APPENDICES

APPENDIX A

SCRRA/Metrolink Fact Sheet

FACT SHEET

The Metrolink Regional System	Mar '09	Mar '08
Number of Routes	7	7
Stations in Service	55	55
Route Miles (includes shared miles)	512	512
Route Miles (excludes shared miles)	388	388
Average Trains Operated/Weekday	149	145
Average Trains Operated/Saturday	46	46
Average Trains Operated/Sunday	32	32
Average Weekday Riders on Metrolink trains (Jan thru Mar)	43,397 (-0.8%)	43,737
Average Weekday Metrolink Riders on Amtrak (Jan thru Mar)	1,912 (+13%)	1,697
Total Average Weekday Metrolink Riders (Jan thru Mar)	45,309 (-0.3%)	45,434
Average System Speed (M.P.H. with stops)	41 m.p.h.	41 m.p.h.

Metrolink by Route Corridor	Mar '09	Mar '08
Ventura County Line (Oxnard to Los Angeles) *†Includes 11 Burbank/Bob Hope Airport trains*		
Stations	12	12
Route Miles	70.9	70.9
Trains Operated/Day	31 †	31
Ave Wkday Riders on Metrolink (Jan thru Mar)	4,661 (+2%)	4,586
Ave Wkday Metrolink Riders on Amtrak (Jan thru Mar)	279 (+4%)	267
Total Ave Weekday Metrolink Riders (Jan thru Mar)	4,940 (+2%)	4,853
Ave Saturday Metrolink Riders on Amtrak (Jan thru Mar)	93 (+17%)	80
Ave Sunday Metrolink Riders on Amtrak (Jan thru Mar)	80 (+35%)	59
Average Speed	42 m.p.h.	42 m.p.h.
Antelope Valley Line (Lancaster to Los Angeles)		
Stations	11	10
Route Miles	76.6	76.6
Trains Operated/Weekday	24	24
Trains Operated/Saturday	12	12
Trains Operated Sunday	6	6
Average Weekday Riders (Jan thru Mar)	6,603 (-8%)	7,150
Average Saturday Service Riders (Jan thru Mar)	2,091 (-2%)	2,127
Average Sunday Service Riders (Jan thru Mar)	1,014 (+12%)	904
Average Speed	41 m.p.h.	41 m.p.h.

The Quarterly Fact Sheet is Prepared by the Metrolink Communications & Development Department

San Bernardino Line (San Bernardino to Los Angeles)

Stations	13	13
Route Miles	56.5	56.5
Trains Operated/Weekday	38	34
Trains Operated/Saturday	20	20
Trains Operated/Sunday	14	14
Average Weekday Riders (Jan thru Mar)	13,059 (+4%)	12,608
Average Saturday Service Riders (Jan thru Mar)	3,744 (+0.2%)	3,738
Average Sunday Service Riders (Jan thru Mar)	2,307 (+11%)	2,075
Average Speed	39 m.p.h.	39 m.p.h.

Riverside Line (Riverside to Los Angeles)

Stations	7	7
Route Miles	59.1	59.1
Trains Operated/Weekday	12	12
Average Weekday Riders (Jan thru Mar)	5,200 (+2%)	5,114
Average Speed	42 m.p.h.	42 m.p.h.

Orange County Line (Oceanside to Los Angeles)

Stations	14	13
Route Miles	87.2	87.2
Trains Operated/Weekday	19	19
Trains Operated/Saturday	8	8
Trains Operated/Sunday	8	8
Ave Wkday Riders on Metrolink (Jan thru Mar)	7,216 (+3%)	7,024
Ave Wkday Metrolink Riders on Amtrak (Jan thru Mar)	1,633 (+14%)	1,430
Total Ave Weekday Metrolink Riders (Jan thru Mar)	8,849 (+5%)	8,453
Average Saturday Service Riders (Jan thru Mar)	769 (+6%)	729
Average Sunday Service Riders (Jan thru Mar)	595 (+20%)	496
Ave Saturday Metrolink Riders on Amtrak (Jan thru Mar)[1]	464 (-5%)	489
Ave Sunday Metrolink Riders on Amtrak (Jan thru Mar)[1]	445 (+4%)	428
Average Speed	44 m.p.h.	44 m.p.h.

Inland Empire-Orange County Line (San Bernardino to Oceanside)

Stations	14	14
Route Miles	100.1	100.1
Trains Operated/Weekday	16	16
Trains Operated/Saturday	6	6
Trains Operated/Sunday	4	4
Average Weekday Riders (Jan thru Mar)	4,380 (-10%)	4,891
Average Saturday Service Riders (Jan thru Mar)	454 (+1%)	448
Average Sunday Service Riders (Jan thru Mar)	283 (+23%)	230
Average Speed	39 m.p.h.	39 m.p.h.

91 Line (Riverside to Los Angeles via Fullerton)

Stations	9	8
Route Miles	61.6	61.6
Trains Operated/Day	9	9
Average Weekday Riders (Jan thru Mar)	2,278 (-4%)	2,365
Average Speed	39 m.p.h.	39 m.p.h.

Metrolink Fast Facts

- Average Number of Auto Trips Removed/Weekday 27,299
- Weekday Riders Who Formerly Drove Alone/Carpooled 67.1percent
- Weekday Riders Who Formerly Made the Trip and Drove Alone/Carpooled 89.7 percent
- Average Metrolink Commute Trip Length (linked) 36.9 miles
- Equivalent Peak Hour Lane Miles on Parallel Freeway Replaced by Metrolink Service up to 1.3
- Percent of work trips destined for Los Angeles Union Station 57.5 percent
- Percent of work trips destined for the Los Angeles Central Business District 36.1 percent
- Average weight of a Metrolink train 400 tons
- Passenger Car Dimensions
  - Length 85'0"
  - Width 9'10"
  - Height 15'11"
- Locomotive Dimensions (maximum)
  - Length 68'0"
  - Width 10'7.5"
  - Height 15'5"
- Average distance for a Metrolink train to stop 1/3 mile
- Percent of Weekday Ethnic Riders by Line Corridor (*Latino, Asian, African-American, other*)
  - San Bernardino Line 70 percent
  - Riverside Line 78 percent
  - Antelope Valley Line 55 percent
  - Ventura County Line 39 percent
  - Orange County Line 51 percent
  - Inland Empire-Orange County Line 49 percent
  - 91 Line 61 percent
  - System 60 percent
- Percent of Weekend Ethnic Riders by Line Corridor (*Latino, Asian, African-American, other*)
  - San Bernardino Line 79 percent
  - Antelope Valley Line 77 percent
  - Orange County Line 51 percent
  - Inland Empire-Orange County Line 50 percent
  - System 71 percent

Source: 2008 Metrolink Customer Satisfaction Survey, 2008 Metrolink Weekend Customer Survey, and SCRRA Budget for FY 2008-09

The Southern California Regional Rail Authority/Metrolink

Date of Formation	August 1991
Form of Government	Joint Powers Authority
Number of SCRRA Board Members	11

Number of Alternates	9
Number of Member Agencies	5
Number of Ex-Officio Members	3
SCRRA Member Agencies	Los Angeles County Metropolitan Transportation Authority Orange County Transportation Authority Riverside County Transportation Commission San Bernardino Associated Governments Ventura County Transportation Commission
Ex-Officio Member Agencies	Southern California Association of Governments San Diego Association of Governments State of California

SCRRA/Contract Employment		
	Operations	342
	Maintenance of Way	143
	SCRRA Administration	198
	SCRRA Interns	17
	TOTAL	***700***

Operating Route Miles by County in System

	Excludes Shared Miles	*Includes Shared Miles*
Los Angeles County	186.0	220.2
Orange County	67.5	117.6
Riverside County	38.1	58.6
San Bernardino County	38.7	38.7
Ventura County	38.9	38.9
San Diego County	19.0	38.0
TOTAL	***388.2***	***512.0***

Metrolink's 2008-09 Annual Budget

Operating Budget	$164.4 million
Projected percent of operating costs covered by operating revenues	53.2 percent
Projected percent of operating costs covered by fares	44.3 percent

Metrolink Train Equipment

Number of Locomotives	52
Total Number of Commuter Rail Cars	**173**
Cab Cars (includes 4 leased from Sound Transit + 2 from Altamont Commute Express)	39
Coaches (includes 8 leased from Sound Transit + 2 from Altamont Commute Express + 15 from New Jersey Transit and 5 from Utah Transit Authority)	134
Equipment on Order:	
Cab cars	57
Coaches	60
Additional lease coaches on order (5 from Utah Transit Authority)	5

Note that 2 cab cars and 4 coaches leased from Sound Transit cars are to be returned in May 2009

Highway-Rail Grade Crossings

Total Number of Grade Crossings of All Types in Metrolink System[2,3]	833
Number of At-Grade Crossings in System	463
Number of Undergrade Crossings (Railroad Over) in System	160
Number of Overgrade Crossings (Railroad Under) in System	210
Number of Public Crossings in System	698
Number of Pedestrian Crossings in System	37
Number of Private Crossings in System	50
Number of Private Pedestrian Crossings in System	4
Number of Station Crossings in the System	44
Number of SCRRA-owned Crossings in System	544
Number of BNSF-owned Crossings in System	144
Number of UPRR-owned Crossings in System	127
Number of NCTD-owned Crossings in System	18

At-Grade Crossings:

	Metrolink	BNSF	UPRR	NCTD
Total	311	70	79	3
Public	255	64	66	3
Pedestrian	10	2	0	
Private	29	1	5	0
Pedestrian Private	0	0	0	0
Station	17	3	8	0

Undergrade Crossings (Railroad Over):

	Metrolink	BNSF	UPRR	NCTD
Total	90	42	24	4
Public	62	40	23	1
Pedestrian	11	2	1	1
Private	10	0	0	1
Pedestrian Private	2	0	0	0
Station	5	0	0	1

Overgrade Crossings (Railroad Under):

	Metrolink	BNSF	UPRR	NCTD
Total	143	32	24	11
Public	128	27	21	8
Pedestrian	10	0	1	0
Private	1	0	0	3
Pedestrian Private	2	0	0	0
Station	2	5	3	0

[2] The Metrolink system operates over rail rights-of-way owned by SCRRA member agencies, Burlington Northern Santa Fe Railroad (BNSF), Union Pacific Railroad (UPRR) and North County Transit District (NCTD)
[3] The list of crossings now includes 48 crossings in two categories not included in the Fact Sheet prior to December 2007. These include four Pedestrian Private crossings and 44 Station crossings.

APPENDIX B

Definitions of Key Terms and Standard Abbreviations

APPENDIX B
Definitions of Key Terms

Advance Preemption	The notification of an approaching train is forwarded to the highway traffic signal controller unit or assembly by railroad equipment in advance of the activation of the railroad warning devices.
Advance Preemption Time	The period of time that is difference between the required maximum highway traffic signal preemption time and the activation of the railroad warning devices.
Buffer Time	The railroad's additional warning time for train handling to ensure that a required minimum warning time for track clearance is provided. Buffer time is discretionary and is added to the required 20-second minimum time.
Cantilever Signal Structure	A structure that is rigidly attached to a vertical pole and is used to provide overhead support of signal units.
Clearance Time	Additional time that must be provided in excess of the minimum time to account for wide crossings or crossing conditions that may slow the vehicle movement through the crossing. Clearance time is added at a rate of one (1) second for each 10 feet (or fraction thereof) of minimum track clearance distance greater than 35 feet.
Clear Storage Distance	The distance available for vehicle storage measured between six (6) feet from the rail nearest the intersection to the intersection stop line or the normal stopping point on the highway. At skewed highway-rail crossings and intersections, the 6-foot distance shall be measured perpendicular to the nearest rail, either along the centerline or the edge line of the highway, as appropriate, to obtain the shorter clear distance. Where exit gates are used, the distance available for vehicle stoppage is measured from the point where the rear of the vehicle would be clear of the exit gate arm. In cases where the exit gate arm is parallel to the track(s) and not perpendicular to the highway, as appropriate, to obtain the shorter distance.
Clear Track Green Interval	The time assigned to clear the design vehicles stopped at the highway-rail crossing stop line from the track area on approach to the signalized highway intersection. This does not include the yellow and all red intervals for the queue

	clearance.
Constant Warning Time Train Detection	A means of train detection that provides relatively uniform warning time for the approach of a train that is not accelerating or decelerating after being detected.
Contractor	The individual, firm, partnership, corporation, joint venture, or combination thereof that has entered into a construction contract with the legal entity for which the work is being performed. For purpose of these guidelines, a contractor also includes any subcontractor, supplier, agent, or other individuals entering the railroad right-of-way during performance of the work.
Design Vehicle	The longest vehicle permitted by statue of the road authority (state or other) on that roadway.
Diagnostic Team	A group of knowledgeable representatives of the parties of interest in a highway-rail crossing or a group of crossings, who, using crossing safety management principles, evaluate conditions at a grade crossing to make determinations or recommendations concerning safety needs at the crossing.
Engineering Study	The comprehensive analysis and evaluation of available pertinent information, and the application of appropriate principles, engineering judgment, experience, education, discretion, standards, guidance, and practices, for the purpose of deciding upon the applicability, design, operation, or installation of traffic control device. An engineering study shall be performed by a registered civil or traffic engineer, or by an individual working under the supervision of said engineer, through the application of procedures and criteria established by the engineer. An engineering study shall be documented.
Dynamic Exit Gate Operating Mode	A mode of operation where the exit gate operation is based on the presence of vehicles within the minimum track clearance distance.
Equipment Response Time	The time elapsed between when the train enters the track circuit and when the train equipment (circuitry, relays, mechanisms, etc.) provides preemption notification to the traffic signal controller or the railroad warning devices.

Exit Gate Clearance Time	For four-quadrant gate systems, the exit gate clearance time is the amount of time provided to delay the descent of the exit gate arms after the entrance gate arms begin to descend.
Exit Gate Operating Mode	For four-quadrant gate systems, the mode of control used to govern the operation of the exit gate arms.
Fail-Safe	A design philosophy applied to safety-critical systems such that the result of a power failure, hardware failure, or the effect of software error shall either prohibit the system from assuming or maintaining an unsafe state, or shall cause the system to assume a state known to be safe.
Flangeway	The area adjacent to the rail that allows the flange of the wheel of the locomotive and rail cars.
Flashing-Light Signals	A warning device consisting of two red signal indications arranged horizontally that are activated to flash alternately (45 to 65 times per minute) when a train is approaching or present at a highway-rail crossing.
Four-Quadrant Gate	Train-activated warning gates that, when lowered, fully block highway traffic from entering the crossing. Gates lower across both approach and departure lanes on both sides of the crossing.
Grade Separation	A crossing of a highway and a railroad at different levels.
Highway	The roadway, road, street, approach road including any pedestrian or bicycle paths and including medians, lighting, fencing, landscaping, sidewalks traffic signs, traffic striping, drainage facilities and all other related highway improvements.
Highway Agency	The Public Agency or Private Entity that owns and maintains the property or has an easement or license for the highway improvements at and approaching the highway-rail grade crossing. The highway agency will typically be a local municipality (a City, a County, or the State or for a private crossing a private party).
Highway-Rail Grade Crossing	The general area where a highway and a railroad cross at the same level, within which are included the railroad, highway, and roadside facilities for traffic traversing that area. Highway-rail grade crossing will also mean the same as rail-grade crossing, rail crossing, at-grade crossing, or

crossing.

Highway Traffic Signals	A power-operated traffic control device by which right-of-way is sequentially provided for various traffic movements at an intersection. These devices do not include power-operated signs, illuminated pavement markers, barricades, warning lights, or steady burning electric lamps.
Hold State	That portion of the preempt sequence in which the traffic signal controller will provide green indications to vehicle movements that do not approach the highway-rail crossing.
Interconnection	The electrical connection between the railroad active warning system and the traffic signal controller unit for the purpose of preemption.
Left Turn Trap	A condition whereby motorists turning left in one direction are shown a circular yellow indication while conflicting through-traffic in the opposite direction is shown a circular green indication. This situation should be avoided to prevent any motorists from turning left in front of oncoming traffic.
Main Track	A track designated in SCRRA's Timetable and General Code Of Operating Rules as a rack extending through yards and between stations that must not be occupied without authority or protection.
Manual	SCRRA's Highway-Rail Grade Crossings Recommended Design Practices and Standards Manual.
Maximum Highway Traffic Signal Preemption Time	Maximum amount of time needed following initiation of the preemption sequence for the highway traffic signals to complete the timing of the right-of-way transfer, queue clearance time, and separation time.
Median	The portion of a divided highway separating the travel ways for traffic in opposite direction.
Member Agency	Any county transportation agency whose property is directly affected by the project. The SCRRA member agencies are the Los Angeles County Metropolitan Transportation Authority (Metro), the Orange County Transportation Authority (OCTA), the Riverside County Transportation Commission (RCTC), the San Bernardino Associated Governments (SANBAG), and the Ventura County

	Transportation Commission (VCTC).
Minimum Track Clearance Distance	For standard two-quadrant railroad warning device control, the minimum track clearance distance is the length along a highway at one or more railroad tracks, measured either from the highway stop line for the highway-rail crossing, warning device, or 12 feet perpendicular to the track centerline, to six (6) feet beyond the tracks, measured perpendicular to the far rail, along the centerline, or along the edge line of the highway, as appropriate, to obtain the longer distance. For four-quadrant gate systems, the minimum track clearance distance is the length along a highway at one or more railroad tracks, measured either from the highway stop line or entrance warning device, to the point where the rear of the vehicle would be clear of the exit gate arm. In cases where the exit gate arm is parallel to the track(s) and is not perpendicular to the highway, the distance is measured either along the centerline or edge of the highway, as appropriate, to obtain the longer distance.
Minimum Warning Time	Through train movement - The least amount of time the railroad active warning devices shall operate prior to the arrival of a train at a highway-rail crossing. Minimum warning time consists of the “minimum time” and the “clearance time” if the railroad warning system is interconnected with the highway traffic signal.
Minimum Time	The minimum 20-second time that the flashing-light signals operate before the arrival of any train in a crossing.
Monitored Interconnected Operation	An interconnected operation that has the capability to be monitored by the railroad or highway authority at a location away from the highway-rail crossing.
Overhead	A grade separated highway over a railroad.
Pedestrian Change/Don’t Walk Interval	An interval during which the flashing upraised hand signal indication is displayed. When a verbal message is provided at an accessible pedestrian, the verbal message is “wait.”
Pedestrian-Rail Grade Crossing	A Highway-Rail Grade Crossing that is used by pedestrians but not by vehicles.
Pedestrian Clearance Time	The time provided for a pedestrian crossing in a crosswalk, after leaving the curb or shoulder, to travel to the farside edge of the traveled way or to a median that has sufficient

	storage area for a pedestrian to wait.
Preemption	The transfer of normal operation of highway traffic signals to a special mode.
Preempt Trap	The condition where the traffic signals clear track green interval of the queue clearance phase at the intersection ends before the railroad warning lights start to flash.
Pre-signal	Supplemental highway traffic signal faces operated as part of the downstream highway intersection traffic signals to stop traffic before it crosses the railroad. The purpose is to prevent vehicles from queuing across the crossing and then finding themselves stopped on the tracks in the area known as the minimum track clearance distance.
Private Rail –Grade Crossing	A Highway-Rail Grade Crossing that is on a privately owned roadway used only by the private property owner or licensee.
Public Agency	The federal government and any agencies, departments, or subdivisions thereof; the State of California; and any county, city, city and county district, public authority, joint powers agency, municipal corporation, or any other political subdivision or public corporation therein; responsible for traffic control or law enforcement at the highway-rail grade crossing and requesting and sponsoring the projects. For the purposes of this Manual, SCRRA is not considered as a Public Agency.
Queue Clearance Time	The time required for the design vehicle stopped within the minimum track clearance distance to start up and move through the minimum track clearance distance and through the downstream intersection if there is not enough clear storage distance for the design vehicle. If pre-signals are present, this time shall be long enough to allow the vehicle to move through the intersection, or to clear the tracks if there is sufficient clear storage distance. If a four-quadrant gate system is present, this time shall be long enough to permit the exit gate arm to lower after the design vehicle is clear of the minimum track clearance distance.
Quiet Zone	A segment of rail line, with one or a number of consecutive public highway-rail crossings at which locomotive horns are not routinely sounded per 49 CFR Part 222.
Railroad Corridor	The corridor that includes the railroad right-of-way and

	adjacent constituent areas that contributes to the operation, maintenance, and safety of the railroad.
Right-of-way	A strip of land, real estate or property of interest, under the ownership or operating jurisdiction of SCRRA or member agency on which railroad tracks, other structures and facilities are constructed.
Right-of-Way Transfer Time	The maximum amount of time needed for the worst-case condition, prior to display of the clear track green interval. This includes any railroad control equipment response time to react to a preemption call, and any traffic signal green, pedestrian walk and clearance, yellow change, and red clearance intervals for conflicting traffic.
SCRRA Standards	The SCRRA Engineering Standards and/or the SCRRA Standard Specifications for any of several elements of track, roadbed, structure, signal, or related facilities.
Separation Time	The component of maximum preemption time minus the right-of-way transfer time and the minimum track clearance distance (MTCD) queue clearance time. It is the additional time during which the MTCD time ends and prior to the arrival of the train.
Simultaneous Preemption	Notification of an approaching train that is forwarded to the highway traffic signal controller unit and railroad active warning devices at the same time.
Station Crossing	A crossing that is located within the limits of a station and associated with a station platform.
Stop Line	A solid white pavement marking line extending across approach lanes to indicate the point at which a stop is intended or required to be made.
Supervisory Interconnect Circuitry	A method by which the integrity of the interconnection between the railroad circuits and the traffic control circuits is monitored. This method utilizes two relays in the traffic signal cabinet. The preempt relay is energized when the active railroad control devices are off. The supervisory relay is energized only when the active railroad control devices are operating. If both are energized or de-energized at the same time (a malfunction), the traffic controller will recognize a malfunction and enter the all flash mode of operation. When the malfunction is recognized, if there is a health status furnished to the railroad, the health status

	relay will de-energize and both systems will operate in a restrictive mode until the problem is corrected.
Third Party	An individual, firm, partnership, or corporation, or combination thereof, private or public, requesting and sponsoring a project. “Third party” also includes the federal government and any agencies, departments or subdivisions thereof; the State of California; and any county, city, public authority, joint powers agency, municipal corporation, or any other political subdivision or public corporation therein requesting and sponsoring a project. Utilities are considered a third party. For the purpose of this Manual, the SCRRA is not considered a third party.
Timed Exit Gate Operating Mode	A mode of operation where controlled descent of the exit gate of a four-quad gate is based on a predetermined time interval.
Traffic Signal	A power-operated traffic control device by which traffic is regulated, warned, or alternately directed to take specific actions.
Underpass	A grade separated highway under a railroad.
Vehicle Intrusion Detection Device	A detector or detectors used as a part of a railroad warning system incorporating processing logic to detect the presence of vehicles within the minimum track clearance distance, and to control the operation of the exit gates.
Wayside Equipment	The signals, switches, and/or control devices for railroad operations housed within one or more enclosures located along the railroad right-of-way and/or on railroad property.

Standard Abbreviations

AASHTO	American Association of State Highways and Transportation Officials
ADA	Americans with Disabilities Act
AREMA	American Railway Engineering and Maintenance of Way Association
ASM	Alternative Safety Measure
Caltrans	California Department of Transportation
CA MUTCD	Manual of Uniform Traffic Control Devices, California Supplement
CPUC	California Public Utilities Commission
CTCDC	California Traffic Control Device Committee
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
G.O.	General Orders of the CPUC
IEEE	Institute of Electrical and Electronics Engineers, Inc. (now just “IEEE”)
METRO	Los Angeles County Metropolitan Transportation Authority
NEMA	National Electrical Manufacturers Association
OCTA	Orange County Transportation Authority
OSHA	Occupational Safety and Health Administration
RCTC	Riverside County Transportation Commission
SANBAG	San Bernardino Associated Governments
SCRRA	Southern California Regional Rail Authority
SSM	Supplemental Safety Measure
SSPWC	Standard Specifications for Public Works Construction
USDOT	United States Department of Transportation
VCTC	Ventura County Transportation Commission

Abbreviations for Preemption

APT	Advance Preemption Time
BT	Buffer Time
CT	Clearance Time
CSD	Clear Storage Distance
ERT	Equipment Response Time
MHTSPT	Maximum Highway Traffic Signal Preemption Time
MT	Minimum Time
MTCD	Minimum Track Clearance Distance
MWT	Minimum Warning Time
QCT	Queue Clearance Time
RTT	Right-of-Way Transfer Time
ST	Separation Time
TAT	Total Approach Time
TWT	Total Warning Time

APPENDIX C

References

APPENDIX C

References

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APPENDIX D

Diagnostic Form Instructions

APPENDIX D

Diagnostic Form Instructions

1. General

The diagnostic form is used by the diagnostic team as a checklist of existing crossing conditions, noticeable conflicts, necessary changes required, etc. Appendix E provides a copy of the SCRRA diagnostic form. The diagnostic form is structured to allow users to easily gather pertinent information about the crossing. The form also accommodates extra notes and diagrams that help to clarify the current conditions at the crossing.

The information contained on the form can be efficiently completed at different stages. The on-site diagnostic review meeting is a very busy event, with little time available for the completion of the statistics for the form. The initiator of the diagnostic process should follow these steps in completing the form:

Step 1: Research available traffic and railroad data.

Step 2: Perform advance field work to document the characteristics of the crossing.

Step 3: Complete the form prior to the diagnostic meeting (except for the conclusions and observation team input).

Step 4: Conduct the diagnostic field meeting, taking notes on the discussion and observations that arise at the meeting, to be published later as minutes to the meeting.

Step 5: Complete the form after the diagnostic meeting is conducted, and send a copy, along with the meeting minutes, to all individuals present at the diagnostic review meeting.

It is important to complete as much of the form as possible prior to the diagnostic meeting in order to maximize the utility of the meeting.

In addition to filling out the diagnostic form, the facilitator of the diagnostic meeting should provide adequate drawings showing the condition of the crossing and the planned improvements. Aerial photographs should include adjacent signals and property uses in order to adequately identify the issues affecting the crossing. In addition, the facilitator should provide a legend of symbols and identifiers of the quadrants associated with the crossing. It would also be helpful to mark the drawing to indicate the railroad direction related to SCRRA operations. The facilitator shall also provide the track chart related to the crossing. In cases where the crossing is located at the edge of the track chart, the adjacent page should be provided as well.

Previous crossing inventories and accident reports for all existing public crossings are available on the FRA website at www.fra.dot.gov.

2. Participants

Parties required to attend a diagnostic include SCRRA, engineering consultant(s), CPUC, involved city and/or county agencies, other operating railroads, and other

stakeholders approved by the team. Collectively, the above-mentioned parties are a multidisciplinary entity referred to as the diagnostic "team".

Roles

The initiating, or lead, agency shall have at least one representative at each diagnostic. With the assistance of the consultant/subconsultant, the initiating agency shall provide diagnostic review materials, facilitate the diagnostic, and provide copies of completed diagnostic forms and meeting minutes to participants following the diagnostic.

- SCRRA**,** as the maintainer of tracks and crossing devices, shall have a representative from the Rail Corridor C& E Division and the Signal and Communication Division at each crossing diagnostic meeting. In addition, other disciplines should be available in order to ensure that engineering issues, right-of-way problems, operations, and warning device maintenance are referenced during the diagnostics.
- The initiating agency is responsible for facilitating the diagnostic process. This includes taking notes, photographing key items, and identifying issues of special concern, as verbalized in the diagnostic. The consultant and subconsultants will provide support for any specific engineering questions, as appropriate. The consultant and subconsultants shall provide exhibits and working drawings of the crossing and surrounding area. In addition, the initiating agency shall provide copies of completed diagnostic forms and meeting minutes to participants following the diagnostic.
- The CPUC shall provide safety oversight.
- Other railroad companies operating on the corridor should have representatives present to provide operational information.
- Representatives from the city or county serving as the maintainer of the roadway in which the crossing is located will provide relevant information related to the effects of local traffic.
- Property owners of land where crossings are located may provide comments on the design of the crossing, if their participation is approved by the team.

All participants meeting within the railroad right-of-way are required to wear protective safety equipment including hard hats, safety boots, orange vests, and safety glasses. All vehicles and participants are required to be a minimum of 25 feet away from active tracks.

3. Crossing Inventory and Existing Features

Existing Warning Devices

The diagnostic team should locate all active and passive warning devices, including existing gates, flashing lights, bells, and signing and striping that control traffic through the crossing. If required warning devices are not present at the crossing, if warning devices obstruct driver visibility, or if warning devices are out of sight due to overgrown vegetation, the diagnostic team should note these problems to resolve the issues in the design phase. The diagnostic team should also note how the warning devices function when the crossing is in use by a train, and whether the warning devices negatively affect

traffic flow and safety. Refer to Section 3.0 for additional information on highway-rail crossing devices.

Traffic Signals and Signs

If the railroad tracks parallel a roadway with an intersection adjacent to the crossing, the diagnostic team should note whether the appropriate warning devices are present. It shall be appropriate for the diagnostic team to observe and record the phasing sequence of the adjacent intersection when the train occupies the crossing, as well as when the crossing is open to regular traffic use. The diagnostic team should also note the operation of vehicles through the intersection when a train is approaching the crossing, and determine whether queuing occurs over the crossing. If the distance between the intersection and closest track is less than 50 feet (75 feet for crossings with heavy multi-unit vehicles) pre-signals should be considered.

Utilities

The diagnostic team should locate all visible utility markers in the vicinity of the crossing and note if aboveground utilities, such as power poles, obstruct driver or pedestrian views. Since oil, gas, and fiber optics utility lines run along the right-of-way, damage to these lines can create hazardous situations. Existing utilities may also interfere with the construction of additional signal foundations, houses, or other facilities, and must be considered within the design.

Minimum requirements concerning the horizontal, and vertical, clearances between the railroad tracks and parallel, and undercrossing, pipelines carrying gas, water, electrical wires, and cable are covered in Part 5 of the latest version of the AREMA Document.

Railroad Features

The diagnostic team should note any pedestrian crossings at stations that allow for access between platforms or access to station parking lots. The diagnostic team should also note if pedestrians use the station crossings as shortcuts between landmarks. Illegal trespassing anywhere inside the railroad right-of-way to access the station or to use the station as a throughway-should be noted so that preventive measures can be developed during the design phase.

The diagnostic team should note whether there are any stations in the vicinity of a street crossing. If so, the diagnostic team should record whether regular station operation affects the crossing. For example, the diagnostic team should note if gates remain lowered at a crossing when a train is idle at an adjacent station due to the location of the crossing circuitry. The diagnostic team should also observe and note pedestrian activity, estimating pedestrian volumes at crossings adjacent to stations to verify whether any unsafe activities occur when trains are occupying or approaching the crossing.

Signal Facilities

Existing signal facilities should be noted during the diagnostic meetings. The locations, if known, of these devices should be noted on the drawings, with particular consideration given to conduit runs to proposed or existing signal devices.

The diagnostic team should note whether the signal facility (house) adjacent to the crossing restricts sight distances, is accessible for maintenance and inspection, and is in good condition.

Track Structure

The diagnostic team should note whether the track structure affects regular traffic flow due to the crossing condition or the transition between street grades and track grades. The diagnostic team should also note if the crossing condition affects regular pedestrian movement due to non-uniform crossing surfaces, and whether the crossing surface is compliant with the current Americans with Disabilities Act (ADA).

Operations

The diagnostic team should observe regular train operations through the crossing and note whether crossing conditions, traffic conditions, and construction may affect regular railroad operations.

Adjacent Turnouts and Crossovers

Additional railroad-related activities adjacent to the crossing should be noted during the diagnostic review. The location of railroad facilities such as turnouts and crossovers, industry leads, and yards should be carefully documented. The diagnostic team should note how adjacent turnouts and crossover use may affect the crossing. The diagnostic team should observe and record whether train switching triggers active warning devices at crossings, and if traffic is adversely affected by this occurrence.

Fencing

The diagnostic team should note if illegal trespassing occurs in the railroad right-of-way, and if fencing is needed to prohibit unsafe pedestrian activity near the railroad tracks. If fencing is already in place at the crossing, the diagnostic team should also note if sight distances of train conductors, drivers, and pedestrians are affected. In addition, the effectiveness of the fencing in minimizing the opportunities for pedestrians to proceed in an unsafe manner should be noted.

Roadway Geometry

The diagnostic team should note whether the geometry of the roadway affects traffic movements through the crossing. The crossing should be as level as possible to promote good sight distances, enhance ride ability, allow safe braking distances, and permit smooth acceleration, as well as to accommodate low-clearance vehicles. For

hump crossings, the diagnostic team should determine whether trucks are at risk of becoming caught over the crossing (which could result in a truck-train collision).

Visibility

The diagnostic team should note if any visibility conflicts exist at the crossing between signals, signs, utilities, vegetation, fencing, development, or warning devices and driver sight lines. The diagnostic team should also observe if adequate reflection and illumination are available at the crossing during nighttime train service.

4. Crossing Characteristics

Traffic Counts

The diagnostic team should have access to the latest traffic counts to better understand current conditions at the crossing.

Train Counts

The diagnostic team should contact the appropriate agency/company to obtain up-to-date train counts to better understand the current operating conditions at the crossing.

Pedestrian Activity

The diagnostic team should note pedestrian activity at the crossing, including the number of pedestrians using the crossing to travel between landmarks (e.g., bus stops, residential neighborhoods, and commercial developments); whether the crossing conditions affect the ability of pedestrians to cross easily; and whether dangerous, illegal trespassing occurs. Of particular note are paths or trails that show evidence of high pedestrian activity. The diagnostic team should note whether the crossing is constructed so as to force pedestrians out into the flow of traffic in order to traverse the crossing.

Vehicle Activity

The diagnostic team should note driver behavior at the crossing, including queues extending over the crossing, drivers illegally maneuvering their vehicles around crossing gates or median islands, articulated public transit buses or school busses using the crossing, and the possibility of buses queuing into the dynamic envelope of the crossing. The diagnostic team should also inspect the crossing during peak travel times to observe worst-case scenarios. Adjacent driveway access is important to note during the diagnostic. Adjacent freeway traffic queuing should be noted as well.

The diagnostic team should note the behavior and type of trucks using the crossing. Trucks operating near the crossing (even those that are not using it directly) can also have a significant effect on the traffic at the crossing.

Right-of-way

The diagnostic team should note whether existing right-of-way is adequate to accommodate crossing improvements such as pedestrian crossing gates, swing gates, refuge areas, and ADA-compliant walkways. Breaches in right-of-way fencing and potential trespassing points should also be noted.

Emergency Services

The diagnostic team should note whether any fire stations, police stations, or hospitals create queuing problems over the crossing, and if emergency vehicles use the crossing on a main/preferred route.

Schools

During the beginning, and end, of school operation hours, the diagnostic team should observe if students use the crossing to reach final destinations, and if queuing over the tracks, abrupt stops, or double-parked vehicles occur as a result. The diagnostic team should also note whether students trespass into the railroad right-of-way.

The team should also note whether school buses use the crossing, and whether school buses come to a stop and open the door to allow the bus driver to observe whether a train is coming from either direction.

Meeting Notes

The facilitator of the diagnostic review is responsible for ensuring that all meeting notes are produced and forwarded to all participating parties.

Diagnostic Form Instructions

The initiating agency or its representative shall be responsible for completing the diagnostic form. When using the FRA crossing inventory, ensure that the information is accurate with current conditions by contacting the railroad company/authority.

The date of diagnostic review, street/road name, subdivision, USDOT number, and CPUC number should be recorded on the top of each page of the Diagnostic Form.

- Date of Diagnostic Review
  - Enter the date that the diagnostic review was performed.
- Street/Road Name
  - Enter the street or road name of the crossing.
- Subdivision
  - The railroad subdivision
- USDOT No.
  - Enter the unique identification number of the crossing assigned by the FRA, which consists of 7 characters (6 numerical characters followed by 1 letter, e.g. 123456A).
- CPUC No.
  - Enter the identification number assigned by the CPUC, which identifies railroad, subdivision, branch/line, milepost, and type of crossing.

Section 1 Diagnostic

This section should be completed prior to the diagnostic review.

Diagnostic Review

- Funded By
  - Check the appropriate box indicating the funding agency.
- Initiated By
  - Check the appropriate box indicating the initiating agency.
- Purpose of Diagnostic
  - State why a diagnostic review is being performed.
- Mtg Beg Time
  - Enter the start time of the diagnostic review.
- Mtg End Time
  - Enter the end time of the diagnostic review.
- Date Initiated
  - Enter the date that the diagnostic review was initiated.
- Level of Diagnostic
  - Check the appropriate box indicating the level of the diagnostic review.
    - Concept
    - Design
    - Design Revision
    - Final

Section 2 Railroad Data

This section outlines the railroad information necessary for the completion of the diagnostic process and should be completed with assistance from the railroad prior to the diagnostic review.

Location Data

- Railroad (R.R)
  - Enter the operating railroad that is responsible for maintaining the crossing.
- State
  - Enter the state in which the crossing is located.
- County
  - Enter the county in which the crossing is located.
- City (In or Near)
  - Enter the city in which the crossing is located or near.
- R.R. Line/Branch
  - Enter the particular line or branch that may run on the same route as other lines of a subdivision but eventually terminate at different locations.
- Nearest R.R. Timetable Station
  - XX
- R.R. Milepost
  - Refer to the railroad track charts for this information.

Railroad Data

- Daily Train Movement
  - Enter the number of passenger and freight trains that pass through the crossing during a 24 hour period beginning at 12:00 A.M. in the appropriate fields.
- Check if Less Than One Movement per Day
  - Check the box if trains pass through the crossing on a non-daily basis.
- Maximum Speed of Train
  - Enter the maximum speed allowable for passenger and freight trains in the appropriate fields.
- Crossing Angle
  - Enter the crossing angle between the track and roadway. The crossing angle is the angle between the curb line and the rail crossing the street, taken from the side of the tracks where vehicles approach the tracks. In a four quadrant application it would be the entrance gate side of the street.
- Type and Number of Tracks
  - Enter how many tracks are located at the crossing. Specify any non-mainline types of tracks.
- Can Two Trains Occupy the Crossing at the Same Time?
  - Check Yes or No if two trains are able to pass each other in opposing directions through the crossing.
- Can One Train Block the Motorist's View of Another Train at the Crossing?

  - Check Yes or No if one train can block the view of motorist from seeing other oncoming trains.
- Crossing Surface: Track
  - Enter the track
- Crossing Surface: Type
  - Enter the drivable crossing surface type (i.e. concrete panels, asphalt concrete, rubber panels, or wood) for each railroad track.
- Crossing Surface: Width
  - Enter the width of each crossing from edge of panel to edge of panel.
- Crossing Surface: Condition
  - Enter the condition at each railroad track.
- Location Relative to Station
  - Enter the location of the crossing relative to the nearest passenger station.
- Location Relative to Rail Operation Facilities
  - Enter the location of the crossing relative to rail operation facilities, i.e. industry switching or yard switching.

Five-Year Accident Data

The evaluator may contact the railroad company/authority to complete this section of the form or log on to http://safetydata.fra.dot.gov/officeofsafety and click the "Accident" field under "Report Type" to obtain FRA accident/incident reports. When using the FRA accident/incident report, ensure that the information is accurate with current conditions by contacting the railroad company/authority.

- Total Accidents
  - Enter the number of accidents that occurred at the crossing within the last five years.
- Number of Personal Injuries
  - Enter the number of personal injuries that were a result of accidents at the crossing within the last five years.
- Number of Fatalities
  - Enter the number of fatalities that were a result of accidents at the crossing within the last five years.
- Property Damage Only
  - Enter the number of accidents that occurred at the crossing, within the last five years, that caused only property damage.
- Personal Injury Accidents
  - Enter the number of accidents that resulted in personal injury.
- Fatal Accidents
  - Enter the number of accidents that resulted in fatalities.
- Have any near misses occurred?
  - Check Yes or No if train-vehicle or train-pedestrian accidents almost occurred at the crossing. Explain what occurred. This information is available from SCRRA.

Adjacent Railroad Facilities

- Adjacent Railroad Crossings within 1 Mile: USDOT No.

  - Enter the USDOT identification number of each of the adjacent crossings assigned by the FRA.
- Adjacent Railroad Crossings within 1 Mile: Street/Road Name
  - Enter the Street or road name of each of the adjacent crossings.
- Adjacent Railroad Crossings within 1 Mile: Warning Devices
  - Enter the types of existing warning devices at each of the adjacent crossings.
- Adjacent Railroad Crossings within 1 Mile: ADT
  - Enter the average daily traffic through the each of the adjacent crossings in a 24 hour period.
- Is there adequate access from this crossing to railroad facilities?
  - Check Yes or No if adequate access points exist for vehicles and/or workers to inspect, maintain adjacent crossings, signal houses and train yards.
- Description of how crossing is affected by adjacent railroad facilities
  - Describe the railroad activities over the crossing.

Section 3 Grade Crossing Inventory

This section should be completed prior to the diagnostic meeting.

Existing Warning Devices

Passive warning devices include different types of warning and regulatory signs, as well as pavement striping in conformance with the CA MUTCD. To correctly account for all types of signs, refer to the attachment labeled “Typical CA MUTCD Signs Used at Highway-Rail Grade Crossings” to match sign type with CA MUTCD coding.

Active warning devices include devices that are, in most cases, activated by a train approaching the crossing. This includes mast mounted flashing lights with or with out entrance/exit gates, cantilever flashing lights, back lights, side lights, pedestrian swing gates, bells, and blank out signs. Configurations of flashing light/gate/cantilever systems must be in conformance with the latest version of the CPUC G.O. 75. To correctly account for all types of blank out signs, refer to the attachment labeled “Typical CA MUTCD Signs Used at Highway-Rail Grade Crossings” to match blank out sign type.

- Type of Passive Warning Device: Qty
  - Enter the total quantity of each type of sign that control traffic through the crossing.
- Type of Passive Warning Device: NB, SB, WB, EB
  - Enter the total amount of each type of sign that control traffic through the crossing in each direction. If the roadway that crosses the tracks is closer to a north/south direction, than NB and SB should be used. If the roadway that crosses the tracks is closer to a west/east direction, than WB and EB should be used. If the crossing is very close to 45 degrees, than a choice should be made to use either NB/SB or WB/EB and should be consistent with all other crossings along a project. This should be identified on the comprehensive sketch.
- Is the crossing illuminated?

  - Check Yes or No if the street lighting adjacent to the crossing provides sufficient light to the crossing.
- Pavement Striping: Stop Bars
  - Check Yes or No if two parallel stop bars are located ahead of the crossing gates to inform drivers to stop behind the gates. If Yes, enter the number of pairs of stop bars.
- Pavement Striping: RxR
  - Check Yes or No if RxR pavement markings exists upstream of the crossing to inform drivers of a crossing downstream. If Yes, enter the number of RxR a pavement markings.
- Pavement Striping: Dynamic
  - Check Yes or No if dynamic envelope pavement markings exists parallel to the tracks throughout the crossing. If Yes, enter the number of sides with dynamic envelope pavement markings.
- Pavement Striping: No Passing
  - Check Yes or No if no passing pavement markings exists at the crossing. If Yes, enter the number of approaches with no passing pavement markings.
- Pavement Striping: Lane Lines
  - Check Yes or No if lane line pavement markings exist on the approaches to the crossing. If Yes, enter the number of lane line pavement markings on all approaches.
- Pavement Striping: Other
  - Check Yes or No if other types of striping control traffic through the crossing. If Yes, specify the type and enter the number of the other type of striping.
- Type of Active Warning Devices: 8", 12"; Incandescent or LED (Light Emitting Diode)
  - The different type of flashing lights that control traffic through the crossing.
    - 8" flashing lights
      - Incandescent
      - LED
    - 12" flashing lights
      - Incandescent
      - LED
- Type of Active Warning Devices: Mast Mounted Flashing Lights
  - Check Yes or No if dual flashing lights are mounted on the mast control traffic through the crossing. If Yes, enter the 8", 12", LED, and total number of individual lights mounted on the mast.
- Type of Active Warning Devices: Cantilever Flashing Lights
  - Check Yes or No if coupled lights are mounted on the cantilever, which is extended over the traffic lanes from the top of the mast control traffic through the crossing. If Yes, enter the 8", 12", LED, and total number of individual lights mounted on the cantilever.
- Type of Active Warning Devices: Back Lights
  - Check Yes or No if coupled lights are mounted on the mast or cantilever in the opposite direction of traffic control traffic through the crossing. If Yes, enter the 8", 12", LED, and total number of individual lights mounted on the mast or cantilever in the opposite direction of traffic.

- Type of Active Warning Devices: Side Lights
  - Check Yes or No if coupled lights mounted on the mast or cantilever not in conformance with CPUC G.O. 75 control traffic through the crossing. If Yes, enter the 8", 12", LED, and total number of individual lights mounted on the mast or cantilever.
- Type of Active Warning Devices: Entrance
  - Check Yes or No if entrance gates exist upstream of the crossing prohibit cars from entering the crossing while a train is passing. If Yes, enter the number of entrance gates, as well as corresponding gate lengths and locations at the crossing.
- Type of Active Warning Devices: Exit
  - Check Yes or No if exit gates exist downstream of the crossing prohibit drivers from maneuvering around the gates in the down position. If Yes, enter the number of exit gates, as well as corresponding gate lengths and locations at the crossing.
- Type of Active Warning Devices: Pedestrian
  - Check Yes or No if pedestrian gates exist upstream and downstream of the crossing prohibit pedestrians from entering the crossing while a train is passing. If Yes, enter the number of pedestrian gates at the crossing.
- Type of Active Warning Devices: Pedestrian Swing
  - Check Yes or No if pedestrian swing gates upstream and downstream of the crossing allow pedestrians trapped in crossing while the gates are activated to exit the crossing area. If Yes, enter the number of pedestrian swing gates at the crossing.
- Type of Active Warning Devices: Bells
  - Check Yes or No if advanced warning bells exist at the crossing. If Yes, enter the number of bells at the crossing.
- Type of Active Warning Devices: R3-1 Blank Out Sign/R3-2 Blank Out Sign/R3-5 Blank Out Sign
  - Check Yes or No if either type of blank out sign exist at the crossing. If Yes, enter the number of each type of blank out sign.
- Type of Active Warning Devices: Modified Blank Out Sign w/ Train Indicator
  - Note any other devices.
- Type of Active Warning Devices: Other
  - Check Yes or No if any other types of active warning devices exist at the crossing. If Yes, specify the type and enter the number of other active warning devices at the crossing.
- Type of Active Warning Devices: Are there any broken gates at the crossing?
  - Check Yes or No if gates no longer serve their original purpose due to malfunction or damage. If Yes, enter the number of broken gates at the crossing.

Traffic Signal Interconnection and Preemption

Explanation of fields:

- Are highway traffic signals interconnected?
  - Check Yes or No if traffic signal phasing changes to accommodate train traffic.
- Do pre-signals exist at the crossing?

- Check Yes or No if signals placed either upstream or downstream of the crossing stop traffic behind the stop bars when a train is passing.

- Is preemption existent at the crossing?
  - Check Yes or No if crossings adjacent to parallel roadways utilizes preemption and the traffic signals clear out the storage area between the intersection and crossing and also prohibit turns towards the storage areas between the intersection and crossing.
- Exiting Warning Time
  - Enter the actual amount of time a driver or pedestrian is given before a train arrives at the crossing.
- Desired Warning Time
  - Enter the preferred amount of time a driver or pedestrian is given before a train arrives at the crossing.

Closure

- Can roadway realignment be accomplished to allow consolidation of crossings?
  - Check Yes or No if the possibility to close the crossing is feasible, which would shift traffic to the surrounding crossings. If Yes, provide sketch of traffic movements due to crossing closure.
- Impact of closure
  - Explain the effects from the closure of the crossing due to increased traffic at upstream and downstream crossings and decreased access to businesses and residences.

Section 4 Highway Information

This section should be completed in advance of the diagnostic meeting.

Other agencies and/or companies may have to be contacted to obtain the amount of school buses and hazardous material vehicles travel over the crossing each day. School bus information is usually obtained from the school district in the area.

Roadway Data

- Agency Having Jurisdiction
  - Enter the government entity, whether it is city, county, or state that is responsible for maintaining the roadway that runs through the crossing.
- Highway Type
  - Enter the type of road that runs through the crossing such as arterials, collector roads, local roads, and cul-de-sacs.
- ADT
  - Enter the average daily traffic (ADT) that travels through the crossing in a 24 hour period.
- Percent Trucks
  - Enter the ratio of trucks to cars that use the crossing each day.
- Speed of Vehicle
  - Enter the maximum and typical range of speeds through the crossing from the most previous traffic study.
- School Bus Operation

  - Check Yes or No if school buses travel through the crossing. If Yes, enter the number of school buses that travel through the crossing on a daily basis.
- Hazardous Materials
  - Check Yes or No if hazardous material vehicles travel through the crossing. If Yes, enter the number of hazardous material vehicles that travel through the crossing on a daily basis.
- Pedestrians
  - Check Yes or No if pedestrians utilize the crossing.
- Curb & Gutter
  - Check Yes or No if curb and gutter exist at the crossing.
- Roadway Surface
  - Enter the type of roadway material used adjacent to the crossing surface.
- Roadway Width
  - Enter the distance from edge of curb to edge of curb of the crossing.
- Roadway Condition
  - Enter the state that the roadway is in during diagnostic review (i.e. poor, good, or excellent).
- Shoulder
  - Check Yes or No if a shoulder exists through the crossing.
- Shoulder: Width
  - Enter the width of the shoulder from the edge of the traveled way to the edge of curb.
- Is the Shoulder Surfaced?
  - Check Yes or No if the shoulders are improved.
- Shoulder Surfaced: Width
  - Enter the width of the improved shoulders.
- Is Sidewalk Present?
  - Check Yes or No if a concrete sidewalk exists to allow pedestrians, including the handicapped, the elderly, and children, to pass through the crossing easily.
- Sidewalk: Width
  - Enter the width of the sidewalk through the crossing.
- Special Conditions Required as a Result of Nearby Highway Intersections
  - Note any special conditions that exist.

<u>Type of Development</u>

- Open Space
  - Check box if surrounding area of the crossing is primarily undeveloped.
- Industrial
  - Check box if surrounding area of the crossing is primarily industrial businesses.
- Residential
  - Check box if surrounding area of the crossing is primarily homes and apartments.
- Institutional
  - Check box if surrounding area of the crossing is primarily campus types of development (i.e. schools, prisons, and hospitals).
- TOD

  - Check box if surrounding area of the crossing is a Transit Oriented Development (TOD) including residences, businesses, and retail.
- Commercial
  - Check box if surrounding area of the crossing is primarily retail businesses.
- New Developments that could affect ADT
  - Check Yes or No if new developments in the surrounding area may increase the amount of vehicles traveling through the crossing. If Yes, explain how the crossing is affected by this increase in traffic.

Pedestrian and Bike Data

- Crossing Information: Is the Crossing Surface Smooth?
  - Check Yes or No if the crossing surface type (i.e. concrete panel, asphalt concrete, rubber, wood) has a smooth even finish and transitions smoothly with the existing sidewalk.
- Crossing Information: Is Adequate Lighting Available?
  - Check Yes or No if adequate lighting is available to allow a pedestrian or biker to cross safely and easily.
- Crossing Information: Does Crossing Panel Extend 1' Behind Back of Path?
  - Check Yes or No if the crossing panels extend one foot from the back of the sidewalk towards the railroad right-of-way.
- Crossing Information: Is Path Width Adequate? 36" Minimum
  - Check Yes or No if minimum sidewalk width allows pedestrians, especially wheelchair users, to move through the crossing easily.
- Crossing Information: Are Flange Gaps 2½" or less, or Flange Fillers Used
  - Check Yes or No if the gap between the track and crossing surface allows for train movement. Flange fillers decrease the size of the flange gap while still allowing the train to move through the crossing.
- Type of Crossing: Shared
  - Check the applicable box if bikers and pedestrians are allowed to use the crossing.
- Type of Crossing: Bike
  - Check the applicable box if only bikers are allowed to use the crossing.
- Type of Crossing: Pedestrian
  - Check the applicable box if only pedestrians are allowed to use the crossing.
- Other Crossing Users: Disabled/Wheelchair
  - Check the appropriate boxes if disabled people or people in wheelchairs travel through the crossing.
- Other Crossing Users: Senior Citizens
  - Check the appropriate boxes if senior citizens travel through the crossing.
- Other Crossing Users: Children
  - Check the appropriate boxes if children travel through the crossing.
- Pedestrian and Bike Information: Pedestrian ADT
  - Enter the most recent pedestrian average daily traffic value.
- Pedestrian and Bike Information: Bicycle ADT
  - Enter the most recent bicycle average daily traffic value.

Section 5 Passenger Station

- Is the Crossing Adjacent to a Station?
  - Check Yes if a station is directly upstream or downstream of the crossing.
- Sketch Access from Station
  - Prepare a graphic presenting how pedestrians, bikers, and vehicles access the station and how these movements affect the crossing.

Section 6 Summary

This section should be completed by the user, with input and direction from the diagnostic team.

Comprehensive Sketch

- Comprehensive Sketch
  - Prepare a graphic presentation which includes all elements of the crossing including, but not limited to, track/s, dimensions, location of warning devices, adjacent roads, adjacent developments and access points, adjacent passenger stations, the crossing angle, and locations and numbering of photos taken. Show compass north and railroad destination for each direction of train movement.

Section 7 Conclusion

This section should be completed by the user, with input and direction from the diagnostic team. If a topic is not labeled in the type of improvement section, it should be added to the comments section.

Recommendations

- Are Improvements to the Crossing Recommended?
  - Check Yes if improvements are recommended
    - Continue to complete “Type of Improvement Section”
  - Check No if improvements are not recommended
    - If No, explain why there are no recommendations
- Type of Improvement: Sight Improvement
  - If the sight distance needs to be improved, explain here.
- Type of Improvement: Crossing Surface
  - If the crossing surface needs to be improved, explain here.
- Type of Improvement: Roadway Approaches
  - If the crossing surface needs to be improved, explain here.
- Type of Improvement: Highway Traffic Signs
  - If the highway traffic signs need to be improved or updated, explain here.
- Type of Improvement: Crossing Signals
  - If the crossing signals need to be improved or updated, explain here.
- Type of Improvement: Crossing Closure
  - If the crossing needs to be closed, explain here.
- Comments

- Record all other comments here.

Section 8 Contact Information

This section should be completed by the user, with input and direction from the diagnostic team.

- Diagnostic Team Name
  - Enter the first and last name of the each diagnostic team participant.
- Affiliation
  - Enter each participant's affiliation (i.e. organization, agency, company they represent) in the corresponding field.
- Phone No.
  - Enter each participant's phone number in the corresponding field.
- E-Mail
  - Enter the participant's e-mail in the corresponding field.

Contacts

- School District
  - Enter the contact information of the school district liaison in the field, including contact name, district name, department name and/or number, work address, work phone number, and work e-mail address.

- Other (Specify)
  - Enter the contact information of any other type of liaison by specifying their role in the diagnostic review. Include the contacts name, agency or company name, department name and/or number, work address, work, phone number, and work e-mail address.

APPENDIX D-1

Diagnostic Forms

DIAGNOSTIC TEAM

Highway-Rail Grade Crossing Evaluation Report

			Date of Diagnostic Review:
Street/Road Name:	Subdivision:	AAR/DOT No.:	CPUC No.:

SECTION 1: DIAGNOSTIC

DIAGNOSTIC REVIEW

Funded By:	☐ RAILROAD ☐ STATE ☐ LOCAL ☐ OTHER _____	Purpose of Diagnostic:		
Initiated By:	☐ RAILROAD ☐ STATE ☐ LOCAL ☐ OTHER _____	Beg Time:	End Time:	Date Initiated:
Level of Diagnostic:	☐ PRE-DESIGN ☐ DESIGN ☐ DESIGN REVISION # ____ ☐ FINAL			

SECTION 2: RAILROAD DATA

LOCATION DATA

Railroad (R.R.):	State:	County:	City: *(In or Near)*
R.R. Line/Branch:	Nearest R.R. Timetable Station:	R.R. Milepost:	

RAILROAD DATA

DAILY TRAIN MOVEMENT*		MAXIMUM SPEED OF TRAIN*		TYPE AND NUMBER OF TRACKS*		
PASSENGER		PASSENGER	mph	MAIN		If Other, Specify:
FREIGHT		FREIGHT	mph	OTHER		

CHECK IF LESS THAN ONE MOVEMENT PER DAY* ☐	CROSSING ANGLE:	Can two trains occupy crossing at the same time? ☐ Yes ☐ No	
Note: Attach track chart to back of this diagnostic form		Can one train block the motorist's view of another train at the crossing? ☐ YES ☐ NO	If Yes, explain:

Crossing Surface	TRACK	TYPE	WIDTH	CONDITION

Location Relative to Station:	Location Relative to Rail Operation Facilities:

FIVE-YEAR ACCIDENT DATA*

TOTAL ACCIDENTS		**Number of Personal Injuries**		**Number of Fatalities**	
Property Damage Only		Personal Injury Accidents		Fatal Accidents	

Have any near misses occurred? ☐ Yes ☐ No Explain:

ADJACENT RAILROAD FACILITIES

Adjacent Railroad Crossings within 1 Mile

DOT No.	Street/Road Name	Warning Devices	ADT*

Is there adequate access from this crossing to railroad facilities?	☐ Yes ☐ No	Is yes, which crossing?
Description of how crossing is affected by adjacent railroad facilities?		

* **Contact the appropriate agency and/or railroad company to complete this section of the Diagnostic form.**

DIAGNOSTIC TEAM

Highway-Rail Grade Crossing Evaluation Report

Date of Diagnostic Review:

Street/Road Name:	Subdivision:	AAR/DOT No.:	CPUC No.:

SECTION 3: GRADE CROSSING INVENTORY

EXISTING WARNING DEVICES

Type of Passive Warning Device#												Yes	No	Qty.	LENSES		LED	Type of Active Warning Device	
Type	Qty	NB	SB	WB	EB	Type	Qty	NB	SB	WB	EB				8"	12"			
☐ R15-1						☐ R1-2												Mast Mounted Flashing Lights	
☐ R15-2						☐ W3-2												Cantilever Flashing Lights	Length:
☐ W10-1						☐ R8-10												Back Lights	
☐ W48 (CA)						☐ R10-6												Side Lights	

												Yes	No	Qty.	Gate Type	Gate Length	Location/s
☐ W10-2						☐ W10-5											
☐ W10-3						☐ W10-11									Entrance		
☐ W10-4						☐ W10-12									Exit		
☐ R8-8						☐ R15-8									Pedestrian		
☐ R1-1						☐ W10-9									Pedestrian Swing		

												Yes	No	Qty.	Type	Location/s
☐ W3-1						Note: Choose direction that is closest to direction of traffic flow over crossing.										

Is the crossing illuminated? ☐ Yes ☐ No															Bells	
															R3-1 Blank Out Sign#	
															R3-2 Blank Out Sign#	
Pavement Striping															R3-5 Blank Out Sign#	
Yes	**No**	**Qty.**	**Type**	**Location/s**											Modified Blank Out Sign w/ Train Indicator	
			Stop Bars												Other	Specify:
			RxR													
			Dynamic													
			No Passing													
			Lane Lines													
			Other												Are there any broken gates at the crossing?	

TRAFFIC SIGNAL INTERCONNECTION AND PREEMPTION

Are highway traffic signals interconnected?	☐ Yes ☐ No	Is preemption existent at the crossing?	☐ Yes ☐ No
Do pre-signals exist at the crossing?	☐ Yes ☐ No	Existing Warning Time	Desired Warning Time

CLOSURE

Can roadway realignment be accomplished to allow consolidation of crossings? If yes, provide sketch. ☐ Yes ☐ No	Sketch:
Impact of Closure:	

#See "Typical CA MUTCD Signs at Highway-Rail Grade Crossings" attached to this form for sign code explanation. Refer to Part 8 of the CA MUTCD for requirements at highway-rail grade crossings.

DIAGNOSTIC TEAM

Highway-Rail Grade Crossing Evaluation Report

			Date of Diagnostic Review:
Street/Road Name:	Subdivision:	AAR/DOT No.:	CPUC No.:

SECTION 4: HIGHWAY INFORMATION

ROADWAY DATA

Agency Having Jurisdiction (i.e. Caltrans):	Highway Type:	ADT*:	PERCENT TRUCKS*	%

Speed of Vehicle*	School Bus Operation*	Hazardous Materials*	Pedestrians	Roadway Surface:
Max. m.p.h.	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO	Roadway Width:
Typical to m.p.h.	No./Day	No./Day	Curb & Gutter ☐ YES ☐ NO	Roadway Condition:

Shoulder: ☐ YES ☐ NO	If Yes, Width:	Is the Shoulder Surfaced? ☐ YES ☐ NO	If Yes, Width:	Is Sidewalk Present? ☐ YES ☐ NO	If Yes, Width:

Special Conditions Required as a Result of Nearby Highway Intersections:

TYPE OF DEVELOPMENT

☐ Open Space ☐ Residential ☐ TOD[$] ☐ Industrial ☐ Institutional ☐ Commercial	New developments that could affect ADT? ☐ Yes ☐ No If yes, explain:

PEDESTRIAN AND BIKE DATA

Yes	No	Crossing Information	Type of Crossing	Other Crossing Users
		Is Crossing Surface Smooth?	☐ Shared ☐ Bike ☐ Pedestrian	☐ Disabled/Wheelchair ☐ Senior Citizens ☐ Children
		Is Adequate Lighting Available?		
		Does Crossing Panel Extend 1' Behind Back of Path?	Qty.	Pedestrian and Bike Information
		Is Path Width Adequate? (36" Minimum)		Pedestrian ADT*
		Are Flange Gaps 2½" or Less, or Flange Fillers Used?		Bicycle ADT*

SECTION 5: PASSENGER STATION

☐ YES ☐ NO	Is the crossing adjacent to a station?

If yes, Sketch access from station

[*] **Contact the appropriate agency and/or railroad company to complete this section of the Diagnostic form.**

[$] **TOD – Transit Oriented Development**

DIAGNOSTIC TEAM

Highway-Rail Grade Crossing Evaluation Report

			Date of Diagnostic Review:
Street/Road Name:	Subdivision:	AAR/DOT No.:	CPUC No.:

SECTION 6: SUMMARY

COMPREHENSIVE SKETCH
(Include location of warning devices, nearby schools, emergency services facilities, and other landmarks)

DIAGNOSTIC TEAM

Highway-Rail Grade Crossing Evaluation Report

			Date of Diagnostic Review:
Street/Road Name:	Subdivision:	AAR/DOT No.:	CPUC No.:

SECTION 7: CONCLUSION

RECOMMENDATIONS			
ARE IMPROVEMENTS TO THE CROSSING RECOMMENDED? ☐ **YES** ☐ **NO**			If No, Explain:
If Yes, what improvements?			
Yes	**No**	**Type of Improvement**	**Describe**
		Sight Improvement	
		Crossing Surface	
		Roadway Approaches	
		Highway Traffic Signs	
		Crossing Signals	
		Crossing Closure	

Prepared By:	Title:	Date:
Comments:		

DIAGNOSTIC TEAM

Highway-Rail Grade Crossing Evaluation Report

			Date of Diagnostic Review:
Street/Road Name:	Subdivision:	AAR/DOT No.:	CPUC No.:

SECTION 8: CONTACT INFORMATION

DIAGNOSTIC TEAM				
No.	Name	Affiliation	Phone No.	E-Mail
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				

CONTACTS
(Contact name, agency or company, department, address, phone number, e-mail address)
School District:
Other (Specify):
Other (Specify):
Other (Specify):
Other (Specify):
Other (Specify):
Other (Specify):

Typical CA MUTCD Signs Used at Highway-Rail Grade Crossings

Regulatory Signs

R15-1
(drilled for 90-degree mounting)

R15-2

R1-1

R1-2

R8-8

R8-10

R10-6

R15-8

Warning Signs

W10-1

W48 (CA)

W10-2

W10-3

W10-4

W3-1*

W3-2*

W10-5

W10-9

W10-11

W10-12

*W3-1 and W3-2 are used in concurrence with R1-1 and R1-2, respectively.

Blank Out Regulatory Signs

R3-1
Activated Blank Out

R3-2
Activated Blank Out

R5-1
Activated Blank Out

APPENDIX E

LADOT Railroad Preemption Worksheet

LADOT Railroad Preemption Form Instructions

The LADOT Railroad Preemption Form is entirely contained on one worksheet within an Excel workbook. If Additional approaches to the crossing are analyzed, the worksheet can be copied within the workbook to provide the appropriate analysis of the crossing.

Section 1 consists of the entries specific to the highway and traffic signal system.

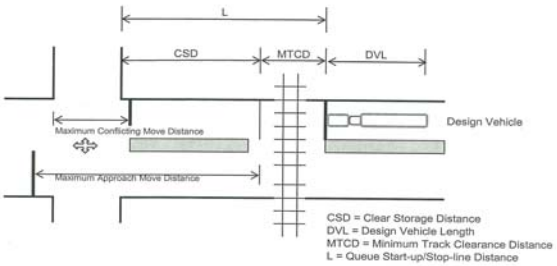
Part 1 contains entries for Maximum Approach Move Distance, Maximum Conflicting Move Distance, Minimum Track Clearance Distance (MTCD), Clear Storage Distance (CSD) and Grade. The Maximum Approach Move Distance is the distance (in feet) from the farthest intersection limit line towards the crossing. The Maximum Conflicting Move Distance is the longest distance (in feet) across the adjacent intersection that crosses the path of the track clearance phase. These are used to determine the time require for a design vehicle to clear the intersection prior to activation of the railroad warning devices or display of track clearance green. If these moves are on an uphill grade, enter the percent grade in the adjacent box labeled Grade. The MTCD is defined to be the distance (in feet) from the railroad warning device limit line or gate to a point 6 feet past the far rail. The CSD is the distance (in feet) from a point 6 feet past the far rail to the intersection limit line. The sum of the MTCD and CSD values determine the length (L). This is the total distance from the railroad warning device limit line or gate to the intersection limit line. If there is an uphill grade at the crossing, enter the percent grade in the adjacent box labeled Grade.

Part 2 contains information specific to the vehicle characteristics used in the calculation of the MTCD Queue Clearance Time. The default values provided on the form are standard for the types of vehicles shown. These should not be changed unless evaluation of specific vehicle lengths and heights is required. The information regarding the vehicle characteristics is used in the calculation of the vehicle times below the characteristic cells. These values are computed by the spreadsheet and cannot be changed by the user. The row beneath these calculated cells provides an “Include as Design Vehicle?” Yes/No selection for each vehicle type. If the roadway is restricted to certain classes of vehicles, the user may choose to not include a particular type of vehicle by selecting “No”. Typically, all vehicle types should be included in the calculations if they are permitted on the highway.

Part 3 contains the calculations for Green Track Clearance Time and MTCD Queue Clearance Time. These are displayed in the green and pink boxes immediately below the Part 2. These are the minimum amount of time necessary to display a track clearance green to clear the MTCD of a queue of vehicles.

Part 4 contains the entries specific to traffic signal timing.

a. The Minimum Walk time is the minimum amount of walk time that must be completed prior to entry into railroad preemption. This can be set to zero or more seconds based on the desired operation of the traffic signal during entry into preemption.
b. The Maximum Ped Clear is the longest pedestrian clearance time that must be completed prior to entry into preemption. This can be set to zero or more seconds based on the desired operation of the traffic signal during entry into preemption. This is typically the Flashing
c. The Minimum Green is the minimum amount of ti into
railroad preemption. This can be set to zero or more affic signal
during entry into preemption.



d. The Maximum Yellow + All Red is the maximum amount of yellow and all red time that must be displayed prior to entry into preemption. This must be set to 3.0 seconds or more based on the traffic signal controller time settings.
e. The Maximum RWTT (Right of Way Transfer Time) is calculated as the maximum amount of time it takes the controller to transfer from its current phase to the railroad track clearance phase based on the timing parameters entered above.
f. Separation Time (ST) is additional time that can be provided between the time the traffic clears the track and the train arrival at the crossing. This is determined by the engineering judgment, and can be set to zero or more second. Values of 4 to 8 seconds are typically used.
g. The Maximum Preemption Time (MPT) is calculated to be the total of MTCD Queue Clearance Time, Maximum RWTT and Separation Time (ST). This is how much time in advance of a train arriving at the crossing that the traffic signal needs to be notified to provide sufficient track clearance green time.

Section 2 consists of the entries specific to the railroad warning system. These can be obtained from the railroad at existing crossings or determined with the railroad for new designs.

a. The Lights Flash time is the amount of time the railroad warning lights flash once activated before the gates begin to descend. This must be set to at least 3 seconds and can be as high a 9 seconds.
b. The Gate Descent time is the amount of time it takes the entrance gates to move from the vertical position to the horizontal position. This must be set to at least 8 seconds and can be as high as 20 seconds.
c. The Minimum Time (MT) is the minimum amount of time the crossing warning system is activated prior to train arrival at the crossing. This must be set to at least 20 seconds.
d. Clearance Time (CT) is additional warning time provided for wide crossings or other site-specific conditions. This can be set to zero or more seconds. Based on the MTCD entered at the top of the form, a minimum suggested value will be displayed to the right of this entry. The suggested value is based on the requirement that crossings more than 35 feet wide need an one second of Clearance Time for each additional 10 feet of width.
e. Minimum Warning Time (MWT) is computed from these entries, which is the minimum amount of time that the warning system is activated prior to train arrival at the crossing.
f. Buffer Time (BT) is discretionary time added by the railroad to account for train handling. This can be set to zero or more seconds.
g. Total Warning Time (TWT) is obtained by adding Buffer Time (BT) to Minimum Warning Time (MWT), which is the normal amount of warning time in advance of a through train arriving at the crossing
h. The entry “Include vehicle-gate interaction check?” is a Yes/No selection that the user can choose to adjust the Advance Preemption Time (APT) so the largest design vehicle will not be hit by the gates. This check is optional, but highly recommended to ensure that the design vehicle has sufficient time to move out of the path of the descending gates.
i. The “Distance from gate to vehicle” is required with a “Yes” selection on item h. This is the distance between the side of the design vehicle and the center of gate mast. This must be set to at least 4 feet and can be as much as 20 feet depending on lane width and gate setback.

The resultant Advance Preemption Time (APT) is shown in the purple box, and represents the time before warning system activation that the traffic signal needs to be notified of an approaching train to provide sufficient queue clearance time. If the vehicle gate interaction check is set to No, then the Advance Preemption Time (APT) is the difference between the Maximum Preemption Time (MPT) and the Minimum Warning Time (MWT). If the vehicle-gate interaction check is set to “Yes”, then the Advance Preemption Time (APT) is calculated so the largest design vehicle has enough time to start up and move before the descending gate hits the vehicle. This will usually result in a larger Advance Preemption Time (APT) than when the vehicle-gate interaction check is not performed. This may adjust the Green Track Clearance time and the Separation Time (ST) to account for the additional Advance Preemption Time (APT). A note is shown in red on the form if an adjustment is made.

a. The Equipment Response Time (ERT) is the amount of time the railroad train detection equipment needs once a train has entered the track circuit before it can be acted upon. This can be set to zero or more seconds, and is typically between 2 and 5 seconds depending on the type of train detection equipment used.
b. Total Approach Time (TAT) is obtained by adding the Equipment Response Time (ERT) to the Total Warning Time (TWT)
c. Maximum Authorized Speed (MAS), is the highest speed trains are allowed to operate on the approach to the crossing. This must be set to at least 5 miles per hour and can be as high as 100 miles per hour.
d. The Total Approach Distance (TAD) is obtained by multiplying the Total Approach Time (TAT) by the Maximum Authorized Speed (MAS). This is the required length of the approach circuit.

Preemption Timeline

With the data entry completed, the Preemption Timeline will display the time relationships between the railroad Warning Device, Traffic Signal and the Design Vehicle. The timeline is read from right to left, with the leftmost time zero being train arrival at the crossing. The timeline is a graphical representation of the sequence of events leading up to the train arriving at the crossing, and can be used to determine if the preemption timings entered are adequate.

If a Phase Omit interval is shown on the Traffic Signal timeline, then the Maximum Approach Move Distance and/or the Maximum Conflicting Move Distance govern the advance preemption time at the intersection. This means that the traffic signal should not start the approach or conflicting moves during this time to prevent a design vehicle from being stopped at the crossing or blocking the track clearance phase. Appropriate settings in the traffic signal controller should be made to account for this situation at the start of the preemption.

Note that the Green Track Clearance time shown on the Preemption Timeline may be less than the value calculated on the form if it extends beyond the arrival of the train at the crossing. This can occur when a large Clear Storage Distance (CSD) exists, and the value shown on the form should be used for the track clearance green time. Also note that the MTCD Queue Clearance Time calculated on the form is shown in two parts on the preemption timeline: Queue Startup and Queue Clearance. This illustrates the portion of time that is needed before the last design vehicle within length begins to move as well as the time it takes the design vehicle to move through the MTCD. The sum of these two parts is equal to the MTCD Queue Clearance Time shown on the form.

Below the timeline is the “Preemption Timeline displays Minimum RWTT?” Yes/No selection box. Normally this is set to “No” and the preemption timeline displays the worst-case Maximum RWTT time that was used to determine the Advance Preemption Time (APT). Selecting “Yes” will cause the timeline to display the best-case Minimum RWTT time, and can be used to show the variability in preemption timing. Care should be taken when the Maximum RWTT time is large to ensure that track clearance green does not end prior to the warning system activation or vehicles may become trapped on the tracks. If the vehicle-gate interaction check is set to “Yes”, then track clearance green is automatically extended to the point when the gates are horizontal to specifically prevent vehicles from becoming trapped on the tracks. This requires either the programming of a longer track clearance green time, the use of a controller that is capable of dynamically adjusting the track clearance green time to account for RWTT variability, or an interconnection between the railroad system and the traffic signal that does not allow the track clearance green to end until the gates are down.

LADOT Railroad Preemption Form

Revised 1/25/2008

Street Name:	Oso	Crossing No:	

Section 1: Highway and Traffic Information

Part 1:

Maximum Approach Move Distance	90	ft	Grade	0.0 %
Maximum Conflicting Move Distance	145	ft	Grade	0.0 %
Minimum Track Clearance Dist, MTCD	35	ft	Grade	0.0 %
Clear Storage Distance, CSD	5	ft		
Queue Start-up/Stop line Distance, L	**40**	ft		

Part 2:

	Car	Truck	Bus	Semi	
Vehicle Length (ft)	15	30	40	65	
Vehicle Height (ft)	5	14	11	14	
Queue Space (ft/veh)	21	36	46	71	
Vehicles within L (veh)	1	1	0	0	
Start moving last vehicle in L (sec)	**3.9**	**3.9**	**2.7**	**4.0**	**4**
Move front of vehicle thru L (sec)	4.1	4.5	3.8	8.5	9
Move entire vehicle past gate (sec)	2.4	3.9	3.8	11.0	11
Move entire vehicle thru MTCD (sec)	**4.6**	**5.9**	**5.4**	**13.7**	**14**
Non-interaction gate descent time (sec)	10.1	2.9	4.0	2.9	3
Approach vehicle clearance time (sec)	8.9	9.6	8.6	17.0	17
Conflicting vehicle clearance time (sec)	11.2	12.7	11.4	24.1	24
Include as Design Vehicle?	**Yes**	**Yes**	**Yes**	**Yes**	Use

Part 3:

Green Track Clearance Time	**24**	sec	*Green Track Clearance extended to Gate Down*
MTCD Queue Clearance Time	**18**	sec	
Minimum Walk	0	sec	
Maximum Ped Clearance	12	sec	
Minimum Green	0	sec	
Maximum Yellow + All Red	6.0	sec	
Maximum RWTT	**18**	sec	
Separation Time, ST	5	sec	*See Preemption Timeline for actual Separation Time*
Maximum Preemption Time, MPT	**41**	sec	

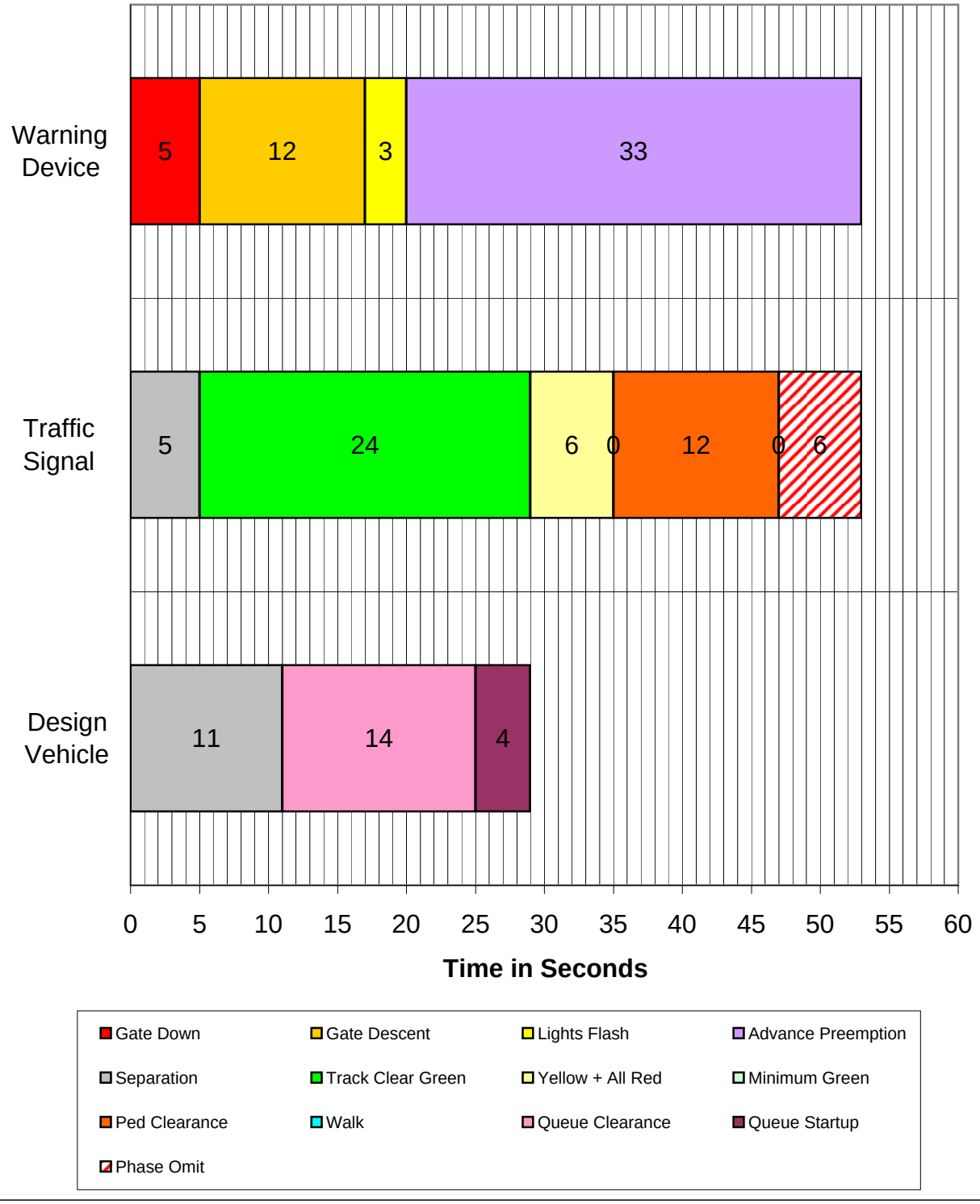
Section 2: Railroad Information

Lights Flash	3	sec	
Gate Descent	12	sec	
Minimum Time, MT	20	sec	
Clearance Time, CT	0	sec	0 sec minimum
Minimum Warning Time, MWT	**20**	sec	
Buffer Time, BT	10	sec	
Total Warning Time, TWT	**30**	sec	
Include vehicle-gate interaction check?	**Yes**		
Distance from gate to vehicle	4	ft	
Advance Preemption Time, APT	**33**	sec	
Equipment Response Time, ERT	5	sec	
Total Approach Time, TAT	**68**	sec	
Maximum Authorized Speed, MAS	79	mph	
Total Approach Distance, TAD	**7879**	ft	

LADOT Railroad Preemption Form Revised 1/25/2008

Street Name:	Oso	Crossing No:	

Preemption Timeline



Preemption Timeline Displays Minimum RWTT? **No**

APPENDIX F

SCRRA Design Exception Form

APPENDIX F

SCRRA DESIGN EXCEPTION FORM
Project Name: _____ Location: _____ Project No.: _____ Contract No.: _____ Date: _____

Part 1: To be Completed by Originator

ORIGINATOR	Requested by: _____ Title: _____ Company: _____ Signature: _____ Print Name: _____	
IMPACTS	Does this Exception impact Safety and Operations? Does this Exception conflict with any CPUC/CA MUTCD regulations and requirements? Does this Exception impact economic, social or environmental issues?	☐ Yes ☐ No ☐ yes ☐ No ☐ yes ☐ No
EXCEPTION INFORMATION	Does the exception affect the following? Engineering Standards ☐ Yes ☐ No Specifications ☐ Yes ☐ No Design Criteria ☐ Yes ☐ No Manual Section ☐ Yes ☐ No	
	Description of Exception/Waiver:	
	Rational for Exception/Waiver:	
	Mitigation Measures:	

REASON FOR REQUEST	Design Exception/Waiver must address the following: • Established Design Criteria versus proposed and existing criteria • Reason the appropriate design criteria cannot be met • Justification for the proposed Criteria • Any background information which documents, support or justify the request • Any mitigation that will be provided to further support or justify the request • Safety implication of the request • The comparative cost of the full standard versus the lower design being proposed. Show what it would cost to met the standard for which the Exception/waiver is requested • Long term effect of the reduced design as compared to the full standard
ATTACHMENTS	The completed SCRRA Design Exception Form and all supporting documentation (drawings, reports, and calculations) shall be submitted with all requests for exceptions. This form (at the end of this page) and all documentation attached with the request must be stamped and sealed by a Registered California Engineer.

Part 2: SCRRA approval Signatures

SCRRA APPROVALS	**Name**	**Date**
	Ron Mathieu, Manager, Rail Corridor C&E	
	Naresh Patel, P.E., Manager, Civil Engineering	
	Dan Guerrero, Manager, C&S Engineering	
	Fred Jackson, Manager, System Safety	
	Darrell Maxey, P.E., Director, E&C	

APPENDIX G

SCRRA Highway-Rail Grade Crossing Design Checklist

APPENDIX G

Highway-Rail Grade Crossings Recommended Design Practices and Standards Manual Design Check List

DESIGN CHECK LIST

DATE: _____

Reviewer: _____ **Organization:** _____ **Discipline:**_____ **Project:** _____

Contract No.: _____ **Contract Title:** _____ **Level of Submittal:** _____ **Sheet** ___**of** ___

Submittal Level: Preliminary (30%)___ ; **In-Progress (60%)** ___ ; **Pre-Final (90%)** ___; **Final (100%)** ___; **Camera Ready (CR)** ___

		Checked		Findings		Notes and Remarks	Required at				
GENERAL ITEMS - Drawings		**Yes**	**No**	**Yes**	**No**		**30%**	**60%**	**90%**	**100%**	**CR**
1	Drawing Index - drawing numbers, sheet numbers, shown in order						X	X	X	X	X
2	Contract Number						X	X	X	X	X
3	Date							X	X	X	X
4	Meets Drafting Standards						X	X	X	X	X
5	Scale and Graphic Scale						X	X	X	X	X
6	Drawing Layout Index						X	X	X	X	X
7	Consultant Identification						X	X	X	X	X
8	Signatures (incl. PE Stamps)									X	X
9	Cross Referencing - Disciplines, Vendors Standards, Codes							X	X	X	X
10	Legend, Abbreviations and Notes						X	X	X	X	X
11	Title Block						X	X	X	X	X
12	Drawing Orientation						X	X	X	X	X
13	Meets: Fire Life Safety, Design Criteria, ADA and CPUC approvals							X	X	X	X
14	SCRRA Standards and Criteria Incorporated						X	X	X	X	X
15	North Arrow						X	X	X	X	X
16	Match Line Coordination						X	X	X	X	X
17	Resolution of review comments								X	X	X
18	Construction Staging							X	X	X	X
19	Existing and Future Land Use						X	X	X	X	X
20	Right of Way Requirements						X	X	X	X	X
21	Temporary Construction Detours										
22	Complies with Table 1-2, SCRRA Design Standards							X	X	X	X
CIVIL/UTILITIES/TRAFFIC ITEMS											
1	City requirements incorporated into design documents, ie. Dwg. Format							X	X	X	X
2	Railroad track plan, profile & align.						X	X	X	X	X
3	Highway and approach highway geom.						X	X	X	X	X
4	Pedestrian-rail grade crossing designs						X				
	curb and gutter, drainage and rail grade										

	crossing surface						x	x	x	x	x
5	Drainage requirements met criteria						x	x	x	x	x
6	All existing utilities identified both within										
	public and railroad right of ways						x	x	x	x	x
7	Relocation of utilities well identified and										
	by whom							x	x	x	x
8	Identification of existing utility locations										
	from as-built or pothole data							x	x	x	x
9	Identification of utility conflicts							x	x	x	x
10	Plan and Profile's for:										
	Water							x	x	x	x
	Sanitary Sewer							x	x	x	x
	Storm Sewer							x	x	x	x
	Gas							x	x	x	x
	Telephone							x	x	x	x
	Electrical							x	x	x	x
	Street Lighting							x	x	x	x
11	Fencing						x	x	x	x	x
12	Pavement Marking							x	x	x	x
13	Signal design							x	x	x	x
14	Warning Devices							x	x	x	x
15	Warning and Regulatory Signage							x	x	x	x
16	Soil Boring Logs and Plan								x	x	x
17	Outline Specifications in CSI format						x				
18	Specifications							x	x	x	x
19	Right -of-way takes identified										
20	Preliminary/ concept diagnostic performed						x				
21	Final/90% Design Diagnostic performed								x		

APPENDIX H

SCRRA Board Highway-Rail Grade Crossing Resolutions

RESOLUTION 98-21
OF THE SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY
REGARDING RAIL-HIGHWAY GRADE CROSSINGS

WHEREAS, the overall purpose of the Southern California Regional Rail Authority (SCRRA) is to design, build and operate a premier regional passenger rail system, including commuter and other passenger services, in Southern California; and,

WHEREAS, consistent with this purpose, SCRRA has undertaken a comprehensive capital program to provide mobility for the region, leading to more livable communities; and,

WHEREAS, as part of this program, SCRRA has adopted a strategic plan which includes eliminating or improving existing at-grade rail-highway crossings, and supporting regional, county and local efforts to build grade-separated rail-highway crossings in the region's passenger rail corridors; and,

WHEREAS, SCRRA and its member agencies, along with the Federal Highway Administration, the Federal Railroad Administration, the California Public Utilities Commission, and the California Department of Transportation cooperate on efforts to increase safety through the minimization and elimination of risks at rail-highway grade crossings, in accordance with Federal and state programs and nationally-recognized transportation and traffic engineering standards and practices;

WHEREAS, SCRRA recognizes that California Public Utilities Commission ultimately determines whether a new rail-highway grade crossing will be built.

NOW, THEREFORE BE IT RESOLVED that SCRRA does hereby adopt the following policy guidelines concerning rail-highway grade crossings;

1. SCRRA shall support and promote the elimination of rail - highway grade crossings to the extent feasible on all regional passenger rail lines.

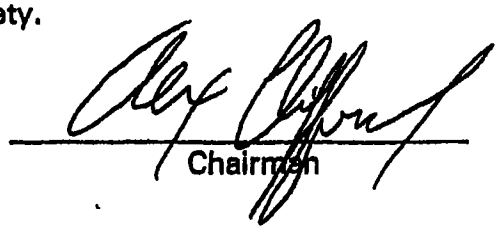
2. SCRRA shall oppose the creation of new rail - highway grade crossings to the extent feasible on all regional passenger rail lines.

3. SCRRA shall support additional funding for grade separations.

4. Any request for an exception shall be presented by a SCRRA member agency; and, upon request, the SCRRA Board will consider exceptions on a case-by-case basis.

5. The SCRRA shall promote to the extent feasible the improvement of remaining grade crossings in the region's passenger rail corridors through the upgrade of active and passive warning devices and crossing surfaces.

6. The SCRRA would support the creation of a new rail-highway grade crossing only if improvements to other grade crossings, including elimination of grade crossing(s), are made part of the creation of the new grade crossing which together clearly improve public convenience and safety.



Chairman

9-11-98

Date

RESOLUTION 91-3

OF THE SOUTHERN CALIFORNIA REGIONAL RAIL AUTHORITY PROMOTING THE ELIMINATION OF RAIL-HIGHWAY GRADE-CROSSINGS AND THE UPGRADE OF EXISTING WARNING DEVICES IN THE REGION'S PASSENGER RAIL CORRIDORS.

WHEREAS, the overall purpose of the Southern California Regional Rail Authority is to advance the planning, design, construction, and then to administer the operation, of regional passenger rail lines serving the counties of San Bernardino, Los Angeles, Ventura, Orange, and Riverside; and

WHEREAS, consistent with this purpose, the Southern California Regional Rail Authority is undertaking a comprehensive capital program to reduce train running times, add track capacity, improve safety, and increase ridership; and

WHEREAS, as part of this program, the Southern California Regional Rail Authority is undertaking a public safety program including the upgrading and/or elimination of existing at-grade rail-highway crossings and the construction of grade-separated rail-highway crossings in the region's passenger rail corridors; and

WHEREAS the Southern California Regional Rail Authority and its member agencies, along with the United States Department of Transportation, the Federal Highway Administration, and the Urban Mass Transportation Administration, are intensifying efforts to promote safety through the elimination of rail-highway grade crossings and the upgrade of existing warning devices, in accordance with the Federal Aid Highway Program Manual, the Federal Aid Highway Act of 1973, 1976 Guidelines and Recommendations, the Surface Transportation Assistance Act of 1987, and the 1989 Report to Congress;

NOW, THEREFORE BE IT RESOLVED that the Southern California Regional Rail Authority does hereby adopt the following policy guidelines concerning rail-highway grade-crossings:

1. The Southern California Regional Rail Authority shall support and promote the elimination of rail-highway grade crossings to the extent feasible on all regional passenger rail lines.

2. Upon the request of a county transportation commission, the Southern California Regional Rail Authority Board will consider exceptions on a case by case basis.

3. The Southern California Regional Rail Authority shall promote to the extent feasible the improvement of remaining grade-crossings in the region's passenger rail corridors through the upgrade of active and passive warning devices and crossing surfaces.

Judi Bachrach — Chairman

October 11 1991 — Date

APPENDIX I

SCRRA Standard Specifications List

Appendix I
SCRRA Standard Specifications

Section	Title
01040	Rules and Hours of Operation
01041	Coordination with SCRRA addendum
01060	Regulatory Requirements
01100	Procedures in Construction
01300	Submittals
01311	Progress Schedules
01400	Control of Work
01420	Definition of Terms and Reference Standards
01500	Control of Materials and Equipment
01545	Work Site Safety Requirements
01575	Maintenance and Protection of Railroad Traffic
01600	Legal Relations and Responsibilities

APPENDIX J

SCRRA Engineering Standards Drawings

Related to Highway-Rail Grade Crossings

APPENDIX K

Sample Highway-Rail Grade Crossing Drawings