004,2007, AND 2010 ADT AND LOS

Roadway Segment LOS - Folsom Dam Control Structure and Stilling Basin Project - **2004-2010 Conditions**

Roadway Segment	Year 2004 Conditions [1]			Year 2007 Conditions [1]			Base Year 2010 Conditions [2]		
	Functional Class	Traffic Count	LOS	Functional Class	Traffic Volumes	LOS	Functional Class	Traffic Volumes	LOS
1. Douglas Boulevard – Barton Road to Folsom-Auburn Road	4AD	36,000	E	4AD	40,200	F	4AD	43,928	F
2. Barton Road – Douglas Boulevard to Eureka Road	2A	8,300	C	2A	11,300	D	2A	12,348	D
3. Eureka Road – Barton Road to Folsom-Auburn Road	2A	4,700	C	2A	5,200	C	2A	5,682	C
4. Auburn-Folsom Road – Douglas Boulevard to Eureka Road	2A	30,900	F	4AU	34,300	F	4AU	37,481	F
5. Auburn-Folsom Road – Eureka Road to Oak Hill Drive	2A	26,500	F	2A	30,500	F	2A	33,328	F
6. Folsom-Auburn Road – Oak Hill Drive to Folsom Dam Road	2A	31,300	F	4AU	40,300	F	4AD	44,037	F
7. Folsom-Auburn Road – Folsom Dam Road to Oak Avenue	4AU	28,600	E	4AU	21,400	D	4AU	23,384	D
8. Folsom Boulevard – Greenback Lane to Leidesdorff Street	4AD	34,900	D	4AD	32,600	D	4AD	35,623	E
9. Folsom Boulevard – Natoma Street to Blue Ravine Road	4AD	37,800	F	4AD	37,800	F	4AD	41,305	F
10. Folsom Boulevard – Blue Ravine Road to Iron Point Road	4AD	30,600	D	4AD	30,600	D	4AD	33,437	D
11. Oak Hill Drive – Barton Road to Folsom-Auburn Road	2C	900	C	2C	5,400	C	2C	5,901	D
12. Santa Juanita Avenue – Barton Road to Oak Avenue Parkway	2A	4,700	C	2A	4,800	C	2A	5,245	C
13. Sierra College Boulevard – Douglas Boulevard to Eureka Road	4AD	25,900	D	4AD	29,400	D	4AD	32,126	D
14. Hazel Avenue – Oak Avenue to Greenback Lane	4AMD	35,400	E	4AMD	35,400	E	4AMD	38,683	F
15. Hazel Avenue – Greenback Lane to Madison Avenue	4AMD	43,100	F	4AMD	43,800	F	4AMD	47,861	F
16. Hazel Avenue – Winding Way to Gold Country Boulevard	4AHD	55,800	F	4AMD	56,700	F	4AMD	61,958	F
17. Oak Avenue Parkway – Hazel Avenue to Santa Juanita Avenue	2AMD	9,900	A	2AMD	12,400	B	2AMD	13,550	C
18. Oak Avenue Parkway – American River Canyon Drive to Folsom-Auburn Road	2A	12,400	D	4AD	16,200	C	4AD	17,702	C
19. Greenback Lane – Hazel Avenue to Madison Avenue	4AMD	23,400	B	4AMD	24,100	B	4AMD	26,335	C
20. Madison Avenue – Hazel Avenue to Greenback Lane	4AMD	31,600	D	4AMD	32,800	E	4AMD	35,841	E
21. Rainbow Bridge – Folsom Boulevard to Leidesdorff Street	2A	46,500	F	2A	40,300	F	2A	44,037	F
22. Folsom Dam Road – Folsom-Auburn Road to East Natoma Street [3]	2A	-	-	2A	-	-	2A	-	-
23. East Natoma Street – Cimmaron Circle to Folsom Dam Road	2A	18,400	E	4AU	16,600	C	4AU	18,139	D
24. East Natoma Street – Folsom Dam Road to Green Valley Road	2A	16,300	D	4AU	27,100	D	4AU	29,613	F
25. Green Valley Road – East Natoma Street to Sophia Parkway	2A	24,400	F	4AU	32,000	F	4AU	34,967	F
26. Sophia Parkway – Green Valley Road to Elmores Way	2A	1,100	C	2A	6,500	C	4AD	7,103	C
27. El Dorado Hills Boulevard – Green Valley Road to Francisco Drive	2A	5,900	C	2A	7,700	C	2A	8,414	C
28. Briggs Ranch Drive – East Natoma Street to Oak Avenue Parkway	2C	900	C	2C	6,100	D	2C	6,666	D
29. Oak Avenue Parkway – Willow Creek Drive to Blue Ravine Road	4AD	6,927	C	4AD	8,800	C	4AD	9,616	C
30. Oak Avenue Parkway – Blue Ravine Road to East Bidwell Street	6AD	17,600	C	6AD	22,200	C	6AD	24,259	C
31. Oak Avenue Parkway – East Bidwell Street to Riley Street	4AD	10,600	C	6AD	13,000	C	6AD	14,205	C
32. East Bidwell Street – Glenn Street to Blue Ravine Road	4AD	20,221	D	4AD	20,200	D	4AD	22,073	D
33. East Bidwell Street – Blue Ravine Road to Oak Avenue Parkway	4AD	24,000	D	4AD	25,100	D	6AD	27,427	D
34. East Bidwell Street – Clarksville Road to Iron Point Road	4AD	32,800	D	4AD	39,300	F	6AD	42,944	D
35. Sibley Street – Glenn Drive to Blue Ravine Road	2A	19,087	F	2A	22,600	F	2A	24,696	F
36. Prairie City Road – Blue Ravine Road to Iron Point Road	4AD	21,446	D	4AD	22,500	D	4AD	24,586	D

37. Blue Ravine Road – Folsom Boulevard to Sibley Street	6AD	18,100	C	6AD	18,100	C	6AD	19,778	C
38. Blue Ravine Road – Sibley Street to Riley Street	4AU	29,100	F	4AU	29,100	F	4AU	31,798	F
39. Blue Ravine Road – Riley Street to East Bidwell Street	4AU	23,448	D	4AU	23,400	D	4AU	25,570	D
40. Blue Ravine Road – East Bidwell Street to Oak Avenue Parkway	4AD	17,294	C	4AD	17,300	C	4AD	18,904	C
41. Blue Ravine Road – Oak Avenue Parkway to Green Valley Road	4AD	18,200	C	4AD	19,500	D	4AD	21,308	D
42. Iron Point Road – Black Diamond Drive to Prairie City Road	4AD	13,000	C	4AD	14,500	C	4AD	15,845	C
43. U.S. 50 – Hazel Avenue to Folsom Boulevard	4FA	111,800	F	4FA	116,800	F	4FA	127,631	F
44. U.S. 50 – Folsom Boulevard to Prairie City Road	4F	94,400	F	4F	99,000	F	4F	108,180	F
45. U.S. 50 – Prairie City Road to East Bidwell Street	4F	71,800	E	4F	71,800	E	4F	78,458	E
46. U.S. 50 – East Bidwell Street to County line	4F	77,000	E	4F	81,900	F	4F	89,494	F
47. Folsom Lake Crossing Bridge	-	-	-	4AHD	26,400	B	4AHD	28,848	C
Folsom Bridge Summary (segments 8,21, and 47)	-	81,400	-	-	99,300	-	-	108,508	-

[1] Data of Functional Class, Traffic Volume, and LOS of Year 2004 and 2007 were from the American River Watershed Project Folsom Bridge Fianl EIS/EIR (Corps 2006)

[2] Base Year 2010 Traffic Volume calculated from Year 2007 ADTs with an annual 3% growth ratio.

[3] Folsom Dam Road has been converted to a restricted access road for construction after the Folsom Lake Crossing was built in 2007.

ROADWAY SEGMENT TRAFFIC VOLUMES
YR 2010 – 2016 NO-BUILD ADT AND LOS

Roadway Segment LOS - Folsom Dam Control Structure and Stilling Basin Project - **2010-2016 No-Build Conditions**

Roadway Segment	Base Year 2010 Conditions			Year 2011 No-Build[1]		Year 2012 No-Build[1]		Year 2013 No-Build[1]		Year 2014 No-Build[1]		Year 2015 No-Build[1]		Year 2016 No-Build[1]	
	Functional Class	Traffic Volumes	LOS	Traffic Volumes	LOS	Traffic Volumes	LOS	Traffic Volumes	LOS	Traffic Volumes	LOS	Traffic Volumes	LOS	Traffic Volumes	LOS
1. Douglas Boulevard – Barton Road to Folsom-Auburn Road	4AD	43,928	F	44,806	F	45,702	F	46,616	F	47,549	F	48,500	F	49,470	F
2. Barton Road – Douglas Boulevard to Eureka Road	2A	12,348	D	12,595	D	12,847	D	13,104	D	13,366	D	13,633	D	13,906	D
3. Eureka Road – Barton Road to Folsom-Auburn Road	2A	5,682	C	5,796	C	5,912	C	6,030	C	6,151	C	6,274	C	6,399	C
4. Auburn-Folsom Road – Douglas Boulevard to Eureka Road	4AU	37,481	F	38,230	F	38,995	F	39,775	F	40,570	F	41,382	F	42,209	F
5. Auburn-Folsom Road – Eureka Road to Oak Hill Drive	2A	33,328	F	33,995	F	34,675	F	35,368	F	36,075	F	36,797	F	37,533	F
6. Folsom-Auburn Road – Oak Hill Drive to Folsom Dam Road	4AD	44,037	F	44,918	F	45,816	F	46,732	F	47,667	F	48,620	F	49,593	F
7. Folsom-Auburn Road – Folsom Dam Road to Oak Avenue	4AU	23,384	D	23,852	D	24,329	D	24,816	D	25,312	D	25,818	D	26,335	D
8. Folsom Boulevard – Greenback Lane to Leidesdorff Street	4AD	35,623	E	36,335	E	37,062	E	37,803	F	38,559	F	39,331	F	40,117	F
9. Folsom Boulevard – Natoma Street to Blue Ravine Road	4AD	41,305	F	42,131	F	42,974	F	43,833	F	44,710	F	45,604	F	46,516	F
10. Folsom Boulevard – Blue Ravine Road to Iron Point Road	4AD	33,437	D	34,106	D	34,788	D	35,484	E	36,194	E	36,918	E	37,656	F
11. Oak Hill Drive – Barton Road to Folsom-Auburn Road	2C	5,901	D	6,019	D	6,139	D	6,262	D	6,387	D	6,515	D	6,645	D
12. Santa Juanita Avenue – Barton Road to Oak Avenue Parkway	2A	5,245	C	5,350	C	5,457	C	5,566	C	5,677	C	5,791	C	5,907	C
13. Sierra College Boulevard – Douglas Boulevard to Eureka Road	4AD	32,126	D	32,769	D	33,424	D	34,093	D	34,774	D	35,470	E	36,179	E
14. Hazel Avenue – Oak Avenue to Greenback Lane	4AMD	38,683	F	39,456	F	40,245	F	41,050	F	41,871	F	42,709	F	43,563	F
15. Hazel Avenue – Greenback Lane to Madison Avenue	4AMD	47,861	F	48,819	F	49,795	F	50,791	F	51,807	F	52,843	F	53,900	F
16. Hazel Avenue – Winding Way to Gold Country Boulevard	4AMD	61,958	F	63,197	F	64,461	F	65,750	F	67,065	F	68,406	F	69,774	F
17. Oak Avenue Parkway – Hazel Avenue to Santa Juanita Avenue	2AMD	13,550	C	13,821	C	14,097	C	14,379	C	14,667	D	14,960	D	15,259	D
18. Oak Avenue Parkway – American River Canyon Drive to Folsom-Auburn Road	4AD	17,702	C	18,056	C	18,417	C	18,786	C	19,161	C	19,545	D	19,936	D
19. Greenback Lane – Hazel Avenue to Madison Avenue	4AMD	26,335	C	26,861	C	27,399	C	27,947	C	28,506	C	29,076	D	29,657	D
20. Madison Avenue – Hazel Avenue to Greenback Lane	4AMD	35,841	E	36,558	F	37,289	F	38,035	F	38,796	F	39,572	F	40,363	F
21. Rainbow Bridge – Folsom Boulevard to Leidesdorff Street	2A	44,037	F	44,918	F	45,816	F	46,732	F	47,667	F	48,620	F	49,593	F
22. Folsom Dam Road – Folsom-Auburn Road to East Natoma Street[2]	2A	-		-		-		-		-		-		-	
23. East Natoma Street – Cimmaron Circle to Folsom Dam Road	4AU	18,139	D	18,502	D	18,872	D	19,250	D	19,635	D	20,027	D	20,428	D
24. East Natoma Street – Folsom Dam Road to Green Valley Road	4AU	29,613	F	30,205	F	30,809	F	31,425	F	32,054	F	32,695	F	33,349	F
25. Green Valley Road – East Natoma Street to Sophia Parkway	4AU	34,967	F	35,667	F	36,380	F	37,108	F	37,850	F	38,607	F	39,379	F
26. Sophia Parkway – Green Valley Road to Elmores Way	4AD	7,103	C	7,245	C	7,390	C	7,537	C	7,688	C	7,842	C	7,999	C
27. El Dorado Hills Boulevard – Green Valley Road to Francisco Drive	2A	8,414	C	8,582	C	8,754	C	8,929	C	9,108	C	9,290	C	9,476	C
28. Briggs Ranch Drive – East Natoma Street to Oak Avenue Parkway	2C	6,666	D	6,799	D	6,935	D	7,074	D	7,215	D	7,359	D	7,507	D
29. Oak Avenue Parkway – Willow Creek Drive to Blue Ravine Road	4AD	9,616	C	9,808	C	10,004	C	10,205	C	10,409	C	10,617	C	10,829	C
30. Oak Avenue Parkway – Blue Ravine Road to East Bidwell Street	6AD	24,259	C	24,744	C	25,239	C	25,743	C	26,258	C	26,783	C	27,319	D
31. Oak Avenue Parkway – East Bidwell Street to Riley Street	6AD	14,205	C	14,490	C	14,779	C	15,075	C	15,376	C	15,684	C	15,998	C
32. East Bidwell Street – Glenn Street to Blue Ravine Road	4AD	22,073	D	22,515	D	22,965	D	23,424	D	23,893	D	24,370	D	24,858	D
33. East Bidwell Street – Blue Ravine Road to Oak Avenue Parkway	6AD	27,427	D	27,976	D	28,536	D	29,106	D	29,688	D	30,282	D	30,888	D
34. East Bidwell Street – Clarksville Road to Iron Point Road	6AD	42,944	D	43,803	D	44,679	D	45,573	D	46,484	D	47,414	D	48,362	D
35. Sibley Street – Glenn Drive to Blue Ravine Road	2A	24,696	F	25,190	F	25,693	F	26,207	F	26,731	F	27,266	F	27,811	F
36. Prairie City Road – Blue Ravine Road to Iron Point Road	4AD	24,586	D	25,078	D	25,580	D	26,091	D	26,613	D	27,145	D	27,688	D
37. Blue Ravine Road – Folsom Boulevard to Sibley Street	6AD	19,778	C	20,174	C	20,577	C	20,989	C	21,409	C	21,837	C	22,274	C
38. Blue Ravine Road – Sibley Street to Riley Street	4AU	31,798	F	32,434	F	33,083	F	33,745	F	34,420	F	35,108	F	35,810	F
39. Blue Ravine Road – Riley Street to East Bidwell Street	4AU	25,570	D	26,081	D	26,603	D	27,135	D	27,678	E	28,231	E	28,796	E
40. Blue Ravine Road – East Bidwell Street to Oak Avenue Parkway	4AD	18,904	C	19,282	D	19,668	D	20,061	D	20,462	D	20,872	D	21,289	D
41. Blue Ravine Road – Oak Avenue Parkway to Green Valley Road	4AD	21,308	D	21,734	D	22,169	D	22,612	D	23,065	D	23,526	D	23,996	D
42. Iron Point Road – Black Diamond Drive to Prairie City Road	4AD	15,845	C	16,161	C	16,485	C	16,814	C	17,151	C	17,494	C	17,844	C
43. U.S. 50 – Hazel Avenue to Folsom Boulevard	4FA	127,631	F	130,183	F	132,787	F	135,443	F	138,151	F	140,914	F	143,733	F
44. U.S. 50 – Folsom Boulevard to Prairie City Road	4F	108,180	F	110,344	F	112,550	F	114,801	F	117,097	F	119,439	F	121,828	F
45. U.S. 50 – Prairie City Road to East Bidwell Street	4F	78,458	E	80,027	E	81,627	F	83,260	F	84,925	F	86,624	F	88,356	F
46. U.S. 50 – East Bidwell Street to County line	4F	89,494	F	91,284	F	93,110	F	94,972	F	96,872	F	98,809	F	100,785	F
47. Folsom Lake Crossing Bridge	4AHD	28,848	C	29,425	C	30,013	C	30,614	C	31,226	C	31,851	C	32,488	D
Folsom Bridge Summary (segments 8,21, and 47)	-	108,508	-	110,678	-	112,892	-	115,149	-	117,452	-	119,801	-	122,197	-

[1] Year 2011-2016 Traffic Volume calculated from Year 2010 ADTs with an annual 2% growth ratio.
[2] Folsom Dam Road has been converted to a restricted access road for construction after the Folsom Lake Crossing was built in 2007.

ROADWAY SEGMENT TRAFFIC VOLUMES

BUILD ADD-ON ADT

Roadway Segment	Additional Trips
1. Douglas Boulevard – Barton Road to Folsom-Auburn Road	57
2. Barton Road – Douglas Boulevard to Eureka Road	0
3. Eureka Road – Barton Road to Folsom-Auburn Road	4
4. Auburn-Folsom Road – Douglas Boulevard to Eureka Road	61
5. Auburn-Folsom Road – Eureka Road to Oak Hill Drive	61
6. Folsom-Auburn Road – Oak Hill Drive to Folsom Dam Road	61
7. Folsom-Auburn Road – Folsom Dam Road to Oak Avenue	60
8. Folsom Boulevard – Greenback Lane to Leidesdorff Street	32
9. Folsom Boulevard – Natoma Street to Blue Ravine Road	32
10. Folsom Boulevard – Blue Ravine Road to Iron Point Road	32
11. Oak Hill Drive – Barton Road to Folsom-Auburn Road	0
12. Santa Juanita Avenue – Barton Road to Oak Avenue Parkway	0
13. Sierra College Boulevard – Douglas Boulevard to Eureka Road	0
14. Hazel Avenue – Oak Avenue to Greenback Lane	0
15. Hazel Avenue – Greenback Lane to Madison Avenue	0
16. Hazel Avenue – Winding Way to Gold Country Boulevard	28
17. Oak Avenue Parkway – Hazel Avenue to Santa Juanita Avenue	0
18. Oak Avenue Parkway – American River Canyon Drive to Folsom-Auburn Road	0
19. Greenback Lane – Hazel Avenue to Madison Avenue	0
20. Madison Avenue – Hazel Avenue to Greenback Lane	28
21. Rainbow Bridge – Folsom Boulevard to Leidesdorff Street	0
22. Folsom Dam Road – Folsom-Auburn Road to East Natoma Street [2]	0
23. East Natoma Street – Cimmaron Circle to Folsom Dam Road	4
24. East Natoma Street – Folsom Dam Road to Green Valley Road	25
25. Green Valley Road – East Natoma Street to Sophia Parkway	23
26. Sophia Parkway – Green Valley Road to Elmores Way	0
27. El Dorado Hills Boulevard – Green Valley Road to Francisco Drive	0
28. Briggs Ranch Drive – East Natoma Street to Oak Avenue Parkway	4
29. Oak Avenue Parkway – Willow Creek Drive to Blue Ravine Road	4
30. Oak Avenue Parkway – Blue Ravine Road to East Bidwell Street	23
31. Oak Avenue Parkway – East Bidwell Street to Riley Street	0
32. East Bidwell Street – Glenn Street to Blue Ravine Road	4
33. East Bidwell Street – Blue Ravine Road to Oak Avenue Parkway	0
34. East Bidwell Street – Clarksville Road to Iron Point Road	23
35. Sibley Street – Glenn Drive to Blue Ravine Road	0
36. Prairie City Road – Blue Ravine Road to Iron Point Road	0
37. Blue Ravine Road – Folsom Boulevard to Sibley Street	0
38. Blue Ravine Road – Sibley Street to Riley Street	0
39. Blue Ravine Road – Riley Street to East Bidwell Street	0
40. Blue Ravine Road – East Bidwell Street to Oak Avenue Parkway	4
41. Blue Ravine Road – Oak Avenue Parkway to Green Valley Road	23
42. Iron Point Road – Black Diamond Drive to Prairie City Road	0
43. U.S. 50 – Hazel Avenue to Folsom Boulevard	81
44. U.S. 50 – Folsom Boulevard to Prairie City Road	21
45. U.S. 50 – Prairie City Road to East Bidwell Street	21
46. U.S. 50 – East Bidwell Street to County line	2
47. Folsom Lake Crossing Bridge	150

ROADWAY SEGMENT TRAFFIC VOLUMES

YR 2010 – 2016 BUILD ADT AND LOS

Roadway Segment LOS - Folsom Dam Control Structure and Stilling Basin Project - **2010-2016 Build Conditions**

Roadway Segment	Functional Class	Year 2010 Build Traffic Volumes	Year 2010 Build LOS	Year 2011 No-Build[1] Traffic Volumes	Year 2011 No-Build[1] LOS	Year 2012 No-Build[1] Traffic Volumes	Year 2012 No-Build[1] LOS	Year 2013 No-Build[1] Traffic Volumes	Year 2013 No-Build[1] LOS	Year 2014 No-Build[1] Traffic Volumes	Year 2014 No-Build[1] LOS	Year 2015 No-Build[1] Traffic Volumes	Year 2015 No-Build[1] LOS	Year 2016 No-Build[1] Traffic Volumes	Year 2016 No-Build[1] LOS
1. Douglas Boulevard – Barton Road to Folsom-Auburn Road	4AD	43,985	F	44,863	F	45,759	F	46,673	F	47,606	F	48,557	F	49,527	F
2. Barton Road – Douglas Boulevard to Eureka Road	2A	12,348	D	12,595	D	12,847	D	13,104	D	13,366	D	13,633	D	13,906	D
3. Eureka Road – Barton Road to Folsom-Auburn Road	2A	5,686	C	5,800	C	5,916	C	6,034	C	6,155	C	6,278	C	6,403	C
4. Auburn-Folsom Road – Douglas Boulevard to Eureka Road	4AU	37,542	F	38,291	F	39,056	F	39,836	F	40,631	F	41,443	F	42,270	F
5. Auburn-Folsom Road – Eureka Road to Oak Hill Drive	2A	33,389	F	34,056	F	34,736	F	35,429	F	36,136	F	36,858	F	37,594	F
6. Folsom-Auburn Road – Oak Hill Drive to Folsom Dam Road	4AD	44,098	F	44,979	F	45,877	F	46,793	F	47,728	F	48,681	F	49,654	F
7. Folsom-Auburn Road – Folsom Dam Road to Oak Avenue	4AU	23,444	D	23,912	D	24,389	D	24,876	D	25,372	D	25,878	D	26,395	D
8. Folsom Boulevard – Greenback Lane to Leidesdorff Street	4AD	35,655	E	36,367	E	37,094	E	37,835	F	38,591	F	39,363	F	40,149	F
9. Folsom Boulevard – Natoma Street to Blue Ravine Road	4AD	41,337	F	42,163	F	43,006	F	43,865	F	44,742	F	45,636	F	46,548	F
10. Folsom Boulevard – Blue Ravine Road to Iron Point Road	4AD	33,469	D	34,138	D	34,820	D	35,516	E	36,226	E	36,950	E	37,688	F
11. Oak Hill Drive – Barton Road to Folsom-Auburn Road	2C	5,901	D	6,019	D	6,139	D	6,262	D	6,387	D	6,515	D	6,645	D
12. Santa Juanita Avenue – Barton Road to Oak Avenue Parkway	2A	5,245	C	5,350	C	5,457	C	5,566	C	5,677	C	5,791	C	5,907	C
13. Sierra College Boulevard – Douglas Boulevard to Eureka Road	4AD	32,126	D	32,769	D	33,424	D	34,093	D	34,774	D	35,470	E	36,179	E
14. Hazel Avenue – Oak Avenue to Greenback Lane	4AMD	38,683	F	39,456	F	40,245	F	41,050	F	41,871	F	42,709	F	43,563	F
15. Hazel Avenue – Greenback Lane to Madison Avenue	4AMD	47,861	F	48,819	F	49,795	F	50,791	F	51,807	F	52,843	F	53,900	F
16. Hazel Avenue – Winding Way to Gold Country Boulevard	4AMD	61,986	F	63,225	F	64,489	F	65,778	F	67,093	F	68,434	F	69,802	F
17. Oak Avenue Parkway – Hazel Avenue to Santa Juanita Avenue	2AMD	13,550	C	13,821	C	14,097	C	14,379	C	14,667	D	14,960	D	15,259	D
18. Oak Avenue Parkway – American River Canyon Drive to Folsom-Auburn Road	4AD	17,702	C	18,056	C	18,417	C	18,786	C	19,161	C	19,545	D	19,936	D
19. Greenback Lane – Hazel Avenue to Madison Avenue	4AMD	26,335	C	26,861	C	27,399	C	27,947	C	28,506	C	29,076	D	29,657	D
20. Madison Avenue – Hazel Avenue to Greenback Lane	4AMD	35,869	E	36,586	F	37,317	F	38,063	F	38,824	F	39,600	F	40,391	F
21. Rainbow Bridge – Folsom Boulevard to Leidesdorff Street	2A	44,037	F	44,918	F	45,816	F	46,732	F	47,667	F	48,620	F	49,593	F
22. Folsom Dam Road – Folsom-Auburn Road to East Natoma Street[2]	2A	-		-		-		-		-		-		-	
23. East Natoma Street – Cimmaron Circle to Folsom Dam Road	4AU	18,143	D	18,506	D	18,876	D	19,254	D	19,639	D	20,031	D	20,432	D
24. East Natoma Street – Folsom Dam Road to Green Valley Road	4AU	29,638	F	30,230	F	30,834	F	31,450	F	32,079	F	32,720	F	33,374	F
25. Green Valley Road – East Natoma Street to Sophia Parkway	4AU	34,990	F	35,690	F	36,403	F	37,131	F	37,873	F	38,630	F	39,402	F
26. Sophia Parkway – Green Valley Road to Elmores Way	4AD	7,103	C	7,245	C	7,390	C	7,537	C	7,688	C	7,842	C	7,999	C
27. El Dorado Hills Boulevard – Green Valley Road to Francisco Drive	2A	8,414	C	8,582	C	8,754	C	8,929	C	9,108	C	9,290	C	9,476	C
28. Briggs Ranch Drive – East Natoma Street to Oak Avenue Parkway	2C	6,670	D	6,803	D	6,939	D	7,078	D	7,219	D	7,363	D	7,511	D
29. Oak Avenue Parkway – Willow Creek Drive to Blue Ravine Road	4AD	9,620	C	9,812	C	10,008	C	10,209	C	10,413	C	10,621	C	10,833	C
30. Oak Avenue Parkway – Blue Ravine Road to East Bidwell Street	6AD	24,282	C	24,767	C	25,262	C	25,766	C	26,281	C	26,806	C	27,342	D
31. Oak Avenue Parkway – East Bidwell Street to Riley Street	6AD	14,205	C	14,490	C	14,779	C	15,075	C	15,376	C	15,684	C	15,998	C
32. East Bidwell Street – Glenn Street to Blue Ravine Road	4AD	22,077	D	22,519	D	22,969	D	23,428	D	23,897	D	24,374	D	24,862	D
33. East Bidwell Street – Blue Ravine Road to Oak Avenue Parkway	6AD	27,427	D	27,976	D	28,536	D	29,106	D	29,688	D	30,282	D	30,888	D
34. East Bidwell Street – Clarksville Road to Iron Point Road	6AD	42,967	D	43,826	D	44,702	D	45,596	D	46,507	D	47,437	D	48,385	D
35. Sibley Street – Glenn Drive to Blue Ravine Road	2A	24,696	F	25,190	F	25,693	F	26,207	F	26,731	F	27,266	F	27,811	F
36. Prairie City Road – Blue Ravine Road to Iron Point Road	4AD	24,586	D	25,078	D	25,580	D	26,091	D	26,613	D	27,145	D	27,688	D
37. Blue Ravine Road – Folsom Boulevard to Sibley Street	6AD	19,778	C	20,174	C	20,577	C	20,989	C	21,409	C	21,837	C	22,274	C
38. Blue Ravine Road – Sibley Street to Riley Street	4AU	31,798	F	32,434	F	33,083	F	33,745	F	34,420	F	35,108	F	35,810	F
39. Blue Ravine Road – Riley Street to East Bidwell Street	4AU	25,570	D	26,081	D	26,603	D	27,135	D	27,678	E	28,231	E	28,796	E
40. Blue Ravine Road – East Bidwell Street to Oak Avenue Parkway	4AD	18,908	C	19,286	D	19,672	D	20,065	D	20,466	D	20,876	D	21,293	D
41. Blue Ravine Road – Oak Avenue Parkway to Green Valley Road	4AD	21,331	D	21,757	D	22,192	D	22,635	D	23,088	D	23,549	D	24,019	D
42. Iron Point Road – Black Diamond Drive to Prairie City Road	4AD	15,845	C	16,161	C	16,485	C	16,814	C	17,151	C	17,494	C	17,844	C
43. U.S. 50 – Hazel Avenue to Folsom Boulevard	4FA	127,712	F	130,264	F	132,868	F	135,524	F	138,232	F	140,995	F	143,814	F
44. U.S. 50 – Folsom Boulevard to Prairie City Road	4F	108,201	F	110,365	F	112,571	F	114,822	F	117,118	F	119,460	F	121,849	F
45. U.S. 50 – Prairie City Road to East Bidwell Street	4F	78,479	E	80,048	E	81,648	F	83,281	F	84,946	F	86,645	F	88,377	F
46. U.S. 50 – East Bidwell Street to County line	4F	89,496	F	91,286	F	93,112	F	94,974	F	96,874	F	98,811	F	100,787	F
47. Folsom Lake Crossing Bridge	4AHD	28,998	C	29,575	C	30,163	C	30,764	C	31,376	C	32,001	[redacted]	32,638	D
Folsom Bridge Summary (segments 8,21, and 47)	-	108,690	-	110,860	-	113,074	-	115,331	-	117,634	-	119,983	-	122,379	-

[1] Year 2010-2016 Traffic Volume calculated from Year 2010 ADTs with an annual 2% growth ratio plus additional trips generated from worker commuting and off-site haul trucks

[2] Folsom Dam Road has been converted to a restricted access road for construction after the Folsom Lake Crossing was built in 2007.

ROADWAY SEGMENT LOS THRESHOLD

Functional Class and Daily Roadway Segment LOS Thresholds

Code	Facility Type	(Total vehicles per day in both directions except as noted)				
		A	B	C	D	E
2C	2-Lane Collector	-	-	5,700	9,000	9,800
MI2	Minor 2-Lane Highway	900	2,000	6,800	14,100	17,400
MA2	Major 2-Lane Highway	1,200	2,900	7,900	16,000	20,500
MH4	4-Lane, Multilane Highway	10,700	17,600	25,300	32,800	36,500
2A	2-Lane Arterial	-	-	9,700	17,600	18,700
4AU	4-Lane Arterial, Undivided	-	-	17,500	27,400	28,900
4AD	4-Lane Arterial, Divided	-	-	19,200	35,400	37,400
6AD	6-Lane Arterial, Divided	-	-	27,100	53,200	56,000
8AD	8-Lane Arterial, Divided	-	-	37,200	71,100	74,700
4F	4-Lane Freeway	22,200	40,200	57,600	71,400	80,200
4FA	4-Lane Freeway with Auxiliary Lanes	28,200	51,000	72,800	89,800	100,700
2AMD	2-Lane Arterial, Moderate Access Control SAC COUNTY	10,800	12,600	14,400	16,200	18,000
4AMD	4-Lane Arterial, Moderate Access Control SAC COUNTY	21,600	25,200	28,800	32,400	36,000
6AMD	6-Lane Arterial, Moderate Access Control SAC COUNTY	32,400	37,800	43,200	48,600	54,000
4AHD	4-Lane Arterial, High Access Control SAC COUNTY	24,000	28,000	32,000	36,000	40,000
6AHD	6-Lane Arterial, High Access Control SAC COUNTY	36,000	42,000	48,000	54,000	60,000

Appendix G – Public Review Comments and Responses

This Appendix contains the responses to comments received during the public review period. The 45 day comment period started on June 28, 2010 and ended on August 12, 2010. One comment letter was received from the Sacramento Metropolitan Air Quality Management District. The comments and responses are shown on the following page.

Appendix G - Comments and Responses

No.	Comment From	Comment		Response
1	Karen Huss, SMAQMD	Although the discussion on diesel particulate matter (DPM) is done well on page 35, the discussion to justify DPM emissions as less than significant should be expanded (pages 43 and 48). The SMAQMD made similar comments regarding DPM emissions in the Mormon Island Auxiliary Dam (MIAD) Modification Project EIS/EIR (State Clearinghouse #2009042077). Language from the MIAD FEIS/EIR (attached) is an example of an expanded significance determination discussion when a health risk assessment has not been conducted. Mitigation measures being implemented that reduce DPM should be added to the discussion as well. DPM is reduced when off-road construction equipment particulate exhaust emissions are required to be reduced by 45% (part of the standard SMAQMD construction mitigation measure).		Additional Language has been added to the report on significance criteria and mitigation measures for DPM.
2	Karen Huss, SMAQMD	The use of aqueous or emulsified diesel fuel as a NOx mitigation strategy has not been viable in the Sacramento region to date (page 50).		Clairifying text has been added to the document,
3		On page 51, the "Mitigated Emissions Summary" indicates that "the 20 percent reduction in NOx applies only to on-site construction equipment and on-site haul trucks." Please clarify that the 20 percent NOx reduction in construction emissions suggested by the SMAQMD's standard construction mitigation measure only applies to off-road equipment not haul trucks designed for on-road use. It doesn't appear emissions calculation changes are necessary (Appendix D2).		Clairifying text has been added to the document.
4	Karen Huss, SMAQMD	The SMAQMD encourages the Army Corps of Engineers to estimate greenhouse gas (GHG) emission reductions that may result from implementing best management practices listed, especially the measures related to concrete production, the most GHG emissive process of this project (pages 61 and 62).		Due to the nature of the air quality analysis, based on estimated contractor schedule, equipment, and plan of construction, the Corps feels that an estimate of quantitative GHG emission reduction from the mitigation measures would be too speculative. The estimated CO_2 emissions are below the 25,000 metric ton reporting threshold.
5	Karen Huss, SMAQMD	A CEQA significance finding for GHG emissions from the project is necessary in accordance with CEQA Guidelines section 15064.4 (page 63).		Text for CEQA level of significance has been added to the document.
6	Karen Huss, SMAQMD	Appendix D2, Air Quality Emissions Calculations, shows the use of electric stationary cranes and man lifts. If electricity to power this equipment is generated by diesel generators, those emissions should be included in the emissions calculations. It is not clear if line power will be used.		Clairifying text has been added to the document.
7	Karen Huss, SMAQMD	Appendix D2 also shows maximum NOx emissions of 34.68 tons/year for the Control Structure and 44.54 tons/year for the Chute and Stilling Basin construction. These calculations are not consistent with Tables 3-9 and 3-11 in chapter 3.3.1.		The Appendix has been updated with the correct calculatios.
8	Karen Huss, SMAQMD	SMAQMD rules apply to all projects at the time of construction. A list of the most common rules that apply to construction is attached. A complete list of all SMAQMD rules is available at www.airqualtiy.org or by calling 916-874-4800.		Comment Noted.