METROLINK SAN BERNARDINO LINE
Infrastructure Improvement Strategic Study

Metrolink San Bernardino Station to Los Angeles Union Station
San Bernardino County and Los Angeles County, California

FINAL REPORT

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Prepared for:

Los Angeles County Metropolitan Transportation Authority
One Gateway Plaza
Los Angeles, CA 90012

and

San Bernardino Associated Governments
1170 West 3rd Street, 2nd Floor
San Bernardino, CA 92410

Prepared by:

HDR Engineering, Inc.
801 South Grand Avenue, Suite 500
Los Angeles, CA 90017

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Acronyms

APT	advanced preemption timing
APTA	American Public Transportation Association
ATCS	advanced train control system
ATSF	Atchison, Topeka and Santa Fe Railway
AVL	Antelope Valley Line
BA	biological assessment
BDPC	ballast deck precast concrete
BMPs	Best Management Practices
BNSF	BNSF Railway Company
BRT	Omnitrans San Bernardino Express, bus rapid transit
CHSR	California High Speed Rail
CalEPA	California Environmental Protection Agency
CARB	California Air Resources Board
CE	Categorical Exclusion
CEQA	California Environmental Quality Act
CHSRA	California High Speed Rail Authority
CP	Control Point
CRP	Credit Risk Premium
CMAQ	Congestion Mitigation and Air Quality
CMF	Central Maintenance Facility
CTC	Centralized Traffic Control
CWA	Clean Water Act
DSBPRP	Downtown San Bernardino Passenger Rail Project
DTSC	Department of Toxic Substances Control
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMD	Electro-Motive Corporation
EMF	Eastern Maintenance Facility
ESA	Endangered Species Act
FRA	Federal Railroad Administration
GCOR	General Code of Operating Rules
GHG	greenhouse gas
GIS	geographic information system

HOV	high-occupancy vehicle
hp	horsepower
HRCSA	Highway-Railroad Crossing Safety Account
HSIPR	High Speed Intercity Passenger Rail Program
HSR	high speed rail
I-10	Interstate 10
ICCTA	Interstate Commerce Commission Termination Act
IEMF	Inland Empire Maintenance Facility
LAUS	Los Angeles Union Station
LRTP	Long Range Transportation Plan
LTF	Local Transportation Fund
LUST	leaking underground storage tank
Metro	Los Angeles County Metropolitan Transportation Authority
MOC	Metrolink Operations Center
MOU	memorandum of understanding
MP	milepost
MPI	MotivePower Industries
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPV	net present value
NRHP	National Register of Historic Places
OCTA	Orange County Transportation Authority
OTP	on time performance
PAA	preliminary alternatives analysis
PCSG	pre-stressed concrete slab girder
PDT	project development team
PTC	positive train control
PUC	(California) Public Utilities Commission
RCB	reinforced concrete box
RCP	reinforced concrete pipe
ROW	right-of-way
RPRP	Redlands Passenger Rail Project
RRIF	Railroad Rehabilitation and Improvement Financing

RTC	Rail Traffic Controller
RSAA	Revised Supplemental Alternatives Analysis
SANBAG	San Bernardino Associated Governments
SBCFCD	San Bernardino County Flood Control District
SBL	San Bernardino Line
SCAG	Southern California Association of Governments
SCRIP	Southern California Regional Interconnector Project
SCRRA	Southern California Regional Rail Authority
SD	storm drain
SPV	special purpose vehicle
STA	State Transit Assistance
STB	Surface Transportation Board
SWPPP	Storm Water Management Pollution Prevention Plan
TDA	Transportation Development Act
TIFIA	Transportation Infrastructure Finance and Innovation Act
TPC	Train Performance Calculation, Calculator
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USDOT	United States Department of Transportation
UST	underground storage tank
WBAPS	Web Accident Prediction System

1.0 EXECUTIVE SUMMARY

The San Bernardino Line (SBL) is a 55-mile rail corridor used by the Southern California Regional Rail Authority (SCRRA) for running Metrolink commuter rail service between Los Angeles Union Station (LAUS) and the Metrolink San Bernardino Station. The SBL is the busiest line on the Metrolink commuter rail system in Southern California and serves as a vital transportation link amongst Los Angeles, San Bernardino and all communities in between. The SBL is also a critical line for the BNSF Railway (BNSF) and Union Pacific Railroad (UPRR) to serve a multitude of customers via industrial tracks throughout the line. East of where the SBL adjoins with the River Subdivision (East Bank), UPRR and Amtrak also provide additional service into Downtown Los Angeles on the adjacent UPRR Alhambra Subdivision.

The average passenger train speed on the SBL is approximately 40 miles an hour (when factoring in station stops), resulting in an average travel time of approximately 90 minutes between the Metrolink San Bernardino Station and LAUS. In May of 2011, Metrolink added a roundtrip express train on the SBL with intermediate stops at the Metrolink Covina and Rancho Cucamonga Stations that reduced the average total travel time by 25 minutes.

Los Angeles County Metropolitan Transportation Authority (Metro) and San Bernardino Associated Governments (SANBAG) are interested in opportunities to enhance operations and safety on the SBL, and jointly commissioned HDR to develop the SBL Infrastructure Improvement Strategic Study (Study). The primary goals of this Study are to identify cost effective infrastructure improvements that lead to the following operational outcomes:

1) Increased average train speed,
2) Reduced travel times and
3) Enhanced overall capacity

HDR performed a comprehensive operational analysis of the SBL and ultimately recommends constructing a second mainline track within two out of the five existing single track corridors on the SBL that would achieve the Study's main objectives. Specifically, the Study recommends constructing a second mainline track from Lone Hill Avenue to CP White in the Cities of San Dimas and La Verne in Los Angeles County, along with constructing another second mainline track in the Cities of Rialto and San Bernardino in San Bernardino County. Both aforementioned double track projects yielded the most cost effective approach for achieving the study's operational objectives when factoring in rail traffic control (RTC) modeling as detailed in Chapter 2 and with anticipated capital costs of $71.6M for Lone Hill to CP White and $70.9 M for CP Lilac to CP Rancho as detailed in Chapters 5.2 and 6 of this Study.

The study also includes conceptual design layouts for enhancing vehicular and pedestrian safety at grade crossings located within the proposed double track limits by incorporating median extensions, pedestrian channelization improvements and railroad signal upgrades (e.g. passenger & vehicular gates) as detailed in Chapter 5. Furthermore, the Study evaluated the condition of existing right of way corridor fencing along the entire SBL and recommends locations where new corridor fencing should be considered for future implementation. The team's recommendations were developed with input from Metrolink's System Safety Department that maintains an extensive database of past right of way intrusion "hot spots" as detailed in Chapter 5 of this Study.

Lastly, the Study proposes a phased implementation strategy for both double track corridors that accounts for anticipated funding opportunities developed in conjunction with Metro, SANBAG and SCRRA. HDR, in collaboration with project stakeholders, identified various combinations of pertinent local, state and federal funding sources as further detailed in Chapter 6 of this Study.

2.0 INFRASTRUCTURE MODELING AND VALIDATION

HDR operations planning staff used Rail Traffic Controller (RTC) operations modeling software to conduct:

1) An analysis of present day operations; and
2) An analysis of potential capacity improvements that would allow Metrolink to offer more frequent, reliable service for its customers over three future timeframes:
    a. Near Term (2015-2017)
    b. Year 2020
    c. Year 2035

The analysis helped determine how each proposed infrastructure improvement could improve operational capacity, service reliability and on time performance.

The sections of this chapter describe and assess:

1) Existing rail operations, infrastructure conditions, equipment and future operating challenges,
2) The selection process of infrastructure improvements analyzed, with an emphasis on:
    a. Impact of proposed infrastructure improvements on line capacity.
    b. Impact of proposed infrastructure improvements on line service reliability and on time performance.
    c. References to other chapters in order to address right of way, environmental and cost factors.
3) The rail operations modeling methodology used to analyze the proposed infrastructure improvements in relation to train operations,
4) Results of modeling for the proposed future operation over three timeframes and
5) Conclusions and recommendations reached as a result of the analysis.

The general area of the project is illustrated in Figure 2-1.

During the course of the project, the HDR team worked closely with Metro, SANBAG and SCRRA to ensure that modeling efforts addressed key factors such as increasing operational capacity between LAUS and San Bernardino and providing greater operating reliability and flexibility. As part of the process, the HDR team received feedback from key personnel most familiar with San Bernardino Line operations regarding where improvements should be focused. Several in-person meetings with senior SCRRA operations and dispatch staff members were conducted to learn about existing areas of infrastructure that may be inhibiting current operations and expansion as well as locations for future infrastructure that may provide the greatest benefit to the line's operation.

Figure 2-1. Project Vicinity Map

HDR also worked closely with Metro and SANBAG to ensure modeling efforts were accurately tested and validated suggesting infrastructure improvements as they developed. In order to share information and provide updates on key tasks and deliverables, regular in-person meetings and conference calls were conducted with all parties, starting with the San Bernardino Line Infrastructure Improvement Strategic Study kickoff meeting on June 13, 2013, and periodically throughout the project's duration.

2.1 Existing Rail Operations, Infrastructure, and Equipment

2.1.1 Rail Operations

Train operations on the San Bernardino Line (SBL) consist of Metrolink commuter passenger trains, Union Pacific Railroad (UPRR) freight trains between MP 15.3 and MP 29.4, and BNSF Railway (BNSF) freight trains between MP 32.3 and MP 56.3. The existing typical operational pattern is as follows:

Metrolink Commuter Passenger:

San Bernardino Line Trains (300 series trains): SCCRA at present operates 42 daily weekday trains on the San Bernardino Line, including one inbound AM express and one outbound PM express train between the Metrolink San Bernardino Station and LAUS. On the weekends, Metrolink operates twenty (20) trains on Saturday and fourteen (14) on Sunday.

Current travel times between San Bernardino and LAUS are approximately 90 minutes for trains that stop at all intermediate station stops. In May 2011, Metrolink added express train service between these two destinations, with only two intermediate station stops, that reduces endpoint to endpoint travel times to a little over an hour.

Existing Metrolink operations are scheduled to provide maximum frequency during the morning and evening commuter peaks, with reduced midday frequency. Some train sets make only one round trip each weekday, while others turn and make additional round trips each weekday.

Freight Trains:

SCRRA dispatchers control all train movements, freight and passenger, on the SBL. Freight movements are scheduled during off-peak commuter hours and nighttime hours to reduce any possible delays or interference by freight trains to the Metrolink commuter rail service.

Union Pacific Railroad: UPRR has the right to serve local industries on the line between MP 15.3 and MP 29.4 and local freight trains usually operate during daylight hours on weekdays as needed.

BNSF: BNSF operates freight trains between CP Vernon at MP 56.3 and the junction with the Pasadena Subdivision at MP 32.3. BNSF operates a medium-sized switching facility at MP 45.6, Kaiser Yard, which serves as a clearing and consolidation yard for traffic to/from local industries. BNSF operates a daily local train, dubbed "The Fontana Hauler," between Kaiser Yard and MP 32.3 that handles on line freight customers as well as the Miller Brewery at the end of the Pasadena Subdivision. There are also various daily freight movements between Kaiser Yard and CP Vernon, where the San Bernardino Line connects with BNSF's Transcontinental Main Line. Metrolink trains have dispatch priority over all BNSF freight trains on this route.

For the purposes of this study, it was determined that including UPRR freight train operations in the model was not necessary due to the limited traffic volume and time of operation, however, BNSF freight trains were included in the model, as some potential improvements could have a positive impact on BNSF freight train performance and operation.

2.1.2 Infrastructure

Method of Operation and Train-Control Systems:

Currently, the Method of Operation for all main tracks in the project area is Centralized Traffic Control (CTC). Metrolink dispatchers control train operations over the entire line and is in the process of instituting PTC operations on the San Bernardino Line. The latest Metrolink PTC implementation schedule is as follows:

- 91 Line – February 18, 2014
- San Bernardino Line – September 21, 2014
- System Wide – January 30, 2015

Trains operate on the trackage in the project area under the General Code of Operating Rules (GCOR), and the Metrolink Employee Timetable and Special Instructions.

Main Tracks:

Existing main tracks in the project area are maintained to the appropriate FRA track classification for the maximum timetable speed. Maximum train speed on main tracks and controlled sidings is governed by curvature, signal spacing, aspects, and other conditions. Power-operated turnouts are used for all main track crossovers and ends of sidings within the project area.

Platform Height:

All Metrolink passenger cars have a car floor height of approximately 18 inches and use an 8-inch platform height (above top of rail), with a distance of 5 feet 4 inches from the centerline of track to the platform edge. This platform height provides clearance sufficient for freight trains to utilize tracks adjacent to passenger platforms without restriction. The 8-inch platform height requires use of "mini-highs" for level access to passenger trains. Mini-highs are simply small raised platforms located at a standard distance from one end of a platform that enable a wheelchair-equipped passenger to ramp upwards to the top of the mini-high platform, with a passenger-train-car attendant or conductor laying

down a portable bridge plate between the mini-high and the car floor so that the wheelchair can roll into the car. Use of mini-highs has implications for operational speed and flexibility of trains. Specifically, it requires accurate spotting of the train consist so that the mini-high is directly opposite a passenger car door, which SCRRA accommodates by the standard placement of mini-highs from the end of the platform.

Station Operation:

Metrolink does not have full time staff assigned at stations along the SBL, but it does employ customer engagement representatives rotating amongst stations that are also available for emergency assistance during incidents. Passengers are self-directed to Metrolink trains by observing customer information system variable message signs, passive route signs in passenger cars and platforms and/or by station concessionaire staff.

Infrastructure Constraints and Their Impact on Operations:

The Metrolink San Bernardino Line (see Figure 2-2 for a schematic overview) consists of a single track from the Pasadena Junction (MP 0.9) to CP Hondo (MP 12.5), with the exception of a small siding at CP Jordan (MP 6.3). This segment of track, with only one passing siding within its limits, restricts or eliminates the movement of opposing trains which creates the largest operational bottleneck on the entire line.

Due to this single track segment, Metrolink is restricted on how reverse peak (trains moving against peak hour traffic during morning and evening peaks) and off peak train movements may be dispatched, as well as how frequently they can run against the peak flows. The inability to schedule meets on this segment forces Metrolink to schedule trains with meets on double track near the center of the railroad between CP White (MP 30.4) and CP Central (MP 34.6).

The San Bernardino Line also has limited right of way from CP Bassett (MP 15.3) to Lone Hill Avenue (MP 26.55) with the right of way width as narrow as 30 feet (see Appendix A3). A thirty foot right of way may be able to accommodate a second track, but then cannot accommodate a maintenance-of-way access road or property for any structures (signal towers, signal bungalows, etc.).

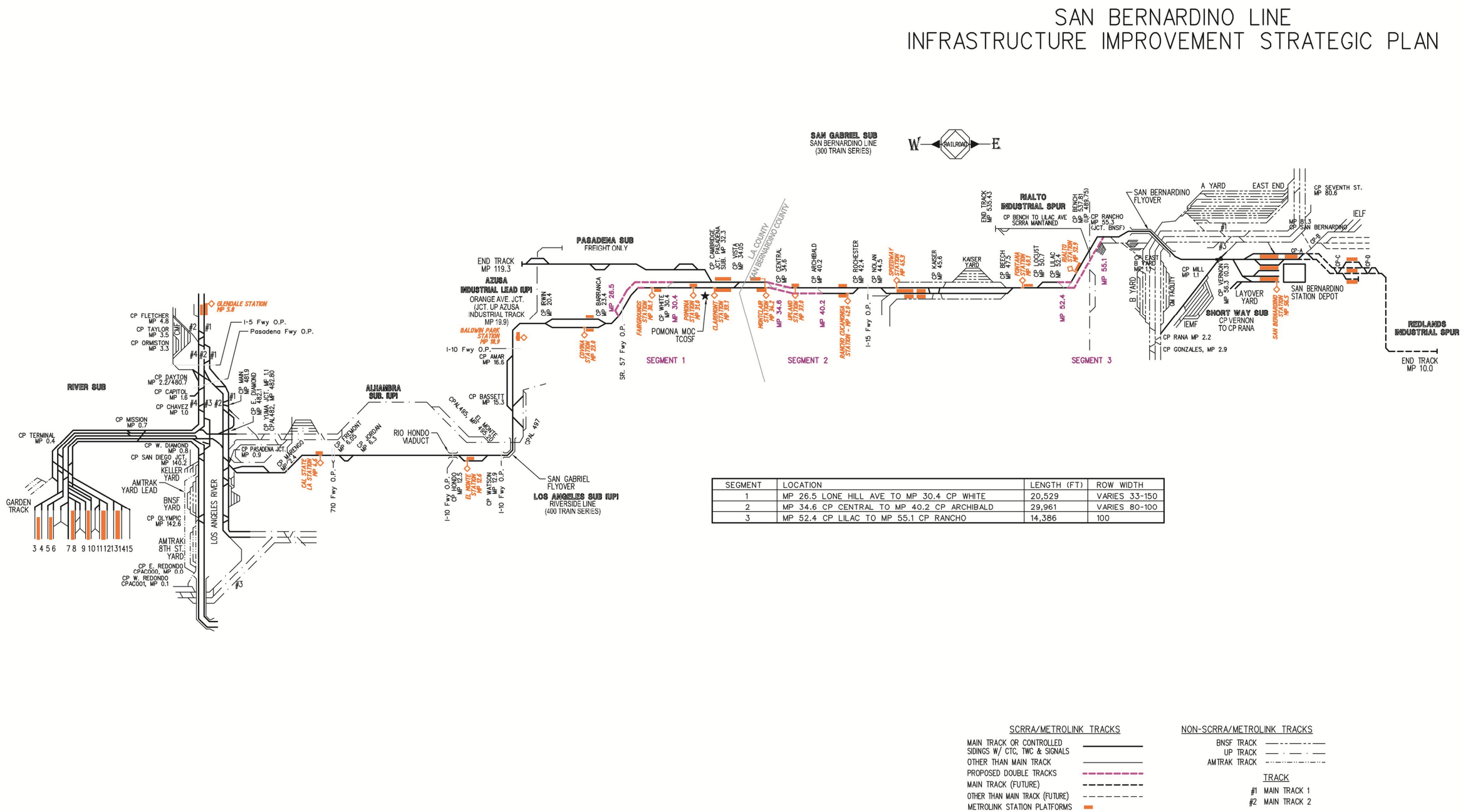
2.1.3 Train Equipment and Train Consist Characteristics

Metrolink:

On the San Bernardino Line, Metrolink trains currently consist of between four and eight bi-level coaches and one or two locomotives arranged for push-pull operation. One of the coaches on each train is equipped as a cab car and is placed at the west end of the train, while the locomotive resides at the east end of the train. In late 2014, Metrolink will likely run five-car consists on all San Bernardino Line trains during construction of the DSBPRP in order to accommodate reduced platform lengths at the Metrolink San Bernardino Station.

Metrolink's locomotive fleet is principally composed of Electro-Motive Corporation (EMD) F59PH, EMD F59PHI and MotivePower Industries (MPI) MP36PH-3C type passenger locomotives. The two EMD type locomotives are rated at 3,200 horsepower (hp) available for traction (flywheel at the main generator) with the MPI type locomotive rated at 3,600 hp. Metrolink has new EPA Tier 4 compliant locomotives on order from EMD, but no performance data was available for these locomotives for incorporation in the study's RTC model. As a result, the MP36 PH-3C locomotive was used on all train consists for RTC modeling purposes.

Figure 2-2. San Bernardino Line Schematic Map



SEGMENT	LOCATION	LENGTH (FT)	ROW WIDTH
1	MP 26.5 LONE HILL AVE TO MP 30.4 CP WHITE	20,529	VARIES 33-150
2	MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD	29,961	VARIES 80-100
3	MP 52.4 CP LILAC TO MP 55.1 CP RANCHO	14,386	100

Metrolink operates variable train consists based upon individual train demand and equipment cycles. On the San Bernardino Line, local trains operate with one locomotive and between 4 to 6 cars, which are a mix of Bombardier and Hyundai-Rotem cars. Specifically, express trains 383 and 384 operate with six cars and two locomotives. Each train consist used in the RTC model was developed using Metrolink's Equipment Cycle list from January, 2013. Car length is nominally 85 feet for all car types with the locomotive lengths varying from 60' to 68' for a total train length nominally at 400 to 580 feet (four to six cars).

2.1.4 Future Operations: Challenges, Opportunities, and Unknowns

New signaling technology, locomotives and extensions pertaining to the San Bernardino Line may have significant impacts on the line's schedule and operations, as described below:

Tier 4 Locomotives:

In order to assist Metrolink in complying with new EPA emissions standards and regulations for locomotives, as well as address planned locomotive retirements and additional needs, new Tier 4 compliant locomotives have been ordered from EMD. Since Metrolink will be the first operator of these locomotives, no performance data on them was available for incorporation in the model. The locomotives are rated at 4,700 hp and may have significantly different operating characteristics than locomotives currently used by Metrolink. Metrolink plans to eventually acquire twenty (20) of these locomotives, but it is unknown how many would potentially be assigned to the SBL or what trains they would be assigned to. Therefore, their potential impact on train scheduling and operations cannot be accurately determined at this time.

Positive Train Control:

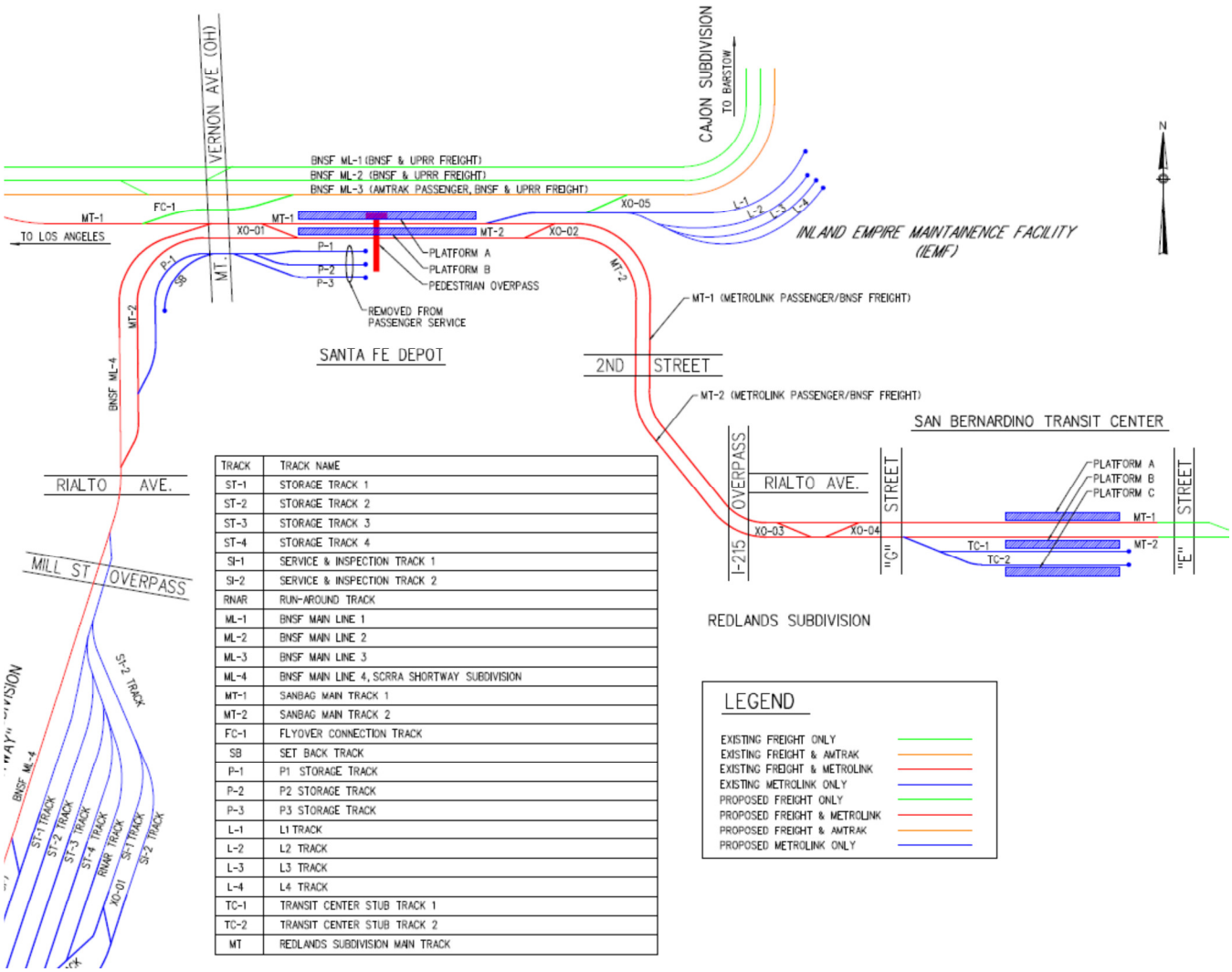
The San Bernardino Line will be the second Metrolink route to implement Positive Train Control. Metrolink is an industry pioneer with this technology and will be the first commuter rail line in the country to be fully PTC operational. Due to the fact that PTC is a new, untested technology, it is uncertain at this point how it may ultimately impact operations.

A critical issue impacting Metrolink service is how long a train crew will need to change operating ends on a trainset at a final terminal such as the Metrolink San Bernardino Station and LAUS. PTC has operating "brains" at each control cab stand on the train which requires an engineer to shut down one "brain," secure the cab, walk the train, turn on the other "brain" and initiate the startup procedure. Metrolink is still refining the startup process, but is assuming that train crews will need a minimum of twenty (20) minutes to offload passengers, sweep the train for passengers and belongings, change operating ends, board passengers and depart. Several turns on the current SBL schedule do not have sufficient time to accomplish the new PTC procedures and will need to be changed. It is unknown at this point how significantly this change will impact Metrolink equipment and crew utilization, train headways and terminal capacity on this and other routes.

Downtown San Bernardino Passenger Rail Project:

SANBAG plans to extend the San Bernardino Line easterly from its current eastern terminus at the Metrolink San Bernardino Station to the new San Bernardino Transit Center (SBTC), located directly south of downtown San Bernardino (see Figure 2-3). Once the new SBTC opens, Metrolink will need to modify the SBL schedule to reflect the operation over an additional one mile of trackage. The resultant change in operations was analyzed in great detail in the *Redlands First Mile Project- Assessment of Rail Operations Report* completed by HDR for SANBAG on July 27, 2010. The study area for the purposes of this Study was not increased to include the new trackage to downtown San Bernardino since the extension has little impact on the San Bernardino Line's existing and future main line capacity capabilities or needs.

Figure 2-3. Downtown San Bernardino Passenger Rail Project



TRACK	TRACK NAME
ST-1	STORAGE TRACK 1
ST-2	STORAGE TRACK 2
ST-3	STORAGE TRACK 3
ST-4	STORAGE TRACK 4
SI-1	SERVICE & INSPECTION TRACK 1
SI-2	SERVICE & INSPECTION TRACK 2
RNAR	RUN-AROUND TRACK
ML-1	BNSF MAIN LINE 1
ML-2	BNSF MAIN LINE 2
ML-3	BNSF MAIN LINE 3
ML-4	BNSF MAIN LINE 4, SCRRA SHORTWAY SUBDIVISION
MT-1	SANBAG MAIN TRACK 1
MT-2	SANBAG MAIN TRACK 2
FC-1	FLYOVER CONNECTION TRACK
SB	SET BACK TRACK
P-1	P1 STORAGE TRACK
P-2	P2 STORAGE TRACK
P-3	P3 STORAGE TRACK
L-1	L1 TRACK
L-2	L2 TRACK
L-3	L3 TRACK
L-4	L4 TRACK
TC-1	TRANSIT CENTER STUB TRACK 1
TC-2	TRANSIT CENTER STUB TRACK 2
MT	REDLANDS SUBDIVISION MAIN TRACK

2.2 INFRASTRUCTURE IMPROVEMENTS ANALYZED

2.2.1 Overview and Description of RTC Modeling Methodology

The RTC model is a software tool in broad use by North American railroads to test rail operational plans and proposed track and signal infrastructure arrangements by realistically simulating train operations and capturing the results. As compared to the pencil and paper methods that the RTC model replaced, the RTC model enables the user to more rapidly test the effects of proposed track geometry and methods of operation and to more rapidly test the effects on the multiple-train performance of proposed schedules, prioritization plans and infrastructure arrangements.

The RTC model is not a tool that suggests or optimizes infrastructure, schedules, or train priorities on its own. Rather, the RTC model is a validation tool that measures the results of user-proposed infrastructure, schedules and train priorities. The RTC model is used to compare infrastructure and train planning alternatives within its own set of rules and results. Subsequently, the results are viewed by rail operations experts who test for adequacy of the model against what is likely to happen within the real railroad world.

RTC is used by every Class I railroad, along with many major commuter rail agencies in North America, and is the only rail simulation software approved by the Federal Railroad Administration for use in testing and validating proposed infrastructure improvements funded with Federal dollars.

2.2.2 RTC Randomization Methodology Applied to the Project

HDR developed a customized randomization protocol to best replicate how the San Bernardino Line operates on a day with typical train delay causes, such as late initial terminal departures and extended station dwells due to heavy loading, passengers needing assistance, etc.

The following attributes were randomly adjusted during each randomization run:

1) Dwell Extension – This is the amount of allowable dwell extension to be applied to each train's route nodes where a dwell has been specified. The probability distribution function applied to this random parameter is the normal distribution. Dwell time at all intermediate stations was set at one minute.
2) Initial Departure Times - Trains in RTC are assigned an initial requested departure time and this value is generally set to the published schedule time. However, trains may actually leave either earlier or later than the published time which is accounted for by specifying a time range that a train may depart its origin with the likelihood weighted towards the scheduled time. The appropriate time range was determined during calibration to achieve an on time performance level of what was actually measured empirically.
    a. Allowable Late Time – This is the amount of time that the first requested departure can leave late from its original requested departure time and each subsequent requested stop will retain its requested arrival or departure time.
    b. Allowable Early Time – This is the amount of time that the first requested departure can leave early from its original requested departure time and each subsequent requested stop will retain its requested arrival or departure time.
3) Train Operator Handling – this attribute dictates the aggressiveness of the train's operator within RTC (i.e. how quickly the operator will accelerate and decelerate). The valid values within RTC range from 1 to 10 and this probability density function applied to this parameter is a uniform distribution making it equally likely to have an aggressive operator as it is a cautious one.

Generally, the values of parameters are determined empirically by obtaining actual train delay data or by on time performance (OTP) reports in order to achieve an aggregated set of runs which lines up reasonably closely with existing operations. These values can then be applied to trains' files in "what-if" scenarios to fairly replicate what may happen on an average day under those conditions.

For this study, the following values were used:

Table 2-1. Parameter Values

Parameter	Value (MM:SS)
Dwell Extension	0:30
Allowable Late	1:00
Allowable Early	1:00

2.2.3 Infrastructure Challenges

There are some major challenges to increasing capacity on the Metrolink San Bernardino Line including, but not limited to:

1) The single track segment from Pasadena Junction (MP 0.9) to CP Hondo (MP 12.5) which is nearly 12 miles long and is the largest operational bottleneck on the entire line. Its location along I-10 and the El Monte Busway corridor would make the construction of extra sidings or double track segments within this section extremely costly and difficult to construct.
2) From CP Bassett (MP 15.3) to Lone Hill Avenue (MP 26.55), the 33' narrow right of way width makes construction of additional sidings or double track segments problematic. From Lone Hill Avenue to CP Vernon (MP 56.3), the Metro right of way in Los Angeles County and the SANBAG right of way in San Bernardino County is wide enough, with the exception of a few locations, to support the construction of additional sidings or double track segments without significant right of way acquisition.
3) Two single track flyovers at MP 14 (UPRR Alhambra Sub) and MP 55.5 (BNSF Transcon mainline) would require new or significantly modified bridge structures if a second mainline track was to be placed upon the structures. Specifically, both flyovers have bent openings that only accommodate a single track which would necessitate shifting bents in order to permit a large enough opening to accommodate a second mainline track.
4) In order to increase service during peak travel periods, a reduction in headways (time between train movements in the same direction) from the current 20 minutes to 15 was considered. After reviewing operational challenges in reducing headways with Metrolink operations staff, this option was rejected for the following reasons:
    a. The single track segment along the I-10 Freeway does not permit a reduction from 20 minutes without eliminating reverse peak movements, which are necessary from service offering and equipment/crew utilization requirements.
    b. The current need to schedule at least 20 minutes at terminals to change operating ends due to PTC requirements will not allow 15 minute headways without causing severe congestion at both LAUS and the Metrolink San Bernardino Station tracks which would most likely exceed the capacity of the terminals to accommodate trains.

2.2.4 Previous Double Track Plans/Studies

Two previous studies identified possible siding locations or main line extensions east of CP Bassett (MP 15.3):

1) **Metrolink Proposed 5 Year Capital Projects:** SCRRA issued a list of proposed capital improvement projects for the years 2012 - 2017 which included three double tracking projects on the San Bernardino Line ranked by SCRRA's determination of their utility and priority:
    a. CP Barranca (MP 23.4) to CP White (MP 30.4)
    b. CP Amar (MP 16.6) to CP Irwin (MP 20.4)
    c. CP Central (MP 34.6) to CP Archibald (MP 40.2)
2) **California High Speed Rail (CHSR):** CHSR and SCRRA's member agencies consisting of LACMTA, SANBAG, OCTA, VCTC and RCTC developed a list of early investment projects on the Metrolink commuter rail system in order to facilitate the future construction of high speed rail in Southern California, which included three double tracking projects on the San Bernardino Line:
    a. CP Central (MP 34.6) to CP Archibald (MP 40.2)
    b. CP Beech (MP 47.5) to CP Locust (MP 50.7)
    c. CP Lilac (MP 52.4) to CP Rancho (MP 55.3)

For the initial screening phase, HDR started with the double track projects originally identified by the SCRRA member agencies, SCRRA and CHSR and HDR conducted RTC modeling in support of an operations analysis to help determine the best double track projects to advance.

2.2.5 Initial Screening Process

In order to test, analyze and validate the aforementioned double track projects with RTC, a hypothetical future schedule was developed from the existing Metrolink schedule by adding three new roundtrip express trains (three in the morning peak and three in the afternoon peak). The new roundtrip express trains will serve the intermediate stops of Rancho Cucamonga and Covina while keeping current service levels intact for all other stops.

Four different RTC dispatch models were created to test and validate various infrastructure scenarios:

- **Base Case Model**. HDR took the 2010 RTC model created by Metrolink, updated infrastructure and operating speeds per the latest timetable and added the train schedule as of October 30, 2012 in order to validate the correct functioning of the model.
- **SCRRA Capital Plan Model**. Metrolink's aforementioned double track projects were added to the Base Case model and the proposed 48 train schedule was run.
- **CHSR Early Investment Projects Model**. CHSR's aforementioned early investment projects on the Metrolink commuter rail system were added to a duplicate model of the Base Case and the proposed 48 train schedule was run.
- **Blended Model**. HDR reviewed the operations, functionality and flexibility of the SCRRA Capital Plan and CHSR Early Investment Projects models. A third infrastructure alternative model was then created by combining improvements from both studies to provide the best overall operating characteristics for the railroad.

Schedules had to be slightly modified for each scenario in order to better utilize the hypothetical infrastructure improvements. In order to avoid disrupting existing commuting patterns and Metrolink market-based scheduling, schedule modifications were limited to 10 minutes maximum from the existing time for peak trains and 20 minutes for reverse peak or off peak trains. After a thorough review of stringlines and dispatch models for the Metrolink and CHSR proposals, HDR placed the following projects into the fourth (recommended) model:

- **CP Amar - CP Irwin**: This project would provide a continuous double track for 8.1 miles at the point closest to the restricted single track segment parallel to I-10 while allowing for express trains to overtake local trains during the morning peak period. The project would also allow for the staging of peak trains to allow "parades" where multiple trains operate in rapid succession and minimize conflicts with opposing reverse peak trains.
- **CP Central - CP Archibald**: This project would create 12 miles of continuous double track operation at the center of the line which would enhance operational flexibility in dealing with late trains by avoiding "cascading" delays.
- **CP Lilac - CP Rancho**: This project would create 4.6 miles of double track at the far eastern end of the railroad which would increase fluidity by reducing delays to opposing trains resulting from late arriving or departing trains in and out of the Metrolink San Bernardino Station. The double track project's benefit is further enhanced when considering the recent opening of the Inland Empire Maintenance Facility (IEMF) and planned construction of the San Bernardino Transit Center. Both projects will increase train movement activity on the mainline directly west of the San Bernardino Station and the ability to stage eastbound trains at CP Rancho will significantly reduce the possibility of cascading train delays resulting from these equipment moves.

- **CP Barranca - CP White:** This project would create 11.2 continuous miles of double track near the center of the route (where most meets and overtakes currently occur on the line) by connecting with existing double track between CP White and CP Central. This improvement would allow for operational flexibility in dealing with late trains by avoiding "cascading" delays which emulates the benefits provided by the CP Central to CP Archibald double track project.

The other double track project from CP Beech to CP Locust is too far from the eastern end of the railroad to provide benefits similar to those achieved with CP Lilac – CP Rancho. In addition, the potential double track project is not near the center of the railroad where meets and overtakes are currently occurring to provide benefits similar to CP Central – CP Archibald or CP Barranca – CP White. Therefore, there are far fewer operational benefits to be gained by constructing this segment of double track compared to the segments listed above.

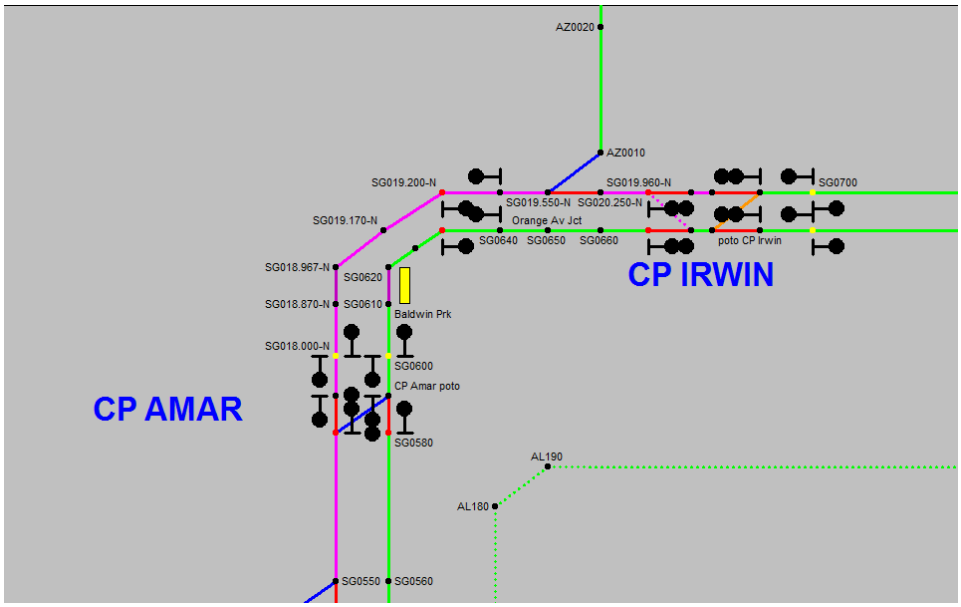
The results of this initial analysis were presented to stakeholders from SCRRA, Metro and SANBAG during the project's kick off meeting in absence of right of way, environmental or cost considerations for each alternative. Right of way, environmental and cost issues for these segments are discussed in greater detail in *Chapters 4 Environmental Constraints* and *Chapter 5 Infrastructure Improvements and Safety Enhancements* of this report. The stakeholder team jointly reviewed the options and discussed the pros and cons for each proposed segment. The stakeholder team, after reviewing operating benefits, right of way, environmental and cost factors for each segment, jointly determined which segments would be carried forward for more detailed modeling and analysis.

Legend:

Link Class	Color Code
Main Track	Green
Foul Track	Red
Crossover	Orange
Passenger Station	**Purple**
Proposed Track/Existing Controlled Siding	Magenta
Turnout	Blue
Yard/Foreign Track (Freight Only) OR Lonehill Avenue to White Siding	White

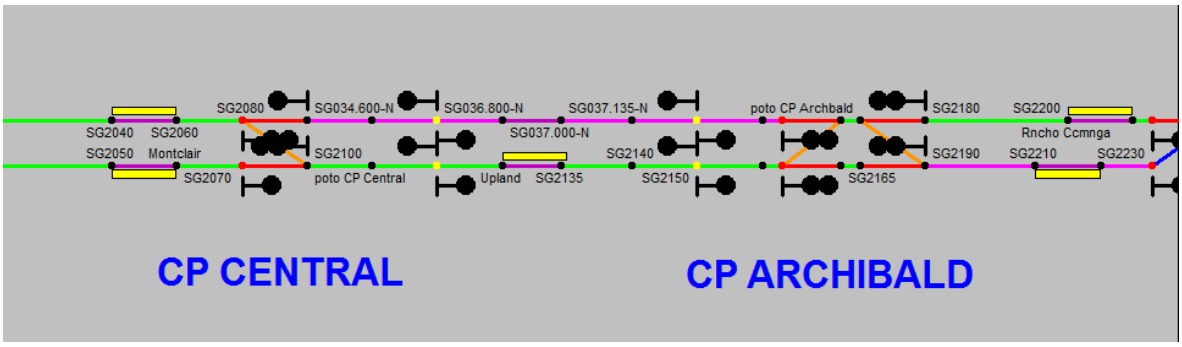
- **CP Amar - CP Irwin:** The SCRRA right of way is 30' wide for most of this segment and any structures (signal towers, signal and grade crossing bungalows, etc.) would need to be constructed outside of this right of way, requiring the acquisition of additional property. In addition, there would be no room for an access road for maintenance of way and signal crews to access the double track section which would necessitate the use of hi-rail equipment for crews to perform regular maintenance.
    - **Team Decision:** Eliminate this segment from short term consideration due to the severe right of way constraints and significant technical and cost related obstacles (I-10 freeway underpass reconstruction, shifting all existing track including all at-grade crossings) as further discussed in *Chapter 5 Infrastructure Improvements and Safety Enhancements* of this report.

Figure 2-4. CP Amar – CP Irwin RTC Model



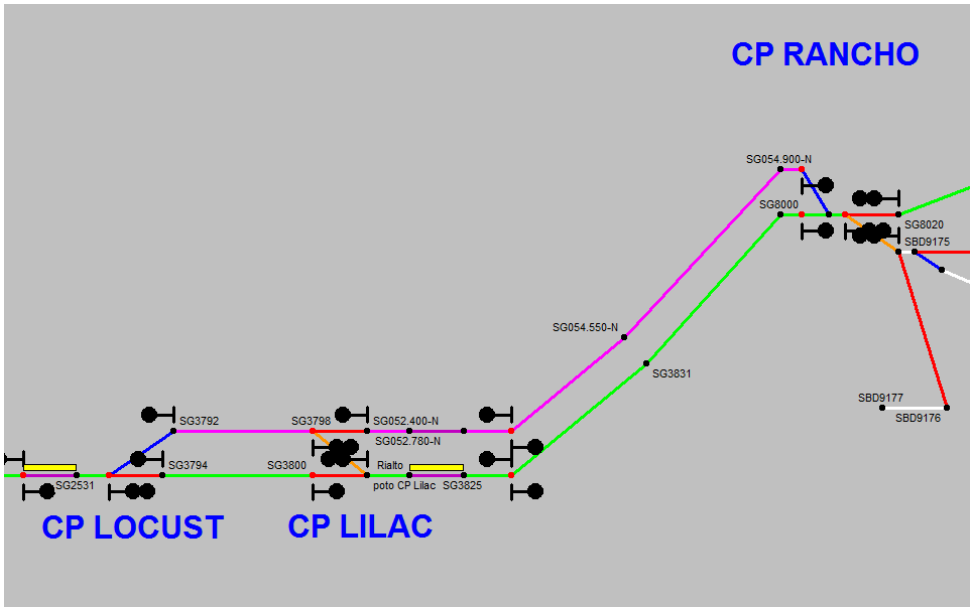
- **CP Central - CP Archibald:** There are few right of way constraints associated with this particular segment of the corridor and the project would create a 12 mile segment of double track with significant operational benefits as further detailed in *Chapter 5 Infrastructure Improvements and Safety Enhancements* of this report.
    - **Team Decision:** Keep segment under consideration.

Figure 2-5. CP Central – CP Archibald RTC Model



- **CP Lilac - CP Rancho:** There are few right of way constraints associated with this particular segment of the corridor as further described in *Chapter 5 Infrastructure Improvements and Safety Enhancements* of this report and the double tracking project would provide clear operational benefits.
    - **Team Decision:** Keep segment under consideration.

Figure 2-6. CP Lilac – CP Rancho RTC Model



- **CP Barranca - CP White**: The team determined that technical and right of way constraints between CP Barranca and Lone Hill Avenue (MP 26.5) would require additional right of way acquisition and made construction of that part of the segment problematic as further described in *Chapter 5 Infrastructure Improvements and Safety Enhancements* of this report. Therefore, it was determined to evaluate a reduced length of the overall segment from Lone Hill Avenue to CP White that does not have similar right of way constraints. This segment would extend the existing double track between CP White and CP Central by 3.9 miles, creating a new double track segment 7.9 miles long.
    - **Team Decision:** Keep revised segment from **Lone Hill Avenue - CP White** under consideration for consideration in the short term.

Figure 2-7. CP Barranca – CP White RTC Model

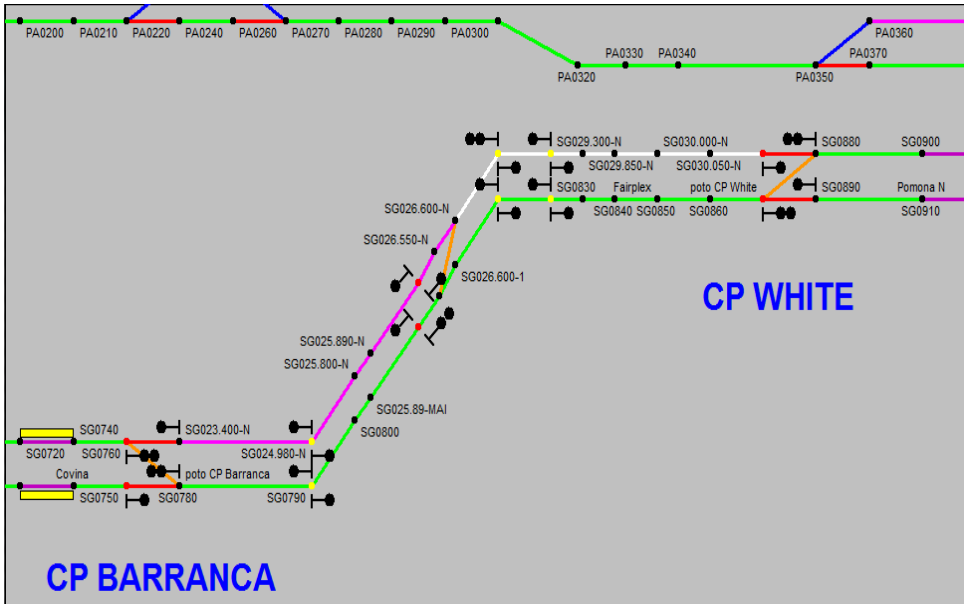
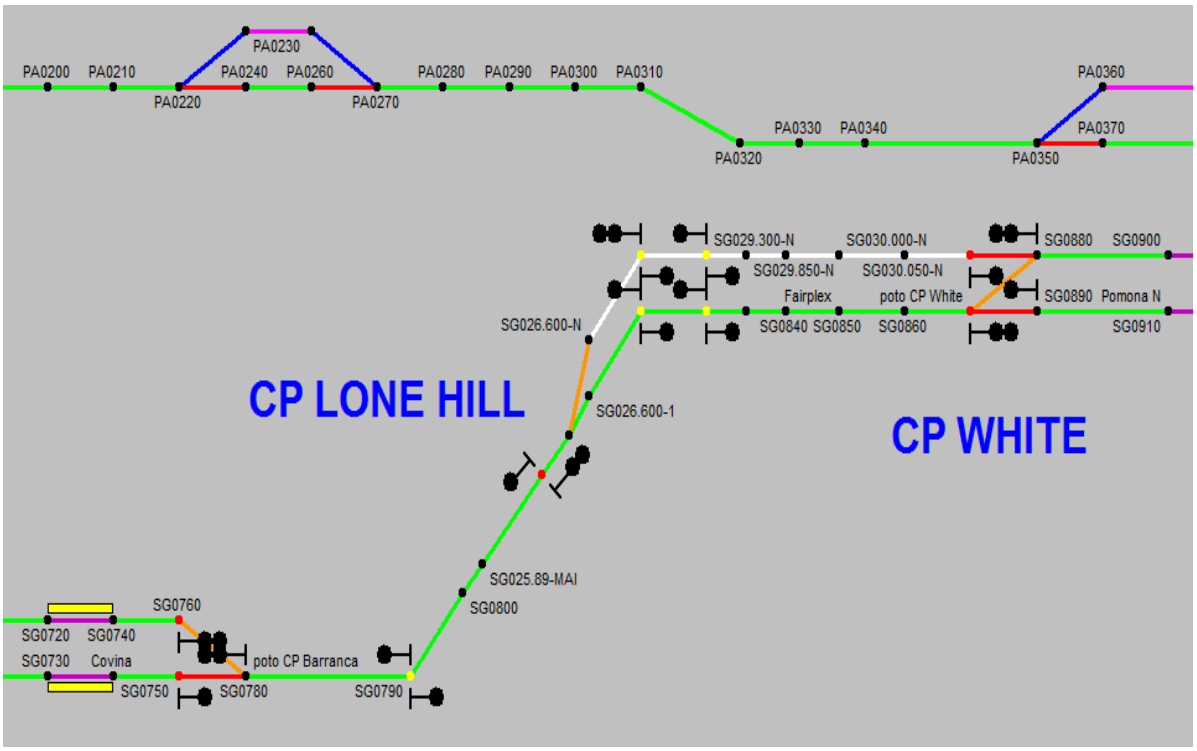


Figure 2-8. Lone Hill Avenue – CP White RTC Model



2.2.6 Final Screening of Alternatives

RTC modeling for the second phase of the screening process for the double track projects on the San Bernardino Line consisted of the following steps:

1) Modification and update of an existing RTC model developed and supplied by SCRRA with recent infrastructure improvements added.

2) Creation of the following RTC modeling scenarios to test the utility of the three remaining infrastructure improvement options (alone and with two in combination). All models were initially run in standard mode and modified until passenger train OTP was at 100%. Afterwards, the models were run in randomized mode to determine how each double track option would perform under randomly adjusted conditions:

    a. **Base Case**: Current Metrolink operations (42 trains per day)

    b. **Current Metrolink Operations with One Improvement Project (3 models):** The Base Case model with independent inclusion of each proposed double track project was run to determine the impact that one double track project would have on current Metrolink operations.

    c. **Near Term (3 models):** An additional express train round trip was added to the 3 models from the second modeling scenario to determine if the proposed double track segment would permit Metrolink to operate 44 trains per day (2 one way express trains added).

    d. **2020 (3 models):** A hypothetical 48 train daily schedule was created with additional 4 express train round trips. Three separate infrastructure models were developed that included combinations of two of the three potential double track segments to determine which combination would best facilitate the operation of the 48 train schedule.

e. **2035 (1 model):** A hypothetical 56 train daily schedule was created by augmenting the 2020 48 train schedule with 3 additional trains at the morning and evening peak period shoulders in 20 minute increments. Furthermore, one reverse peak train in each direction was included to help balance equipment. The schedule was added to the 2020 model that exhibited the best overall performance to determine the ability of the selected double track segments to accommodate the 2035 schedule.

3) Evaluate and compare infrastructure options. In order to determine the ability of the potential double track alternatives to support existing and proposed Metrolink service, appropriate outputs needed to be generated from each model to compare and evaluate these options against each other. The following output data was extracted from each model and used as the key metrics for evaluation and comparison:

a. Delay Percentage: This formula is the most common metric used in RTC evaluations which is calculated as follows:

100 x True delay / (Total elapsed - True delay - Total dwell - Wait on schedule) where:

True Delay = Total elapsed run time - Ideal (seed or run-time) elapsed run time.

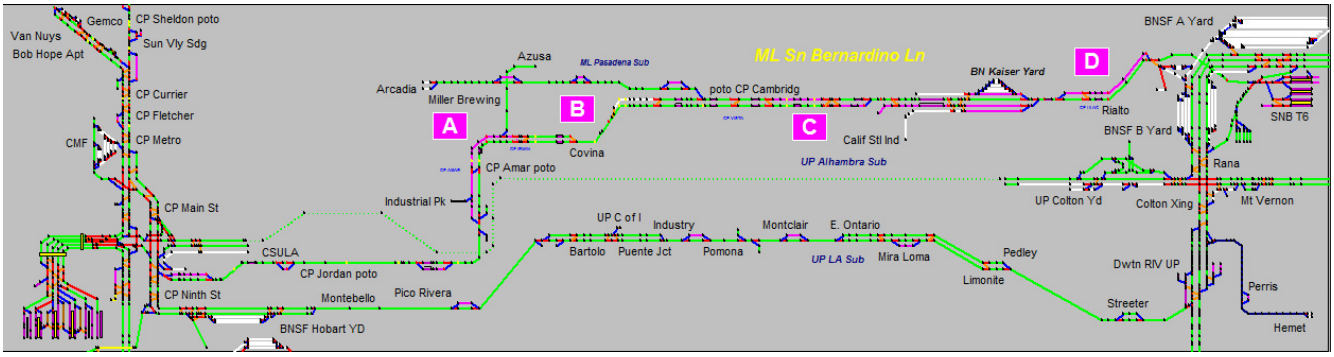
True delay includes the acceleration and deceleration associated with conflict resolutions; in other words, the amount of time it takes a train to enter and leave a siding to meet an opposing train compared to the time the train would have taken over the same segment without having to take the siding.

b. Delay Minutes per 100 Train-Miles: How many minutes a train is delayed compared to pure running time over 100 train miles where a Train Mile equals a train operating one mile.

c. Overall Train On Time Performance (OTP): The overall percentage of trains operating on time where the arrival time at endpoint is no more than 5 minutes late which is the same metric used by Metrolink to evaluate Amtrak's operations performance.

4) Perform a final assessment of the impact of the individual and combined infrastructure improvements on current Metrolink operations with One Improvement, Near Term, 2020 and 2035 service scenarios on train travel times, operational flexibility and capacity as indicated by the RTC model.

Figure 2-9. RTC Model of the San Bernardino Line



Key:

A- CP Amar - CP Irwin
B- CP Barranca/Lone Hill Avenue - CP White
C- CP Central - CP Archibald
D- CP Lilac - CP Rancho

2.3 RTC MODELING RESULTS

Animation videos of the RTC Models are included on a DVD located in Appendix B3.

2.3.1 Scenario 1: Base Case

This model is an exact duplicate of current Metrolink San Bernardino Line operations as of September 30, 2013 and is run for two key reasons:

1) Debugs and validates functionality of the model
2) Creates existing operational benchmarks to be used for comparison with other scenarios

Assumptions used in creating the Base Case model included:

1) Existing Metrolink rail infrastructure
2) Current September 30, 2013 Metrolink schedules
3) Train consists created from Metrolink's Equipment Cycle List from January 2013
4) Operations within LAUS, San Bernardino Station and Inland Empire Maintenance Facility (IEMF) were not modeled.

After all infrastructure, schedule and consist data was inputted and minor troubleshooting was performed, a dispatch model was run and operated at 100% on time performance. This Base Case model represents a perfect operating day on the San Bernardino Line with no delays attributed to mechanical issues, passenger loading, weather, train interference and/or other causes. A string line chart showing current train operations on the San Bernardino Line is included in Appendix B1.

In order to reflect operations on the line when typical delays occur, the Base Case model was randomized to present a more realistic picture of daily operations on the line. The performance metrics from the randomized base model are summarized in Table 2-2:

Table 2-2. Base Case Performance Metrics

Base Case	
Delay Percentage (%)	6.99
Delay Minutes per 100 Train Miles (minutes)	4.14
On-time performance (% of trains on time)	93.27

An analysis of existing operations using the Base Case RTC model in conjunction with past conversations and meetings with SCRRA operations management staff resulted in the following observations:

- According to SCRRA operations personnel, SCRRA has had recent difficulty with overall on time performance on the line and contributing factors include:
    - The introduction of new, heavier Hyundai Rotem cars has reduced the train's horsepower to ton ratio. As a result, there may be insufficient horsepower on the train to maintain the existing train schedule with the heavier consist.
    - An aging locomotive fleet and the resulting reduction in available horsepower from those units has contributed to some trains failing to maintain schedule.
    - The introduction of express trains on the route in 2011 requires precision train operation to facilitate train overtakes and opposing train meets, which is not always possible when factors as described above impact on time performance. Furthermore, late trains caused by the aforementioned factors listed above have led to cascading train delays on several days of operation.

- The extended single track operation within the I-10 corridor at the west end of the line severely restricts the ability of Metrolink to offer reverse peak service on weekdays. The few reverse peak trains on the schedule take from 1 hour and 50 minutes to 2 hours and 5 minutes to complete their run, which is a significant increase over the standard one hour and 30 minutes. Reverse peak trains are critical to the operation since they accommodate passengers with non-traditional commute patterns, and reposition equipment and crews to facilitate second peak train runs on the same day.
- Metrolink is currently only able to offer peak period train service in 20 minute intervals primarily due to the operation of hourly reverse peak service on the single track segment within the I-10 median. The service limits peak movements to one every 20 minutes due to the limited ability of trains to meet on the segment. The implementation of PTC may require Metrolink to increase headway times beyond the current 20 minute peak hour standard resulting from increased equipment turn times at the end terminals.

As a result, Metrolink modified the San Bernardino Line schedule in April 2014 due to the likelihood that PTC terminal requirements will mandate a minimum train turn time of 20 minutes. In addition, Metrolink added time to certain train schedules to correlate with actual train performance, along with modifying equipment and crew turns to eliminate turns of less than 20 minutes.

Metrolink will also analyze the current express train schedules to determine how their performance impacts other trains during peak hours, and possibly change express train departures or shift those departure times with an existing local train.

The performance of the San Bernardino Line model indicates that the schedules must be adjusted to improve overall on-time performance, and that no additional service frequencies can be successfully accommodated without increasing infrastructure capacity. The Base Case San Bernardino Line schedule can be found in Appendix B2.

2.3.2 Scenario 2: Current Metrolink Operations with One Improvement

This model is comprised of the Base Case model with independent inclusion of each potential double track project to determine the impact that each double track segment would have on current Metrolink operations.

In the standard dispatch format, all three models ran like the Base Case at 100% OTP. Each model was then dispatched in randomized format to determine how each potential double track segment contributed to the ability of the infrastructure to help Metrolink recover from typical service disruptions. The performance metrics from the randomized cases are summarized below:

Table 2-3. Scenario 2 Performance Metrics

Alternative	Base	CP Central - CP Archibald	Lone Hill Ave. - CP White	CP Lilac - CP Rancho
Delay (%)	4.90	3.92	4.81	4.38
Delay minutes per 100 train miles (min)	2.82	2.22	2.78	2.52
On time performance (%)	95.24	97.42	93.80	94.57

It should be noted that existing Metrolink schedules are based upon the San Bernardino Line's existing infrastructure and designed to capitalize on double track segments that are currently available. Also, it's important to note that most train meets and overtakes currently take place on the existing double track segment between CP White (MP 30.4) and CP Central (MP 34.6).

The Lone Hill Avenue - CP White and CP Central - CP Archibald improvements increase the length of this double track segment by 3.9 miles and 5.6 miles, respectively. In each case, trains scheduled to meet in the current segment that are operating late have the ability to still meet or overtake at speed with the new segment(s) incorporated which reduces the opportunity for individual train delays to "cascade" and make other trains late as well.

The CP Lilac - CP Rancho segment permits trains operating late into or out of the Metrolink San Bernardino Station to meet opposing trains on this segment; whereas, an eastbound train must hold at CP Lilac (2.9 miles west) to meet a westbound train with the current infrastructure.

However, it's important to note that Metrolink would optimize train schedules to best take advantage of new infrastructure and that actual service recovery metrics could conceivably be better than what the models indicate.

Conclusion: For existing Metrolink operations, all three improvement options provide a similar level of benefit from an on time performance perspective. However, there are right of way and capital cost considerations outlined in *Chapter 5 Infrastructure Improvements and Safety Enhancements* that had to be considered when prioritizing the potential double track segments.

2.3.3 Scenario 3: Near Term

This model is composed of the three aforementioned Scenario 2 models with an additional round trip express train added to the existing Metrolink train schedule to determine how construction of these improvements could support a 44 train Metrolink schedule. The Scenario 3 (44 train) San Bernardino Line schedule can be found in Appendix B2.

In the standard dispatch format, all three models ran at 100% OTP. Each model was then dispatched in randomized format to determine how each improvement contributed to the ability of the infrastructure to help the modified Metrolink schedule recover from typical service disruptions. The performance metrics from the randomized cases are summarized below:

Table 2-4. Scenario 3 Performance Metrics

Alternative	Lone Hill Ave. - CP White	CP Central - CP Archibald	CP Lilac - CP Rancho
Delay (%)	5.31	5.15	5.06
Delay minutes per 100 train miles (min)	3.65	3.51	3.45
On time performance (%)	88.85	88.40	87.81

Conclusion: For near term Metrolink operations, all three double track segments provide a similar level of operational benefits and, with minor adjustments to the rest of the schedule, can help support the operation of an additional round trip express train. However, there are right of way and capital cost considerations outlined in Chapter *5 Infrastructure Improvements and Safety Enhancements* that had to be taken into account when prioritizing the potential double track segments.

2.3.4 Scenario 4: 2020

This model is broken into three components where each combination of two improvements is modeled to determine which combination can best support a 48 train daily schedule. The Scenario 4 (48 train) San Bernardino Line schedule can be found in Appendix B2.

In the standard dispatch format, all three models ran at 100% OTP. Subsequently, each model was then dispatched in randomized format to determine how each improvement contributed to the ability of the

infrastructure to help the modified Metrolink schedule recover from typical service disruptions. The performance metrics from the randomized cases are summarized in Table 2-5:

Table 2-5. Scenario 4 Performance Metrics

Alternative	Lone Hill Ave. - CP White + CP Central - CP Archibald	CP Central - CP Archibald + CP Lilac - CP Rancho	Lone Hill Ave. - CP White + CP Lilac - CP Rancho
Delay (%)	4.81	4.40	4.73
Delay minutes per 100 train miles (min)	3.35	3.06	3.33
On time performance (%)	93.02	92.08	88.64

Conclusion: For a 48 train daily schedule, all three double track segments provide some level of benefit from an operations perspective. All three combinations provide similar delay % and delay minutes per 100 train miles, but the Lone Hill Ave. - CP White plus CP Lilac - CP Rancho double track pairing experienced slightly reduced on time performance relative to the other options. However, all three double track scenarios can help support the operation of 48 daily trains with minor adjustments to the rest of the schedule. It's important to note that *Chapter 5 Infrastructure Improvements and Safety Enhancements* provides a summary of right of way and capital costs associated with each double track alternative that had to be taken into account in order to develop final consensus on which projects to advance into environmental clearance and preliminary engineering.

2.3.5 Scenario 5: 2035

This final model tests the proposed infrastructure options with a hypothetical 56 train schedule. The Scenario 5 (56 train) San Bernardino Line schedule can also be found in Appendix B2.

The 56 train schedule presented some challenges given Metrolink's position that 20 minutes is the best headway that can be utilized on the San Bernardino Line due to previously covered issues such as opposing train meets, PTC equipment turn requirements and station capacity issues. In order to increase service to 56 daily trains, additional trains had to be added to peak hour service "shoulders" (20 minutes before and/or after traditional peak service).

In addition, two reverse peak trains needed to be added to help balance equipment and crews. Metrolink informed the team that only one reverse peak train can operate per hour during peak periods with 20 minute headways, and this rule was followed in the scheduling of the reverse peak trains. In the standard dispatch format, the model ran at 100% OTP and the performance metrics from the randomized cases are summarized below:

Table 2-6. Scenario 5 Performance Metrics

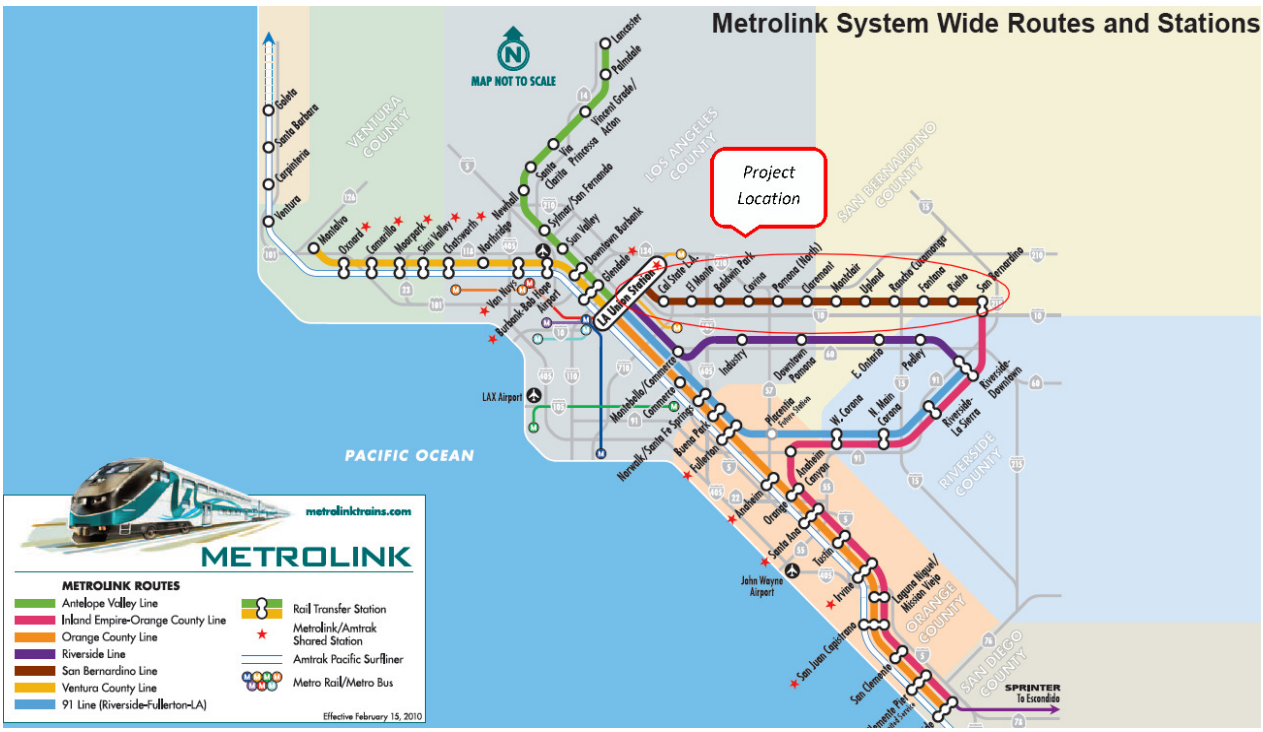
Alternative	Lone Hill Ave. - CP White + CP Central - CP Archibald	CP Central - CP Archibald + CP Lilac - CP Rancho	Lone Hill Ave. - CP White + CP Lilac - CP Rancho
Delay (%)	5.65	4.51	5.82
Delay minutes per 100 train miles (min)	4.58	3.65	4.76
On time performance (%)	94.12	93.51	90.44

Conclusion: For a 56 train daily schedule, all three potential double track combinations provided some level of benefit from an operations perspective. All three combinations provided similar delay % and delay minutes per 100 train miles, but the Lone Hill Ave. - CP White plus CP Lilac - CP Rancho alternative experienced slightly reduced on time performance compared to the other options as evidenced in Table 2-6. However, all three double track alternatives can help support the operation of 56 daily trains with minor adjustments to the rest of the schedule.

3.0 EXISTING CONDITIONS AND PLANNED CAPITAL PROJECTS

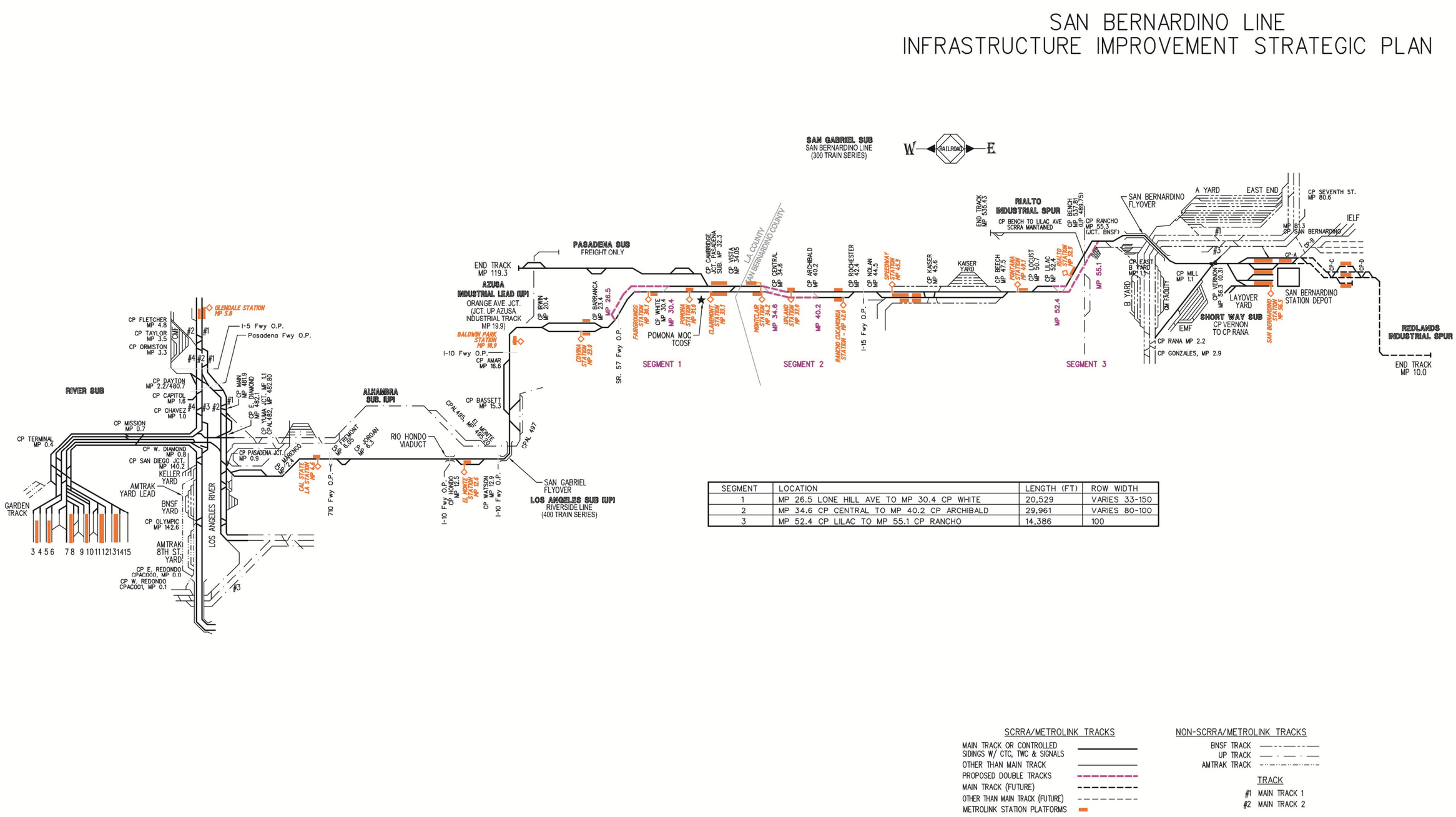
The SBL is a rail corridor primarily for Metrolink commuter rail service between LAUS in downtown Los Angeles and the Metrolink San Bernardino Station in San Bernardino. At its west end Amtrak also provides additional passenger service in Downtown Los Angeles on the adjacent UP Alhambra Subdivision. A map of the entire Metrolink system is shown in Figure 3-1 and a schematic map of the SBL is shown in Figure 3-2. This 55-mile corridor runs at-grade through Los Angeles and San Bernardino Counties, briefly on the River Subdivision's East Bank Junction before transitioning to the San Gabriel Subdivision roughly parallel to the Interstate 10 (I-10 corridor). The route then continues east of El Monte along the San Gabriel Subdivision until reaching the Metrolink San Bernardino Station. The route has numerous at-grade crossings, bridges, under/over passes, and slower speed curves between the El Monte and Baldwin Park stations.

Figure 3-1. Metrolink Commuter Rail System Map



In addition to commuter rail service, the UPRR operates freight trains in this corridor between the El Monte flyover and CP Bassett (connection to UPRR Alhambra Sub) and to other customers along the line through a trackage rights agreement. BNSF has a trackage rights agreement that permits it to run freight trains between CP Cambridge, the connection with the Pasadena Line, and San Bernardino. BNSF also has a significant operational presence at the Rancho Cucamonga Station, California Speedway Station, the Kaiser Yard near CP Rancho (BNSF junction), and the Metrolink San Bernardino Station. Refer to *Chapter 2.1 Existing Rail Operations, Infrastructure, and Equipment* for more information on freight rail operations along the SBL.

Figure 3-2. San Bernardino Line Schematic Map



SEGMENT	LOCATION	LENGTH (FT)	ROW WIDTH
1	MP 26.5 LONE HILL AVE TO MP 30.4 CP WHITE	20,529	VARIES 33-150
2	MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD	29,961	VARIES 80-100
3	MP 52.4 CP LILAC TO MP 55.1 CP RANCHO	14,386	100

SCRRA/METROLINK TRACKS

- MAIN TRACK OR CONTROLLED SIDINGS W/ CTC, TWC & SIGNALS
- OTHER THAN MAIN TRACK
- PROPOSED DOUBLE TRACKS
- MAIN TRACK (FUTURE)
- OTHER THAN MAIN TRACK (FUTURE)
- METROLINK STATION PLATFORMS

NON-SCRRA/METROLINK TRACKS

- BNSF TRACK
- UP TRACK
- AMTRAK TRACK

TRACK

- #1 MAIN TRACK 1
- #2 MAIN TRACK 2

3.1 EXISTING CORRIDOR RIDERSHIP AND SAFETY

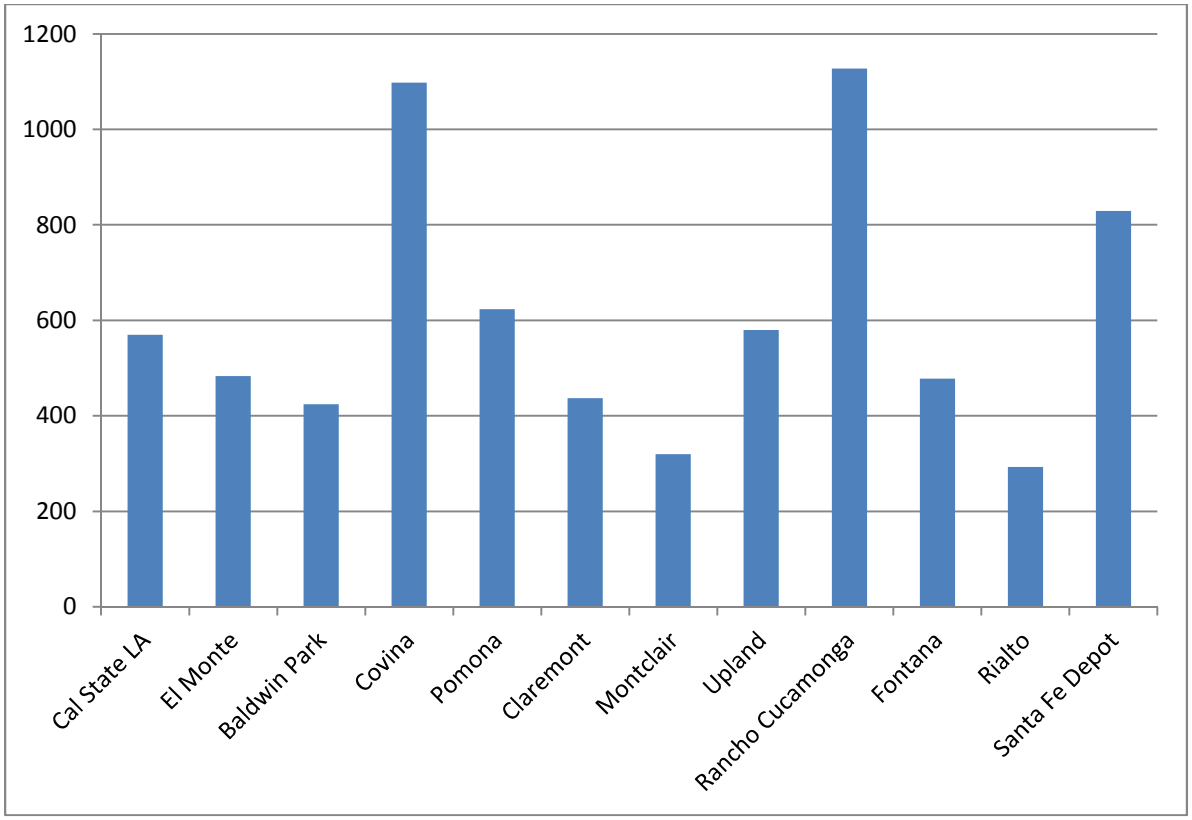
3.1.1 Metrolink Commuter Passenger Service

The SBL is on right-of-way (ROW) owned by Metro within Los Angeles County and SANBAG within San Bernardino County. This line is the busiest line in the Metrolink System carrying approximately 12,000 passengers each day through urban, residential, industrial, and commercial areas. The average speed on the SBL is approximately 40 miles an hour resulting in travel times between the Metrolink San Bernardino Station and LAUS of approximately 90 minutes.

The SBL serves 12 stations (not including LAUS) with regular inbound (from the Metrolink San Bernardino Station to LAUS) and outbound (from LAUS to the Metrolink San Bernardino Station) train service. Current service consists of 42 (21 inbound and 21 outbound) trains on weekdays, 20 trains (10 inbound and 10 outbound) on Saturdays, and 14 trains (7 inbound and 7 outbound) on Sundays. While most trains stop at every station, limited stop (express) trains introduced in May 2011, provide service from the Metrolink San Bernardino Station to LAUS during weekdays in 1 hour and 5 minutes.

The Metrolink SBL average weekday ridership was 11,676 in May 2014, carrying approximately 28 percent of all Metrolink riders. As illustrated in Figure 3-3 *SBL Weekday Boardings by Station (FY13, 4th Quarter)*, the station with the highest ridership is Rancho Cucamonga with nearly 1,200 daily boardings, followed by Covina with approximately 1,100 daily boardings. It should be noted that station boardings do not sum to total system ridership since ridership estimates do not reflect transfers and other factors. The Metrolink San Bernardino Station is also served by the Metrolink Inland Empire Orange County Line, and higher ridership at this station is most likely attributed to the greater level of service at that station.

Figure 3-3. San Bernardino Line Weekday Boardings by Station (FY13, 4th Quarter)



In addition to anticipated population and job growth, future ridership potential at these stations will be influenced by ongoing efforts by cities, Metro, and SANBAG which have plans to encourage higher density transit-oriented development around their Metrolink stations.

3.1.2 Corridor Safety

The study included a comprehensive review of right-of-way fencing in order to identify locations for potential corridor safety enhancements. In conjunction with Metrolink's Safety Department, the HDR team (Team) prioritized locations for new and/or replacement fencing by reviewing SCRRA's robust records log of past trespassing incidents. The trespassing incidents reported and monitored by Metrolink tend to be predominately graffiti based, however there are a number of incidents caused by pedestrians attempting to cross the tracks in areas of non-access. For a description of proposed corridor safety enhancements and exhibits summarizing hot spot areas (10 or more trespass incidents), see *Section 5.1.9. Corridor Safety Overview*.

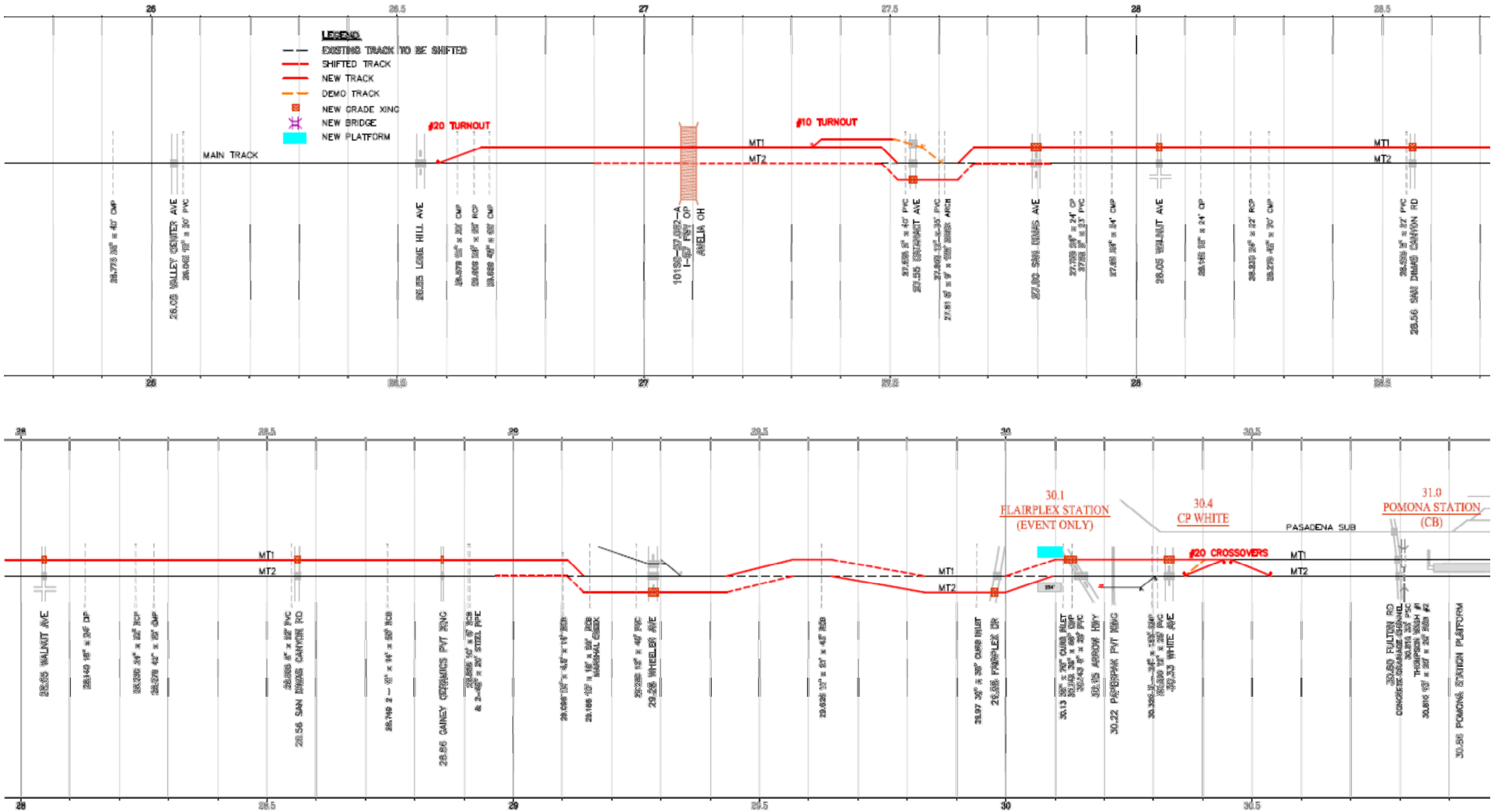
3.2 EXISTING CORRIDOR CONDITIONS

An overall map of the SBL depicting the existing alignment and proposed double track locations is provided in Appendix A1. Inventories of existing structures, at-grade crossings, stations, and corridor information for the entire SBL are provided in Appendix H. Two (2) existing single track segments of the SBL (Lone Hill Avenue to CP White and CP Lilac to CP Rancho) have been identified for potential double track improvements, while a third existing single track segment (CP Central to CP Archibald) was advanced through the conceptual design process, but is not ultimately recommended for double tracking as explained in *Chapter 2 Infrastructure Modeling and Validation* and *Chapter 5 Infrastructure Improvements and Safety Enhancements* of this report. Generally, the characteristics of these segments can be described as follows:

3.2.1 Section 1 - Lone Hill Avenue to CP White (MP 26.55 – MP 30.4)

Lone Hill Avenue to CP White (Section 1) is a mixed suburban and industrial area entirely within Los Angeles County and is a candidate for proposed double track improvements. The freight-only SCRRA Pasadena Subdivision approaches the SBL in a southeasterly bearing east of Walnut Avenue and parallels the line until joining the SBL east of the Pomona Station. A track schematic of this section is presented in Figure 3-4.

Figure 3-4. Lone Hill Avenue to CP White Track Schematic



Route Description

Originating just east of Lone Hill Avenue in the City of San Dimas, traveling east towards San Bernardino, the alignment crosses under the I-57 freeway and passes by the Hargrave Chemical Facility. This particular facility is located on Metro owned property which is leased to the Aeropres Corporation. The property includes 374' of UPRR operated spur track which creates a double track at-grade crossing at Cataract Avenue (see Appendix C1 for the proposed realignment of the UPRR siding). The alignment then crosses over a brick arch culvert via a single-track earthen-fill bridge and continues east through a mixed residential and industrial neighborhood. At South Walnut Avenue, the Pasadena Subdivision approaches the SBL from the northwest.

Figure 3-5. Brick Arch Culvert – Looking North

Photo courtesy Bing Maps

East of South San Dimas Canyon Road, the alignment turns to the southeast and crosses over the Puddingstone Channel before reaching a private at-grade crossing at Ganey Ceramics. Continuing east, the alignment crosses two local drainage structures at mile post (MP) 28.89 and MP 29.09, (see Appendix H for additional details) before passing over Marshall Creek and reaching Wheeler Avenue.

Figure 3-6. Local Drainage (MP 28.89) – Looking South

Photo courtesy Google Maps

Figure 3-7. Local Drainage (MP 29.10) – Looking West

Photo courtesy Google Maps

A UPRR industry track servicing Mohawk Western Plastics Inc. leads to a double track at-grade crossing at Wheeler Avenue (see Appendix D2 for the proposed grade crossing concept). The alignment continues southeast and crosses the Live Oak Wash before turning back to the northeast at Fairplex Drive.

Before reaching Arrow Highway, the alignment passes a side loading and unloading platform known as the Pomona Fairplex Station (see Figure 3-8) that is used annually on weekends throughout the duration of the Los Angeles County Fair (August 30th – September 29th in 2013). During the duration of the fair, all San Bernardino Line weekend trains stop at the Fairplex Station with the exception of the 351, 352, and 353 trains on Saturdays and the 351 train on Sundays. A free shuttle brings passengers to and from

the Fairplex gates. Following Arrow Highway, the alignment passes through the Paper Pak Industries private at-grade crossing and reaches CP White at North White Avenue.

Figure 3-8. Pomona Fairplex Loading and Unloading Platform – Looking South

Photo courtesy Google Maps

Right-of-Way

Corridor right-of-way widths from Lone Hill Avenue to CP White are shown in Table 3-1. The existing track right-of-way limits vary significantly and are depicted in Appendix A3 and in the track plans in Appendix C1.

Table 3-1. Right-of-Way Widths: MP 26.55 – MP 30.4

From	To	Width
Lone Hill Avenue (MP 26.55)	Cataract Avenue (MP 27.55)	Varies: 49.5'-183'
Cataract Avenue (MP 27.55)	San Dimas Canyon Road (MP 28.5)	Varies: 53'-249'
San Dimas Canyon Road (MP 28.56)	Wheeler Avenue (MP 29.28)	Varies: 53'-80'
Wheeler Avenue (MP 29.28)	White Avenue (MP 30.4)	Varies: 40'-184'

Track Characteristics

This section consists of a single mainline throughout its limits (MP 26.55 – MP 30.40) in the existing condition with three (3) prominent UPRR served industry tracks. Double track improvements are proposed for the entirety of this section (see *Chapter 5.1.10 Lone Hill Avenue to CP White Conceptual Design* for narrative and Appendix C for plans) with only the Hargrave Chemical Facility siding being affected by the project. In the proposed design, the existing layout is modified so that the Hargrave Chemical Facility is accessed from the east in lieu of the west across Cataract Avenue as currently configured. Accordingly, the modified layout also results in the existing turnout being relocated to the west for a variety of safety and regulatory reasons as outlined in *Chapter 5.1.10 Lone Hill Avenue to CP White Conceptual Design*.

See Table 1 and 2 in Appendix H for additional information regarding existing track geometry and inventories of existing rail and signal equipment in this section.

Figure 3-9. Hargrave Chemical Facility Siding – Looking North

Photo courtesy Google Maps

Railroad Signals and PTC

The Lone Hill Avenue to CP White section is composed of an existing single track bidirectional intermediate signal at Lone Hill Avenue (MP 26.55), an existing single track bidirectional intermediate signal at San Dimas Avenue (MP 27.80), an existing single track bidirectional intermediate signal at Wheeler Avenue (MP 29.28), and an end of double track control point named CP White railroad east of White Avenue (MP 30.40).

Each signal location is currently equipped with positive train control (PTC) antennas, PTC radios, wayside messaging servers and wayside interface units. CP White currently utilizes the San Gabriel fiber communications network for primary communications with the Metrolink Operations Center (MOC), with an advanced train control system (ATCS) radio as backup. Each highway at-grade railroad crossing within the section is currently equipped with active warning devices, train approach prediction equipment and event recorders.

Existing At-Grade Crossings

Lone Hill Avenue to CP White is characterized by 10 highway-rail grade crossings and two (2) private at-grade crossings (Ganey Ceramics and Paper Pak Industries) as summarized in the inventory of existing at-grade crossings in Table 4 of Appendix H. All existing at-grade crossings in this section are affected by the project and are discussed in *Chapter 5.1.10 Lone Hill Avenue to CP White Conceptual Design* and proposed grade crossing layouts are provided in Appendix D2.

Non-Roadway Crossings

In addition to the notable, aforementioned existing structure and drainage crossings, there are numerous minor structure and drainage crossings throughout this section of single track. Inventories of all known existing non-roadway crossings are summarized in Tables 3-2, 3-3, 3-4, and 3-5 and modifications to existing structures and drainage features are further discussed in the *Chapter 5 Infrastructure Improvements and Safety Enhancements*. Utility research will be required during the preliminary engineering phase to determine additional utility conflicts.

Table 3-2. Summary of Structure Crossings

Description	MP	Width
SR-57 Freeway Overpass	MP 27.08	150’
8’x 9’x 118’ Brick Arch Culvert	MP 27.61	120’
2 – 11’x 14’x 50’ Reinforced Concrete Box (RCB)	MP 28.75	50’
10’x 5’ RCB and 2-48”x 20’ Steel Pipes	MP 28.89	20’
10’x 4.5’x 14’ RCB	MP 29.10	14’
10’x 18’x 59’ RCB (Marshall Creek)	MP 29.17	59’
11’x 21’x 43’ RCB	MP 29.63	43’

Table 3-3. Summary of Crossing Culverts

Size	MP	Length
12” Corrugated Metal Pipe (CMP)	MP 26.58	22’
24” Reinforced Concrete Pipe (RCP)	MP 26.61	20’
48” CMP	MP 26.69	60’
8” Polyvinyl Chloride (PVC)	MP 27.54	40’
12” PVC	MP 27.60	35’
24” Clay Pipe (CP)	MP 27.80	24’
8” PVC	MP 27.89	23’
24” CMP	MP 27.95	24’
18” Cast Iron Pipe (CIP)	MP 28.14	24’
24” RCP	MP 28.23	22’
42” CMP	MP 28.28	70’
8” PVC	MP 28.56	22’
12” PVC	MP 29.28	40’
30”x 38” Curb Inlet	MP 29.97	Unknown
36”x 68” CMP	MP 30.14	Unknown
8” PVC	MP 30.14	25’
2 – 24” CMP	MP 30.32	165’
12” PVC	MP 30.33	25’

Existing Metrolink owned underground fiber optic facilities also cross the tracks at two locations in this segment as summarized in Table 3-4. Just east of the San Dimas Canyon Road at-grade crossing, an existing fiber optic line crosses under the tracks from south to north before crossing back under the tracks from north to south just east of the Gainey Ceramics private at-grade crossing.

Table 3-4. Summary of Existing Fiber Optic Crossings

Description	MP	Owner
Underground Crossing	MP 28.57	SCRRA – F24
Underground Crossing	MP 28.86	SCRRA – F24

Existing overhead utility lines cross over the tracks throughout the Lone Hill Avenue to CP White segment as summarized in Table 3-5. Ownership is currently unknown and will need to be verified during preliminary engineering.

Table 3-5. Summary of Existing Overhead Utility Crossings

Description	MP	Owner
Overhead Cable Crossing	MP 27.07	Unknown
Overhead Cable Crossing (Cataract Ave.)	MP 27.55	Unknown
Overhead Cable Crossing (San Dimas Ave.)	MP 27.80	Unknown
Overhead Cable Crossing (Walnut Ave.)	MP 28.05	Unknown
Overhead Cable Crossing	MP 28.68	Unknown
Overhead Cable Crossing (Gainey Ceramics)	MP 28.86	Unknown
Overhead Cable Crossing	MP 28.99	Unknown
Overhead Cable Crossing	MP 29.17	Unknown
Overhead Cable Crossing (Wheeler Ave.)	MP 29.28	Unknown
Overhead Cable Crossing	MP 29.87	Unknown
Overhead Cable Crossing (Fairplex Dr.)	MP 29.98	Unknown
Overhead Cable Crossing (Arrow Hwy.)	MP 30.15	Unknown
Overhead Cable Crossing (White Ave.)	MP 30.33	Unknown

Stations

This section of single track includes one (1) existing station at the Pomona Fairplex which is assessed for potential improvements to meet future operational expansion in *Chapter 5.1.8 Stations Overview*, while the track plans in Appendix C1 illustrate the proposed station layout.

Constraints

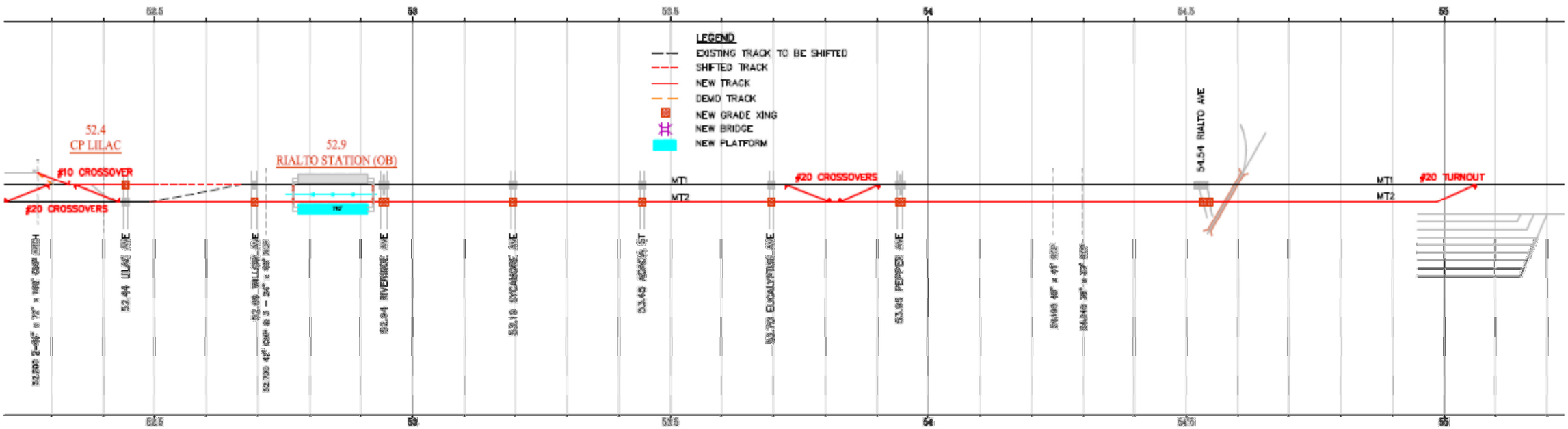
There are no major engineering challenges that would preclude this segment from receiving double track improvements. However, there are site constraints at the UPRR controlled Hargrave Chemical Facility siding and SR-57 freeway overpass. Refer to *Chapter 5.1.10 Lone Hill Avenue to CP White Conceptual Design* for information regarding mitigation of these constraints.

Environmental constraints for this section are discussed in *Chapter 4.0 Environmental Constraints*. In addition, planned capital improvement projects and proposed or recently completed projects that may affect the SBL are discussed in Chapter 3.3.

3.2.2 Section 2 – CP Lilac to CP Rancho (MP 52.4 – MP 55.3)

CP Lilac to CP Rancho (Section 2) is a mixed suburban and industrial area entirely within San Bernardino County in the Cities of Rialto and San Bernardino and is a candidate for proposed double track improvements. The UPRR Mojave Subdivision crosses over the SBL (Colton Cutoff Overpass) at MP 54.55. CP Rancho serves as a junction point for the BNSF which has significant operations in the area with a large loading facility to the west of Rancho Avenue. A track schematic of this section is presented in Figure 3-10.

Figure 3-10. CP Lilac to CP Rancho Track Schematic



Route Description

Traveling east from CP Lilac in the eastern edge of the City of Rialto, the alignment approaches the Rialto Station and crosses over a 42" CMP and three (3) 24" RCP culverts at the west end of the station platform. The line continues east through the four (4) lane crossing at South Riverside Avenue and approaches South Dale Avenue (MP 53.09) where the line is characterized by an open top concrete channel running parallel to the tracks on the north side of the railroad right-of-way to just west of West Rialto Avenue (MP 54.49).

Figure 3-11. Drainage Culverts at the Rialto Station – Looking North

The track alignment crosses into the City of San Bernardino at South Eucalyptus Avenue and enters into a large horizontal curve turning to the northeast at South Pepper Avenue. One (1) 48" RCP drainage culvert and one (1) 36" RCP drainage culvert crosses the alignment at MP 54.19 and MP 54.24 respectively and outfall storm water north into the open top concrete channel. The alignment then crosses West Rialto Avenue at a skewed angle.

Figure 3-12. Drainage Culverts MP 54.19 and 54.24 – Looking North

Photo courtesy Google Maps

Adjacent to the West Rialto Avenue crossing is the UPRR Colton Cutoff Overpass, which grade-separates the UPRR Mojave Subdivision. This UPRR route runs from Bakersfield in the north to the West Colton Yard in the south. Horizontal clearances from the existing piers of the cutoff bridge to the proposed track centerlines played a large role in determining the proposed track spacing for the second main line as outlined in *Chapter 5.1.11 CP Lilac to CP Rancho Conceptual Design*. The alignment continues to the northeast as it passes a BNSF loading facility and reaches a BNSF junction point at CP Rancho.

Figure 3-13. Rialto Ave. Crossing and UPRR Colton Cutoff Overpass – Looking East

Right-of-Way

Corridor right-of-way widths from CP Lilac to CP Rancho are shown in Table 3-6. The existing track right-of-way limits do not vary through this section of the alignment and are further depicted in the track plans included in Appendix C1.

Table 3-6. Right-of-Way Widths: MP 52.40 – MP 55.30

From	To	Width
CP Lilac (MP 52.4)	CP Rancho (MP 55.3)	100’

Track Characteristics

This section consists of a single mainline throughout its limits (MP 52.40 - MP 55.30) in the existing condition with no industry sidings. Double track improvements are proposed for the entirety of this section (see *Chapter 5.1.11 CP Lilac to CP Rancho Conceptual Design* for narrative and Appendix C1 for plans). In addition, refer to Tables 1 and 2 in Appendix H for additional information regarding existing track geometry and inventories of existing rail and signal equipment in this section.

Railroad Signals and PTC

The CP Lilac to CP Rancho section is composed of an existing end-of-siding control point named CP Lilac railroad west of Lilac Avenue (MP 52.40), an existing single track bidirectional intermediate signal railroad east of Pepper Avenue (MP 53.98), an existing single track hot box/dragging equipment detector railroad west of Rancho Avenue (MP 54.90) and an existing single crossover control point named CP Rancho railroad east of Rancho Avenue (MP 55.30).

Each signal location is currently equipped with PTC antennas, PTC radios, wayside messaging servers, wayside interface units and Ethernet radios. CP Lilac and CP Rancho currently utilize ATCS radios for primary communications with the MOC with no backup. Each highway at-grade railroad crossing within the section is currently equipped with active warning devices, train approach prediction equipment and event recorders.

Existing At-Grade Crossings

CP Lilac to CP Rancho is characterized by eight (8) highway-rail grade crossings as summarized in the inventory of existing at-grade crossings in Table 4 of Appendix H. All existing at-grade crossings in this section are affected by the project as detailed in *Chapter 5.1.11 CP Lilac to CP Rancho Conceptual Design* and proposed grade crossing layouts are provided in Appendix D2. The proposed track centers necessary to accommodate the UPRR Colton Cutoff Overpass creates a unique at-grade crossing at West Rialto Avenue as discussed in *Chapter 5.1.11 CP Lilac to CP Rancho Conceptual Design*.

Non-Roadway Crossings

All known existing structure and drainage crossings are summarized in Tables 3-7 and 3-8 and the locations of known overhead utility crossings are summarized in Table 3-9. Required modifications to existing structures and drainage features are further discussed in the *Chapter 5 Infrastructure Improvements and Safety Enhancements*. Utility research will be required during the preliminary engineering phase to determine additional utility conflicts.

Table 3-7. Summary of Structure Crossings

Description	MP	Width (Elevated)
UPRR Colton Cutoff Overpass	MP 54.57	325’

Table 3-8. Summary of Crossing Culverts

Size	MP	Length
42” CMP	MP 52.70	46’
3 - 24” RCP	MP 52.70	46’
48” CMP	MP 54.19	41’
36” RCP	MP 54.24	37’

Existing overhead utility lines cross over the tracks throughout the CP Lilac to CP Rancho segment as summarized in Table 3-9. Ownership is currently unknown and will need to be verified during the environmental clearance and preliminary engineering phase.

Table 3-9. Summary of Existing Overhead Utility Crossings

Description	MP	Owner
Overhead Cable Crossing (Lilac Ave.)	MP 52.44	Unknown
Overhead Cable Crossing (Willow Ave.)	MP 52.69	Unknown
Overhead Cable Crossing (Sycamore Ave.)	MP 53.19	Unknown
Overhead Cable Crossing (Eucalyptus Ave.)	MP 53.70	Unknown
Overhead Cable Crossing (Pepper Ave.)	MP 53.95	Unknown
Overhead Cable Crossing (Rialto Ave.)	MP 54.54	Unknown

Stations

This section of single track includes one (1) existing station at Rialto which is assessed for potential improvements to meet future operational expansion in *Chapter 5.1.11 CP Lilac to CP Rancho Conceptual Design* while Appendix F1 illustrates the proposed station layout.

Constraints

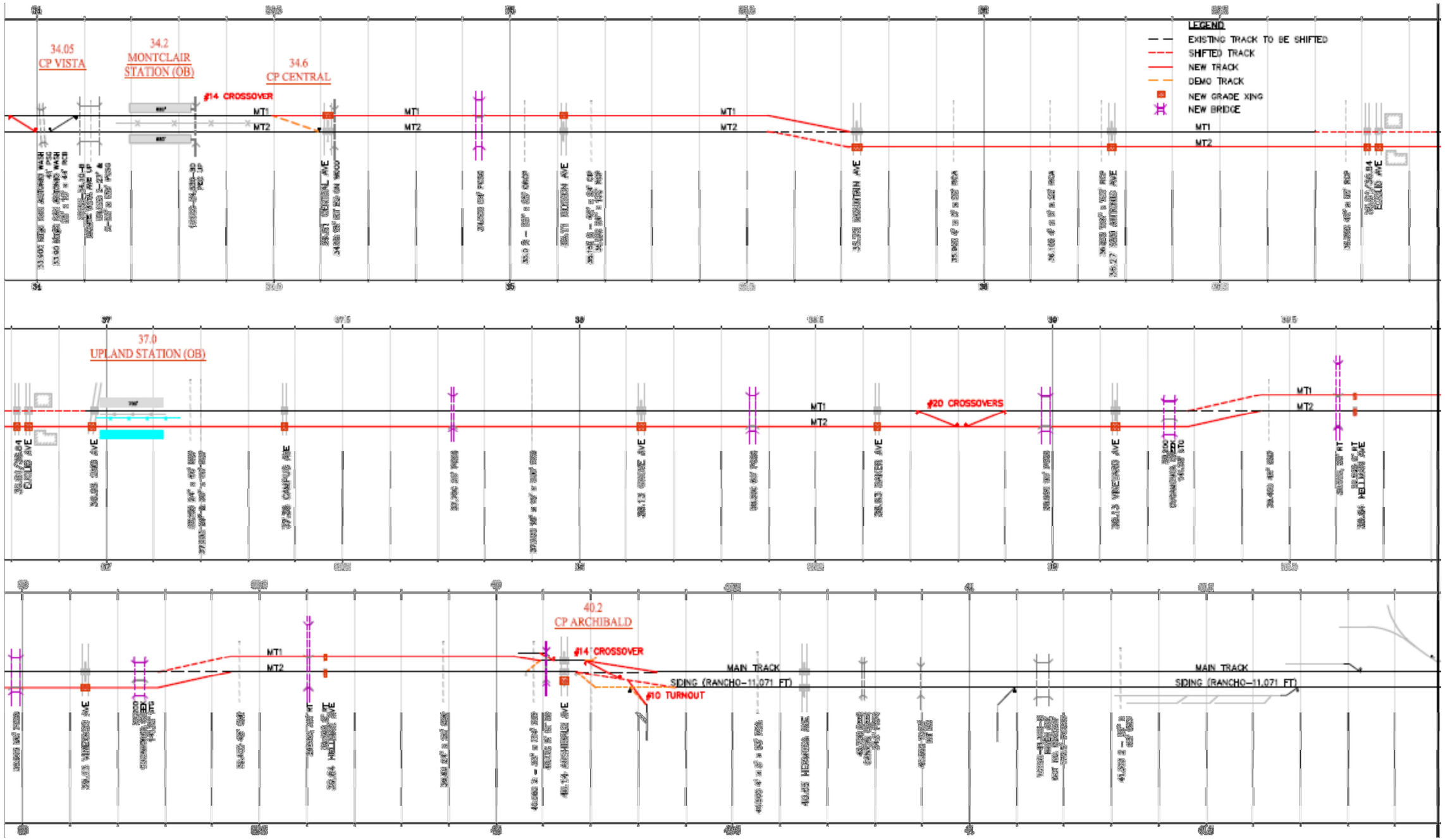
There are no major engineering challenges that would preclude this segment from receiving double track improvements. However, there are site constraints at the UPRR Colton Cutoff Overpass that necessitate non-standard track centers which creates a unique at-grade crossing at West Rialto Avenue. Refer to *Chapter 5.1.11 CP Lilac to CP Rancho Conceptual Design* for information regarding mitigation of the aforementioned existing overpass.

Environmental constraints for this section are discussed in *Chapter 4.0 Environmental Constraints*, while planned capital improvement projects and proposed or recently completed projects that may affect the SBL are discussed Chapter 3.3.

3.2.3 Section 3 – CP Central to CP Archibald (MP 34.6 – MP 40.2)

CP Central to CP Archibald (Section 3) is a mixed suburban and industrial area entirely within San Bernardino County. This section currently consists of a single mainline track and is a lower priority candidate (relative to CP Lilac - CP Rancho and Lone Hill Ave. - CP White) for proposed double track improvements as further summarized in *Chapter 2 Infrastructure Modeling and Validation* and *Chapter 5 Infrastructure Improvements and Safety Enhancements*. This segment of track is devoid of industry tracks with the exception of a siding track servicing both sides of Archibald Avenue. A large number of bridges and drainage culverts characterize this portion of the SBL. A track schematic of this section is presented in Figure 3-14.

Figure 3-14. CP Central to CP Archibald Track Schematic



Route Description

Shifting back to a single track at CP Central in the City of Montclair, the alignment crosses the first of many bridges and culverts just east of the Central Avenue at-grade crossing. At MP 34.90, the alignment traverses over a pre-stressed concrete slab girder (PCSG) bridge that passes over an existing local drainage outflow as depicted in Figure 3-15.

Figure 3-15. PCSG Bridge 34.90 – Looking North

At North Benson Avenue, the alignment enters the City of Upland, turns to the northeast, and traverses over a dual 36" reinforced concrete pipe (RCP) culvert before turning due east at North Mountain Avenue. Continuing east, the alignment crosses over a four (4) foot by three (3) foot concrete arch culvert and an underground 108" RCP drainage pipe prior to arriving at San Antonio Avenue. The alignment then passes over a 42" RCP, crosses SR-83 (North Euclid Avenue) at-grade, and reaches the Metrolink Upland Station east of 2nd Avenue. The alignment crosses over two more underground RCP's before turning southeast to the east of North Campus Avenue while a second PCSG bridge exists east of Campus Avenue at MP 37.70 as depicted in Figure 3-16.

Figure 3-16. PCSG Bridge 37.70 – Looking North

Photo courtesy Google Maps

At MP 37.90 the alignment crosses over a 16' x 10' reinforced concrete box (RCB) which outfalls storm water from the West Cucamonga Channel into the 7th and 8th Street Basins to the south of the tracks as depicted in Figure 3-17. The alignment returns to an eastward bearing at Grove Avenue and crosses into the City of Rancho Cucamonga. A third PCSG bridge exists east of Grove Avenue at MP 38.30 while a fourth bridge is traversed at MP 38.90 to the west of Vineyard Avenue.

Figure 3-17. West Cucamonga Channel Inlet – Looking North

Photo courtesy Google Maps

East of Vineyard Avenue, the alignment crosses over the Cucamonga Creek on a 142' steel plate girder bridge (Bridge 39.20), which crosses the creek at a skewed angle with the existing abutments built square to the tracks and the piers oriented parallel with the Creek as depicted in Figure 3-18. The bridge is on San Bernardino County Flood Control District (SBCFCD) owned property and any modifications to the bridge or additional structures spanning the creek would need to be permitted and approved by the SBCFCD and U.S. Army Corps of Engineers (USACE). Refer to *Chapter 4.4 Hydrology and Water Quality/Regulatory Permitting* for more information on potential permitting associated with the double tracking project.

Figure 3-18. Cucamonga Creek Bridge 39.20 – Looking North

Photo courtesy Google Maps

East of the Cucamonga Creek Bridge, the alignment spans a 48" corrugated metal pipe (CMP) (MP 39.46) and a three (3) culvert bridge (MP 39.55) before reaching Hellman Avenue. In May 2012, the Rancho Cucamonga City Council approved a $6.5 million contract for storm drain improvements on Hellman Avenue from the Cucamonga Creek channel to 8th Street. The improvement area includes the intersection of Hellman Avenue and 8th Street immediately south of the Metrolink tracks.

The improvement project included the removal of existing open top channels on either side of Hellman Avenue, asphalt repaving, re-profiling of the 8th Street and Hellman Avenue intersection, railroad signal improvements, and the installation of a 120" storm drain (SD) pipe jacked under the Metrolink tracks directly below the centerline of Hellman Avenue. Construction began in July 2012 and was completed in early 2013.

Figure 3-19. 120" Storm Drain Installation at Hellman Avenue

Photo courtesy City of Rancho Cucamonga

Funding shortfalls that initially prevented widening of the crossing, pedestrian improvements, advanced preemption timing (APT), and signalization of the Hellman Avenue and 8th Street intersection are set for design and construction (with the exception of pedestrian improvements) in 2014/2015 if funds are available.

East of Hellman Avenue, the track alignment crosses over a 24" CMP at MP 39.80 along with crossing over two (2) 33" RCP culverts at MP 40.08 just west of Archibald Avenue. The Archibald Avenue at-grade crossing is a two (2) track crossing with the Metrolink mainline to the south and an industry track serving Western Metal Decorating to the west of the crossing and what appears to be an unused track towards Owen Generator Rentals to the east as depicted in Figure 3-20. Immediately east of Archibald Avenue is the terminus of the single track section at CP Archibald where the existing 11,000' Rancho siding begins south of the Metrolink mainline.

Figure 3-20. Ex. Archibald Ave. At-Grade Crossing – Looking North

Photo courtesy Google Maps

Right-of-Way

Corridor right-of-way widths from CP Central to CP Archibald are shown in Table 3-10 and the existing track right-of-way limits vary and are depicted in the track plans in Appendix C.

Table 3-10. Right-of-Way Widths: MP 34.60 – MP 40.20

From	To	Width
CP Central (MP 34.6)	Hellman Avenue (MP 39.64)	100’
Hellman Avenue (MP 39.64)	North Industrial Lane (MP 39.97)	80’
North Industrial Lane (MP 39.97)	CP Archibald (40.2)	100’

In the southeast quadrant of the Euclid Avenue at-grade crossing, an existing Ace Hardware building is located only 22’ south of the existing main line that is located on leased property owned by SANBAG. The location of the building prevents the addition of a new main line track to the south of the existing track without a full or partial right-of-way take or shifting of the tracks. Future phases of analysis and/or design may need to evaluate the feasibility of terminating or modifying the current lease in order to accommodate construction of a future second track through this area.

Figure 3-21. Right-of-Way Encroachment at Euclid Ave – Looking East

Photo courtesy Google Maps

Track Characteristics

This section of the corridor consists of a single mainline track from MP 34.60 – MP 40.20 that includes an industry track servicing Western Metal Decorating just west of Archibald Avenue. This segment of the SBL is characterized by several large curves, bridges, and culvert crossings.

Double track improvements were originally considered for the entirety of this section (see *Chapter 5.1.12 CP Central to CP Archibald Conceptual Design* for narrative and Appendix C for plans) and will impact the Western Metal Decorating industry track. At Archibald Avenue, the Western Metal Decorating industry track leads to a double track at-grade crossing. The proposed double-track improvements will include a #10 turnout (to serve the industry track) to be placed on the proposed main line west of Archibald Avenue for a variety of safety and regulatory reasons as outlined in *Chapter 5.1.12 CP Central to CP Archibald Conceptual Design*.

Refer to Tables 1 and 2 in Appendix H for additional information pertaining to existing track geometry and inventories of existing rail and signal equipment in this section.

Railroad Signals and PTC

The CP Central to CP Archibald section is composed of an existing single crossover control point named CP Vista railroad west of the Monte Vista underpass (MP 34.00), an existing end-of-double track control point named CP Central railroad west of Central Avenue (MP 34.58), an existing single track bidirectional intermediate signal at Euclid Avenue (MP 36.80), an existing single track bidirectional intermediate signal at Baker Avenue (MP 38.60) and an existing end of double track control point named CP Archibald railroad east of Archibald Avenue (MP 40.20).

Each signal location is currently equipped with PTC antennas, PTC radios, wayside messaging servers, wayside interface units and Ethernet radios. CP Vista, CP Central and CP Archibald currently utilize ATCS radios for primary communications with the MOC with no backup. Each highway at-grade railroad crossing within the section is currently equipped with active warning devices, train approach prediction equipment and event recorders.

Existing At-Grade Crossings

CP Central to CP Archibald is characterized by 12 highway-rail grade crossings and Table 4 of Appendix H provides an inventory of the existing at-grade crossings. All existing at-grade crossings in this section are affected by the project.

Non-Roadway Crossings

In addition to the aforementioned existing structure and drainage crossings, there are additional structure and drainage crossings throughout this section. Inventories of all existing non-roadway crossings are summarized in Tables 3-11, 3-12, and 3-13. Modifications to existing structures and drainage features are further discussed in *Chapter 5 Infrastructure Improvements and Safety Enhancements*. Utility research will be required during the preliminary engineering phase to determine additional utility conflicts.

Table 3-11. Summary of Structure Crossings

Description	MP	Width
Unknown Bridge Type	MP 34.60	18’
Pre-Stressed Concrete Slab Girder (PCSG)	MP 34.90	64’
4’ x 3’ x 22’ Reinforced Concrete Arch (RCA)	MP 35.90	22’
4’ x 3’ x 22’ RCA	MP 36.10	22’
16’ x 10’ x 300’ RCB	MP 37.90	300’
PCSG	MP 37.70	28’
PCSG	MP 38.30	60’
PCSG	MP 38.90	90’
Steel Plate Girder (Cucamonga Creek)	MP 39.20	141.78’
3 - Culvert Bridge (Unknown Diameter)	MP 39.55	30’
Unknown Bridge Type	MP 40.12	8’

Table 3-12. Summary of Crossing Culverts

Size	MP	Length
2 - 36" RCP	MP 35.00	25'
2 - 48" CIP	MP 35.15	24'
24" RCP	MP 35.15	150'
108" RCP	MP 36.22	100'
42" RCP	MP 36.76	96'
24" RCP	MP 37.15	60'
24" RCP	MP 37.20	60'
30" RCP	MP 37.20	60'
48" CMP	MP39.40	Unknown
24" CMP	MP 39.80	20'
2 – 33" RCP	MP 40.08	114'

Existing overhead utility lines cross over the tracks throughout the CP Central to CP Archibald segment as summarized in Table 3-13. Ownership is currently unknown and will need to be verified during future design phases in the event the potential double track project is advanced.

Table 3-13. Summary of Existing Fiber Optic Crossings

Description	MP	Owner
Overhead Cable Crossing (Central Ave.)	MP 34.61	Unknown
Overhead Cable Crossing (Benson Ave.)	MP 35.11	Unknown
Overhead Cable Crossing (San Antonio Ave.)	MP 36.27	Unknown
Overhead Cable Crossing (Campus Ave.)	MP 37.38	Unknown
Overhead Cable Crossing (Grove Ave.)	MP 38.13	Unknown
Overhead Cable Crossing (Baker Ave.)	MP 38.63	Unknown
Overhead Cable Crossing (Vineyard Ave.)	MP 39.13	Unknown
Overhead Cable Crossing (Hellman Ave.)	MP 39.64	Unknown
Overhead Cable Crossing (Archibald Ave.)	MP 40.14	Unknown

Stations

This section includes one (1) existing station at Upland and *Chapter 5.1.12 CP Central to CP Archibald Conceptual Design* provides a summary of potential improvements to meet future operational expansion while Appendix F1 includes a conceptual station layout.

Constraints

There are no major engineering challenges that would preclude this segment from receiving double track improvements. However, there are engineering challenges associated with the Ace Hardware building right-of-way encroachment at Euclid Avenue, the siding track at Archibald Avenue, and potential permitting obstacles associated with modifications or additions to the Cucamonga Creek Bridge. Refer to *Chapter 5.1.12 CP Central to CP Archibald Conceptual Design* for additional information regarding mitigation of these obstacles.

Environmental constraints for this section are discussed in *Chapter 4.0 Environmental Constraints* and planned capital improvement projects and proposed or recently completed projects that may affect the SBL are discussed Chapter 3.3.

3.3 OUTREACH AND PLANNED CAPITAL PROJECTS

The team gathered initial information on the rail corridor through an introductory site visit, direct coordination with cities adjacent to the SBL, a project kickoff meeting with stakeholders (Metro, SANBAG & SCRRA), data provided by stakeholders, and additional input from stakeholders at monthly project development team (PDT) meetings. The PDT meetings permitted the team to gather information on existing conditions, assumptions on future improvements and funding, benefits of proposed improvements, and prioritization of goals from the stakeholders' perspectives.

Outreach to stakeholders and cities along the corridor enabled the team to compile a matrix and corresponding exhibit of proposed capital improvement projects that could directly affect the proposed double track segments (see Appendix A2). Along with these capital improvement projects, several proposed or recently completed projects also impact the SBL.

3.3.1 Planned Capital Improvement Projects

Early in the project, the team initiated outreach efforts consisting of meetings and phone calls with the stakeholders and cities along the corridor to determine if any capital improvement projects were being planned along the line. From these phone calls and meetings, the team developed a comprehensive matrix of planned capital improvement projects and corresponding city and agency contacts. The projects consist of new retail and residential construction, utility improvements, station improvements, station parking lot expansions, and grade crossing improvements.

The SBL Planned Capital Improvement Projects map included in Appendix A2 utilizes information obtained from the aforementioned matrix to graphically depict locations of projects that may directly affect the SBL. Six (6) projects have been identified as having a direct impact on the SBL with only one (1) impacting the proposed double track locations.

<u>Metrolink Rialto Station Parking Lot Expansion:</u>

At the existing Metrolink Rialto Station, a proposed parking lot expansion is currently in the design phase with design and right-of-way acquisition anticipated to be completed by mid 2014. Refer to Appendix F1 for the limits of the planned station parking lot expansion at the Metrolink Rialto Station.

3.3.2 California High Speed Rail

The California High Speed Rail Authority (CHSRA) has developed a Preliminary Alternatives Analysis (PAA) consisting of 290 miles of potential alignments from Los Angeles to San Diego through the Inland Empire (Phase II of the CHSR system). Eighteen (18) areas have been identified for alignment refinements based on comments included in the March 2011 *Preliminary Alternatives Analysis (PAA) Report Los Angeles to San Diego via the Inland Empire Section* document and Areas 11 and 12 interface with the San Bernardino Line.

Area 12 encompasses a section from LAUS to I-605 where the SBL traverses down the median of the I-10 corridor. The anticipated design and planning timeline for the proposed CHSRA system from Los Angeles to San Diego will lag far behind the anticipated design schedules for the recommended SBL double track projects recommended in this report. The CHSRA recently hired consultants to advance the PAA and refine the alternatives in support of a Revised Supplemental Alternatives Analysis (RSAA).

The RSAA will be finalized in approximately (2) years and the CHSRA is at least four (4) years away from issuing an Environmental Impact Statement (EIS) for the proposed Los Angeles to San Diego

segment. The CHSRA indicated that a construction completion date for the Los Angeles to San Diego segment is estimated to be post-2029 and that there may be opportunities for a phased approach.

Impacts on the SBL

Multiple alternatives for the high speed rail infrastructure are under consideration in the I-10 corridor including aerial structures, tunnel and/or trench options, and freeway widening of I-10. These alternatives are potentially cost-prohibitive and present significant technical obstacles that will require further analysis to determine feasibility.

- ***I-10 Aerial Structure*** – This alternative consists of an aerial structure supporting CHSR tracks in the median of the I-10 corridor from LAUS to west of I-605 that appears to lack support from adjacent jurisdictions due to the potential right-of-way impacts. Furthermore, this alternative would require displacement of existing Metrolink tracks between LAUS and MP 11.5. The I-10 Freeway has sharp horizontal curves through the Alhambra curve that would reduce the maximum operating speed and/or require significant realignment of the CHSR tracks through El Monte. A potential realignment would require additional right-of-way making this option unattractive from a technical and capital cost perspective.
- ***I-10 Underground Option*** – The CHSRA is currently considering an underground alternative that would be aligned with Garvey Road which is an arterial street south of and parallel to I-10. Traversing under Garvey Road would yield a straight alignment and would avoid having to realign the existing Metrolink SBL tracks. However, this option has not yet been discussed with any of the local cities and further analysis is required to determine its feasibility. The bridge foundations of several freeway overpasses would be in conflict and official CHSR policy promotes underground tunneling only in mountainous regions where it is unavoidable.

Metro and SANBAG will continue to meet with the CHSRA to review proposed corridor improvements to minimize the potential for future conflicts with CHSR. See *Chapter 5.1.1 Course Level Screening of Alternatives* for more information on the I-10 corridor.

3.3.3 Downtown San Bernardino Passenger Rail Project

SANBAG is currently advancing construction of the Downtown San Bernardino Passenger Rail Project (DSBPRP) which extends the SBL one mile from the existing Metrolink San Bernardino Station to a new transit center in downtown San Bernardino.

The DSBPRP includes a new Transit Center (SBTC) in downtown San Bernardino that will include a centralized bus facility for existing fixed-route and recently constructed bus rapid transit service. The SBTC will facilitate multimodal connections for Metrolink, Omnitrans San Bernardino Express bus rapid-transit system (sbX), future Redlands Passenger Rail Transit and a potential future CHSR connection. The primary features of the DSBPRP include construction of a second track, SBTC, grade crossing improvements, railroad signalization, roadway closures and improvements to the Metrolink San Bernardino Station consisting of new platforms, parking lots and a pedestrian overpass.

SANBAG also recently completed construction of the Eastern Maintenance Facility Phase 3 Expansion Project (EMF Project) to expand capacity of the commuter rail layover and equipment maintenance facility located on an approximately 24-acre site in the City of Colton. The recently completed project includes a new tail track between Citrus and Laurel streets and lengthened storage tracks to accommodate a total of 13 commuter rail train sets.

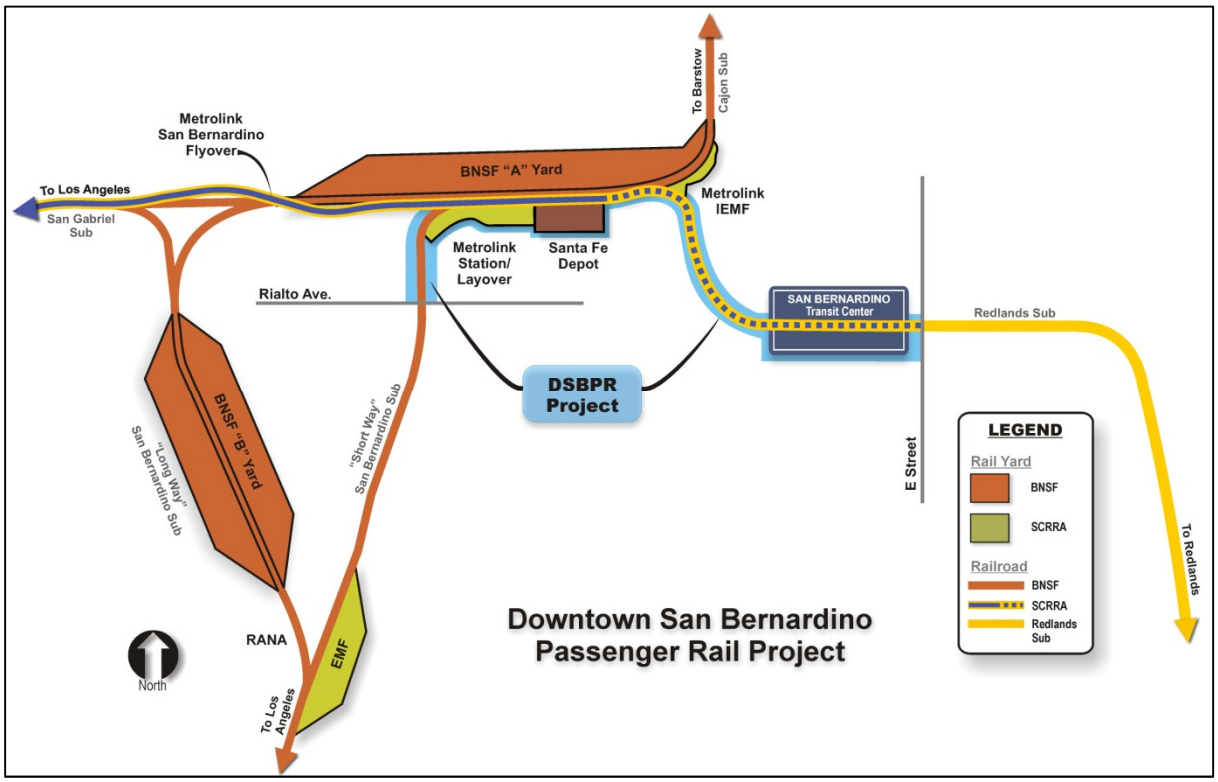
The recently completed project will increase the amount of trackage within the facility to accommodate future enhancements of Metrolink train service.

Impacts on the SBL

The DSBPRP does not physically impact the potential double track projects recommended in this report since it's located east of the line's current eastern terminus. The DSBPRP is anticipated to improve service on the SBL by connecting the Metrolink commuter rail system directly into downtown San Bernardino, which is a major employment and commercial hub in the Inland Empire. Connecting into downtown San Bernardino is expected to encourage transit oriented development around the new SBTC and improve multimodal connections to the local bus and sbX bus rapid transit system via the new transit center.

The project's primary goal is to simultaneously improve regional mobility, ridership, and air quality by extending Metrolink service to downtown San Bernardino which will ultimately reduce automobile trips. In addition to extending the SBL one (1) mile, the implementation of the project will benefit the entire Metrolink system by accommodating fleet projections in the Inland Empire and will support increased transportation demand over the next three decades. Construction of the entire project is currently scheduled for completion in late 2015. See Figure 3-22 for an overview of DSBPRP.

Figure 3-22. DSBPRP Overview



Courtesy HDR

3.3.4 Redlands Passenger Rail Project

SANBAG is also leading the Redlands Passenger Rail Project (RPRP) to address the transportation needs of the County between San Bernardino and Redlands. The project's preliminary engineering phase was recently completed and the project is anticipated to advance into the final design phase in early 2015.

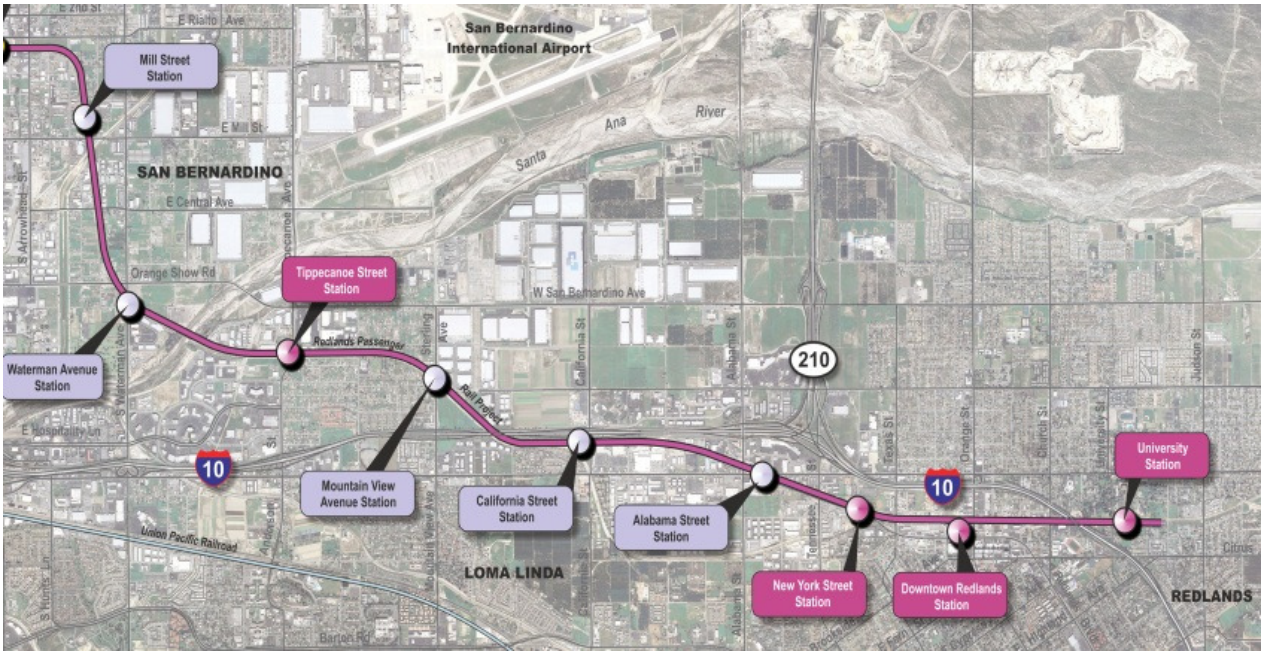
The Project is located within the eastern portion of the San Bernardino Valley, within the southwestern corner of San Bernardino County as depicted in Figure 3-23. The RPRP will traverse nine miles within SANBAG owned railroad right-of-way extending from the proposed SBTC in the City of San Bernardino on the west to the University of Redlands in the City of Redlands on the east.

Passenger rail service would be facilitated via five station stops at the SBTC, Tippecanoe Avenue (or Waterman Avenue), New York Street, Orange Street (Downtown Redlands), and University Street (University of Redlands) as depicted in Figure 3-23. The project includes replacement of the existing rail line, reconstruction of existing bridge structures, construction of new station platforms, a new train layover facility, and auxiliary improvements such as parking lots, drainage infrastructure, grade crossing safety enhancements, and pedestrian access improvements.

Impacts on the SBL

The RPRP does not interface with the potential double track projects recommended in this report since the RPRP is located east of the SBL's current eastern terminus. As previously mentioned, the new SBTC will serve as the western terminus of the RPRP where it is anticipated that riders will transfer from the RPRP system to the Metrolink SBL. The RPRP will serve a nine mile long corridor between downtown San Bernardino and Redlands and will provide riders in San Bernardino and Redlands with convenient access to Los Angeles via Metrolink and vice versa.

Figure 3-23. Proposed RPRP Route



Courtesy HDR

3.3.5 Metro Gold Line Foothill Extension – Azusa to Montclair

The 11.5 mile Metro Gold Line Foothill Extension from Pasadena to Azusa (Phase I) broke ground on June 26, 2010 and is anticipated to be completed in late 2015, when it will be turned over to Metro for testing and pre-revenue service. An initial contract was awarded in June 2010 to design and build the Gold Line Bridge over the I-210. In July 2011, a second contract was awarded to design and build the Pasadena to Azusa alignment and a final contract was awarded in February 2013 to complete the intermodal parking facilities.

The Foothill Extension's second phase will extend the Gold Line by 12.3 miles from Azusa to Montclair and will add six (6) stations in the cities of Glendora, San Dimas, La Verne, Pomona, Claremont, and Montclair (see Figure 3-24). As with the Pasadena to Azusa extension project, the extension from Azusa to Montclair is planned to be built along the former Atchison, Topeka and Santa Fe (ATSF) right-of-way (Pasadena Subdivision), which was purchased by Metro in the early 1990s. Once completed, a trip from

Montclair to downtown Pasadena will take just over 40 minutes, while a trip from Montclair to Los Angeles will take approximately 75 minutes.

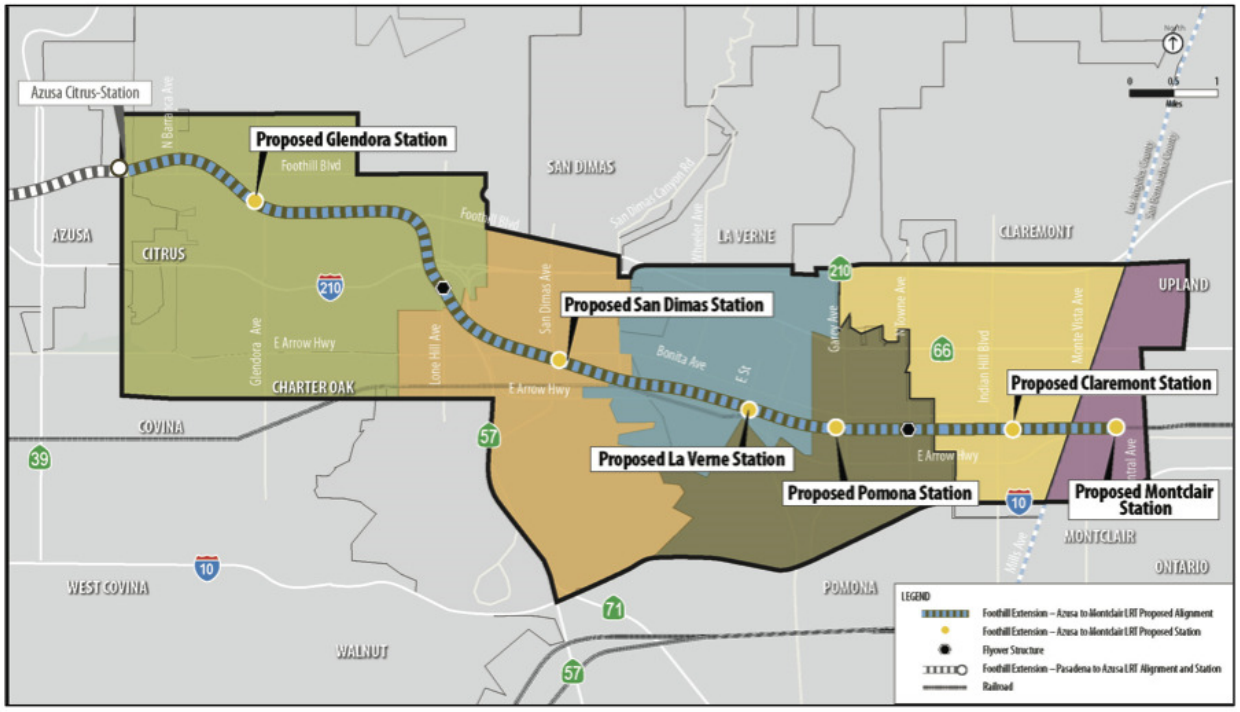
Planning for the Azusa to Montclair Extension began in 2003, and significant work has been completed for the segment. In late 2010, the project's environmental review and preliminary engineering were initiated. The project's final EIR was certified by the Metro Gold Line Foothill Extension Construction Authority Board of Directors in March 2013, and a locally preferred alternative was selected.

Completion of the Azusa to Montclair segment of the Foothill Extension will cost approximately $950 million and no funding has been secured for this segment of the extension. Once funding is secured, final design and construction will take approximately four years to complete.

Impacts on the SBL

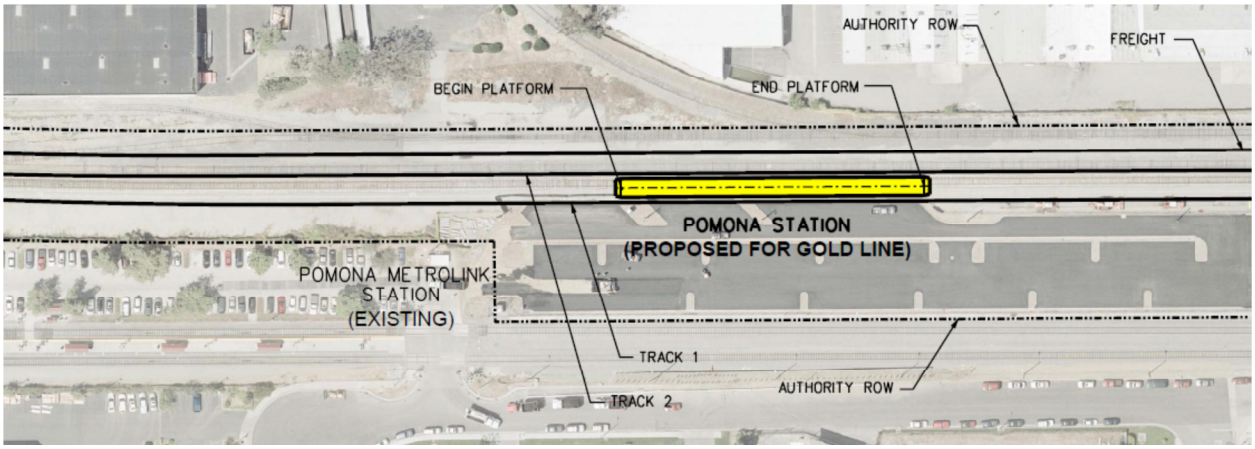
The Gold Line will follow the Pasadena Subdivision freight track on the north end of the right of way until approaching the SBL at the Pomona North station, and will continue to run parallel to the SBL until the Montclair station. The Gold Line extension will not interface with the potential double track projects referenced in this report (Lone Hill Ave. to CP White and CP Central to CP Archibald). The proposed Gold Line extension will coexist with Metrolink facilities since the existing corridor is already double tracked from where the Gold Line comes in at Pomona North through to the Montclair Station. The proposed Gold Line Pomona station is to be situated to the north east of the existing Metrolink Pomona North Station as depicted in Figure 3-25, will operate separately from the Metrolink station, and not impact the existing Metrolink platform or any of its at-grade pedestrian crossings. Current Gold Line Phase II Pomona Station plans (Figure3-25) depict the acquisition and usage of the current Metrolink Pomona North eastern parking lot for Gold Line patrons. The project could lead to additional future ridership by providing Gold Line users with a direct rail link to the SBL that previously did not exist.

Figure 3-24. Proposed Gold Line Foothill Extension Route



Courtesy Metro Gold Line Foothill Extension Construction Authority

Figure 3-25. Proposed Pomona Gold Line Station



Courtesy Metro Gold Line Foothill Extension Construction Authority

4.0 ENVIRONMENTAL CONSTRAINTS

This section summarizes the potential environmental constraints found on or adjacent to the two recommended San Bernardino Line (SBL) double track projects (Lone Hill Ave. - CP White and CP Lilac - CP Rancho) along with the CP Central - CP Archibald Double Track Project recommended as a second tier priority. The chapter provides context for the relative ease of future environmental clearance and permitting for these recommended double track projects. The analysis is based on a review of public information and mapping resources.

The assessment considered the potential for environmental impacts and factored this into the recommended improvements and the determination of the time frame a given improvement would best be implemented.

The following environmental resource categories have been considered in the research:

- Biological Resources
- Cultural Resources
- Hazards and Hazardous Materials
- Hydrology and Water Quality/Regulatory Permitting
- Noise and Vibration
- Schools, Parks, and Recreation

The analysis shown in Table 4-1 represents the identified environmental constraints discussed by type along the corridor by milepost (MP). Proposed improvements will be subject to the jurisdiction and regulations of a number of federal resource agencies, acts, and processes regardless of whether the proposed improvements are within or outside of the existing rail right-of-way.

This is a preliminary assessment of the environmental constraints that will need to be considered during implementation of the recommended double track projects. It is intended to assist with identifying which portions of the existing corridor can be improved with relatively limited environmental clearance documentation. The assessment is based on a review of:

- Public web-based information including school district, municipal and other public websites.
- Public mapping resources including Google Earth Professional, FEMA floodplain maps, National Register of Historic Places, GeoTracker, and Geographic Information System (GIS).
- Previous Metrolink Project Definition and Concept Design Reports for Central to Archibald and Lilac to Rancho.

However, this assessment does not identify or describe all known or anticipated environmental issues that could affect attaining environmental clearance for the proposed improvements or obtaining permits, and should not be considered a “scoping” document. No public outreach or field visits were conducted for this preliminary assessment and the recommendations are based on the understanding of the constraints in the corridor, federal agency regulatory processes, and applicable state and federal laws.

Table 4-1. Summary of Potential Environmental Constraints by Category

From Mile Post	To Mile Post	Biology[1]	Cultural	Hazards	Hydrology & Regulatory	Noise and Vibration	Schools, Parks and Recreation
Lone Hill Avenue to CP White (MP 26.55 to MP 30.32)							
26.55	27.08	X		X	X	X	X
27.05	27.08	X		X	X		X
27.08	27.40	X		X	X		
27.40	27.75	X		X	X		X
27.65	27.65	X		X	X	X	X
27.75	27.80	X		X	X	X	
27.80	27.80	X	X	X	X	X	
27.80	28.80	X		X	X	X	
28.80	29.08	X		X	X	X	X
29.08	29.10	X		X	X	X	
29.10	29.20	X			X	X	
29.20	29.30	X			X	X	X
29.30	29.40	X			X	X	
29.40	29.50	X			X	X	X
29.50	29.55	X			X	X	
29.55	29.63	X			X	X	X
29.63	29.83				X	X	X
29.83	29.85			X	X	X	X
29.85	30.15			X		X	X
30.15	30.32			X		X	
CP Central to CP Archibald (MP 34.60 to MP 40.20)							
34.60	34.60			X			
34.60	34.60	X		X	X		
34.60	34.80			X			
34.80	34.85			X		X	
34.85	34.93			X			
34.93	34.95			X	X		
34.95	35.10			X			
35.10	35.70			X		X	
35.70	35.80			X			
35.80	35.95			X		X	
35.95	36.00	X		X		X	
36.00	36.75	X				X	
36.75	36.80	X		X		X	
36.80	36.80	X	X	X			
36.80	36.90	X		X			
36.90	37.00	X					
37.00	37.10	X		X			

From Mile Post	To Mile Post	Biology[1]	Cultural	Hazards	Hydrology & Regulatory	Noise and Vibration	Schools, Parks and Recreation
37.10	37.24	X				X	X
37.24	37.38	X					
37.38	37.40	X				X	X
37.40	37.41	X		X	X	X	X
37.41	37.45	X				X	X
37.45	37.52	X				X	X
37.52	37.65	X				X	
37.65	37.70	X		X		X	
37.70	37.72	X				X	
37.72	37.85	X			X	X	
37.85	37.92	X			X		
37.92	37.95	X			X	X	
37.95	38.00					X	
38.00	38.13			X		X	
38.13	38.13	X		X	X	X	
38.13	38.20			X		X	
38.20	38.30					X	
38.30	38.36	X				X	
38.36	38.38	X			X	X	
38.38	38.97	X				X	
38.97	38.99	X			X	X	
38.99	39.13	X				X	
39.13	39.13	X			X	X	
39.13	39.20	X				X	
39.20	39.25	X			X	X	
39.25	39.35	X				X	
39.35	39.40	X					
39.40	39.60	X		X			
39.60	39.65	X		X	X		
39.65	39.77	X		X		X	
39.77	39.80	X		X			
39.80	39.89	X					
39.89	40.15	X				X	
40.15	40.20	X				X	X
40.20	40.20	X			X	X	X
CP Lilac to CP Rancho (MP 52.40 to MP 55.30)							
52.40	52.45	X		X			
52.45	52.65	X		X		X	X
52.65	52.70	X		X		X	
52.70	52.81	X		X	X		

From Mile Post	To Mile Post	Biology[1]	Cultural	Hazards	Hydrology & Regulatory	Noise and Vibration	Schools, Parks and Recreation
52.81	52.86	X		X	X	X	
52.86	52.95	X		X	X		
52.95	52.95	X	X	X	X		
52.95	53.10	X		X	X	X	
53.10	53.20	X		X	X	X	
53.20	53.65	X			X	X	
53.65	54.00	X		X	X	X	
54.00	54.08	X			X	X	
54.08	54.20	X			X	X	X
54.20	54.58	X			X	X	
54.58	55.03	X			X	X	
55.03	55.30	X			X		
55.30	55.30	X			X		

Notes:
[1]For purposes of this strategic plan, potential jurisdictional areas/regulatory permitting is evaluated and discussed within Section 4.4 Hydrology and Water Quality.

4.1 BIOLOGICAL RESOURCES

Biological resources were analyzed using a combination of both the California Natural Diversity Database and the National Wetland Inventory database.

Lone Hill Avenue to CP White

- From MP 26.55 to 29.63, areas immediately adjacent to the rail corridor to over one (1) mile south of the rail corridor are classified as freshwater forested/shrub wetland, freshwater emergent wetland, freshwater pond, riverine, and lake. In addition, riverines cross beneath the rail corridor at MP 27.65, 28.78, and 29.19.
- Approximately 0.35 miles to one (1) mile south of the rail corridor, the coastal California Gnatcatcher has been identified in multiple areas spanning from MP 27.20 to 29.10.

CP Central to CP Archibald

- Approximately 1.25 miles directly north of MP 34.60, there is a freshwater forested/shrub wetland and a freshwater pond located at the Cable Airport.
- The endangered plant species, Slender-Horned Spineflower, has been identified in the general area from approximately MP 35.95 to 37.75.
- Approximately 0.06 miles south of the rail corridor from MP 37.72 to 37.95 is a freshwater pond and the Riverine Freshwater Emergent Wetland.
- Approximately 1.75 miles north of MP 38.13 is a freshwater emergent wetland.
- From approximately MP 38.3 to 40.2, the Delhi Sands Flower-Loving Fly, an endangered species, has been identified in the general area.
- Approximately 1.5 miles north of MP 39.13 is a freshwater pond.
- Approximately one (1) mile immediately to the south of MP 40.2 is a freshwater pond.

CP Lilac to CP Rancho

- From MP 52.40 to 55.30, biological resources potentially located along the entire length of the rail corridor include species such as the Delhi Sands Flower-Loving Fly, Salt Marsh Bird's-Beak, Marsh Sandwort, Slender-Horned Spineflower, and the San Bernardino Kangaroo Rat.
- Approximately 1.32 miles north of MP 54.50 is an area identified being occupied by Santa Ana River Woolly Star.
- Approximately 0.20 miles north of MP 55.3 in the vicinity of the Lytle Creek Channel, is an area identified as being occupied by an endangered species, the San Bernardino Kangaroo Rat.

Since the locations of the biological resources are in the vicinity of the rail right-of-way, impacts to these resources would likely be significant. Therefore, it is recommended that a biological report be completed as part of the subsequent environmental analysis to minimize the impacts to the endangered species.

4.2 CULTURAL RESOURCES

Cultural resources were analyzed using the National Register of Historic Places (NRHP) database. According to the database, the following historic resources were identified and listed below:

Lone Hill Avenue to CP White

- The Walker House/The San Dimas Hotel, located at MP 27.80 approximately 0.43 miles north of the rail corridor, was built in 1887 as a hotel, converted into a residence in 1889, and turned into a restaurant in 1979. The building became vacant in 1997 and was later acquired and renovated by the City of San Dimas.

CP Central to CP Archibald

- At MP 36.81, the Upland Public Library, located at 450 N. Euclid Avenue approximately 0.31 miles north of the rail corridor, formally opened to the public on July 26, 1913 as Upland's first civic building.

CP Lilac to CP Rancho

- At MP 52.95, the First Christian Church of Rialto, located at 201 N. Riverside Avenue approximately 0.39 miles north of the rail corridor, is a historic church that was built in 1906 and purchased by the City of Rialto in 1964 to avoid its demolition.

Since the locations of the historic sites are not located within the rail right-of-way and are not adjacent to the rail corridor, impacts to these historic sites would not be significant. However, as paleontological and archaeological resources were not analyzed as part of the project, there is the potential for impacts to these resources. Therefore, it is recommended that a cultural report be completed as part of the subsequent environmental analysis.

4.3 HAZARDS AND HAZARDOUS MATERIALS

Hazards and hazardous materials were analyzed using GeoTracker.

Lone Hill Avenue to CP White

Approximately 18 closed sites, 16 permitted underground storage tank (UST) facilities, four (4) Leaking Underground Storage Tank (LUST) Cleanup sites, three (3) "other hazardous materials" cleanup sites, and one (1) Department of Toxic Substances Control (DTSC) cleanup site are located within this existing single track segment.

CP Central to CP Archibald

Approximately 15 closed sites, seven (7) permitted UST facilities, and three (3) DTSC cleanup sites are located within the limits of this existing single track segment which not recommended for double tracking as part of this study.

CP Lilac to CP Rancho

Approximately four (4) closed sites, seven (7) UST facilities, and three (3) DTSC cleanup sites are located within this proposed double tracking project.

As these sites are located in close proximity to the rail corridor, there is the potential for a significant impact to occur during the course of the project. As a result, it is recommended that a Phase I Environmental Site Assessment be completed as part of the subsequent environmental analysis for both the Lone Hill Ave. – CP White and CP Lilac – CP Rancho recommended double track projects.

4.4 HYDROLOGY AND WATER QUALITY/REGULATORY PERMITTING

Potential hydrology and water quality impacts were analyzed using the FEMA floodplain maps and Google Earth Professional. The following potential hydrology and water quality impacts were identified and listed below:

Lone Hill Avenue to CP White

- From MP 26.55 to 27.95, the FEMA floodplain maps identify an area approximately 0.70 to 1.11 miles north of the rail corridor as an area that has a high risk of flooding.
- From MP 26.55 to 29.63, areas immediately adjacent to the rail corridor to over one mile south of the rail corridor are classified as freshwater forested/shrub wetland, freshwater emergent wetland, freshwater pond, riverine, and/or lake.
- From MP 26.55 to 29.85, the FEMA floodplain maps identify an area approximately 0.09 to 0.95 miles south of the rail corridor as an area of moderate and low risk of flooding, with a small area that extends across the rail corridor at MP 27.65.
- The Puddingstone Reservoir is located approximately 0.64 mile south of the rail corridor between MP 27.45 and 28.51.
- Storm water runoff is conveyed at a bridge spanning from MP 27.61 to 27.65.
- A concrete-lined channel crosses beneath the rail corridor at MP 28.78.
- A concrete-lined channel crosses beneath the rail corridor at MP 29.19.
- The Live Oak Wash crosses the rail corridor at approximately MP 29.64.

CP Central to CP Archibald

- Approximately 1.25 miles directly north of MP 34.6, there is a freshwater forested/shrub wetland and a freshwater pond located at the Cable Airport.
- There is a bridge spanning from MP 34.93 to 34.95 where storm water is conveyed. The proposed project would likely involve the construction of a second bridge to the north of the existing track, which would involve work within the channel. See Section 5.1.10 *CP Central to CP Archibald Conceptual Design* for the proposed conceptual alignment.
- The Ontario Reservoir Number 1, located at MP 37.4, is adjacent to the southern boundary of the rail corridor.

- Approximately 0.06 mile south of the rail corridor from MP 37.72 to 37.95 is a freshwater pond and the Riverine Freshwater Emergent Wetland.
- From MP 37.75 to 38.95, the FEMA floodplain maps identify this stretch of the rail corridor as a combination of moderate and low risk of flooding (primarily to the north and south of the rail corridor) and high risk of flooding (immediately adjacent to the rail corridor).
- Approximately 1.75 miles north of MP 38.13 is a freshwater emergent wetland.
- There is a 60-foot pre-stressed concrete slab girder (PCSG) bridge spanning from MP 38.36 to 38.38. The proposed project would likely involve the construction of a 60-foot PCSG bridge to the south of the existing track as further discussed in Section 5.1.12 *CP Central to CP Archibald Conceptual Design*.
- From MP 38.95 to 40.2, there is a high risk of flooding immediately adjacent to the rail corridor for the majority of this span of the rail corridor.
- There is a 72-foot ballast deck precast concrete (BDPC) bridge spanning from MP 38.97 to 38.99. The proposed project would likely involve the construction of a 72-foot pre-stressed concrete bridge to the south of the existing track as further detailed in Section 5.1.12 *CP Central to CP Archibald Conceptual Design*.
- Approximately 1.5 miles north of MP 39.13 is a freshwater pond.
- There is an existing 144-foot long beam bridge that spans the Cucamonga Creek concrete drainage channel just east of Vineyard Avenue at MP 39.2. The proposed project would involve the construction of either a beam span structure or a concrete box girder structure to the south of the existing tracks as further summarized in Section 5.1.12 *CP Central to CP Archibald Conceptual Design*.
- From MP 39.60 to 39.61, the existing tracks extend over a concrete culvert and implementation of the proposed project would require a culvert extension in order to accommodate construction of the second track.
- Approximately one mile immediately to the south of MP 40.2 is a freshwater pond.

CP Lilac to CP Rancho

- From MP 52.70 to 55.30, areas adjacent to southern boundary of the rail corridor are designated as Zone X, which means areas of minimal flood hazard determined to be outside the 0.2 percent annual chance of flood.
- From MP 53.1 to 54.58, there is a storm water channel that runs parallel to the existing rail corridor. The proposed project would construct a second track and retaining wall from MP 54.15 to MP 54.35, which could reduce the conveyance.
- From MP 53.73 to 54.50, there is a combination of moderate and low risk of flooding and high risk of flooding immediately adjacent to the northern boundary of the rail corridor.
- Located just east of MP 55.3 is the concrete-lined Lytle Creek Channel zoned as high risk of flooding.

Construction of the recommended double track projects in the vicinity of the above listed bodies of water would have the potential to impact water quality and alter drainage patterns. Best Management Practices (BMPs) during construction would have to be implemented and a Storm Water Management Pollution Prevention Plan (SWPPP) would have to be prepared. In addition, construction within FEMA floodplain

zones would require implementation of the Natural Hazard Management Plan that would include flood monitoring and an evacuation plan for all infrastructure located within a 100-year flood zone.

In addition, there is a potential for these bodies of water to be considered jurisdictional waters. Title 33 of the United States Code (U.S.C.) requires that entities proposing to build upon, alter, deface, destroy, move, injure, or obstruct in any manner that impairs the integrity or functionality of a flood control facility constructed by the United States must obtain authorization from the USACE in the form of a "408 Permit." Section 401 of the Clean Water Act (CWA) governs the discharge of pollutants into waters of the U.S. and requires that a water quality certification be obtained from the corresponding State Water Resources Control Board. Section 404 of the CWA governs the discharge of dredged and/or fill material into waters of the U.S. The 1600 permit from the California Department of Fish and Wildlife regulates all diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake. A 408, 401, 404 permit, and/or 1600 streambed alteration agreement may be required for project improvements in these areas which would need to be determined as part of the subsequent environmental analysis.

4.5 Noise and Vibration

Noise and vibration impacts are projected to occur where residential properties, schools, and parks are located. The areas in which these noise and vibration impacts are anticipated to occur are listed in Table 4-1. Temporary construction noise associated with the double tracking projects could be a considerable impact to these sensitive receptors. Therefore, it is recommended that a noise and vibration study be completed as part of the subsequent environmental analysis.

4.6 School, Parks and Recreation

In several places along the corridor, improvements are proposed adjacent to existing public parks, schools, and trails. Although it does not appear that these resources would be directly affected by proposed improvements, it is likely that indirect effects (noise, aesthetics, etc.) will trigger the provisions of Section 4(f) of the 1966 Department of Transportation Act and will require an evaluation of effects.

Potential impacts to schools, parks, and recreational facilities may occur at the following locations:

Lone Hill Avenue to CP White

- From MP 26.55 to 27.08, the Lone Hill Middle School (700 S. Lone Hill Avenue) and San Dimas High School (800 W. Covina Boulevard) are located approximately 0.13 miles south of the rail corridor and are considered a section 4(f) resource and a noise sensitive land use.
- From MP 27.4 to 27.55, Pioneer Park (225 S. Cataract Avenue) is located approximately 0.23 miles north of the rail corridor and is considered a section 4(f) resource and a noise sensitive land use.
- From MP 27.48 to 27.75, Raging Waters water park (111 Lakeside Road) is located approximately 0.35 miles south of the rail corridor and is considered a section 4(f) resource and a noise sensitive land use.
- From MP 27.55 to 27.6, the small Rhodes Park (210 W. Bonita Avenue) is located approximately 0.35 miles north of the rail corridor and is considered a section 4(f) resource and a noise sensitive land use.
- From MP 28.8 to 29.08, Damian High School (2280 Damien Avenue) is located approximately 0.14 miles north of the rail corridor and is considered a section 4(f) resource and a noise sensitive land use.

- From MP 29.2 to 29.3, the 5.7 acre Wheeler Avenue Park (1499 Palomares Avenue) is located approximately 0.15 miles north of the rail corridor and is considered a section 4(f) resource and a noise sensitive land use.
- From MP 29.4 to 29.5, Kuns Park (1600 Bonita Avenue) is the oldest park in the City of La Verne and is located approximately 0.40 miles north of the rail corridor and is considered a section 4(f) resource and a noise sensitive land use.
- From MP 29.55 to 30.15, the University of La Verne (1950 3rd Street) is located approximately 0.14 miles north of the rail corridor and is considered a section 4(f) resource and a noise sensitive land use.

CP Central to CP Archibald

- From MP 36.0 to 36.1, the six acre Citrus Park (8th Street between San Antonio Avenue and Mountain Avenue) is located approximately 0.14 miles south of the rail corridor and is considered a section 4(f) resource and a noise sensitive land use.
- From MP 37.15 to 37.23, the 6.5 acre Olivedale Park (8th Street between Campus Avenue and Sultana Avenue) is located approximately 0.14 miles south of the rail corridor and is considered a section 4(f) resource and a noise sensitive land use.
- From MP 37.38 to 37.52, the five acre 8th Street Reservoir, also known as Wardens Field, is located just south of the rail corridor at the intersection of 8th Street and Campus Avenue and is considered a section 4(f) resource and a noise sensitive land use.
- From MP 40.15 to 40.35, Cucamonga Elementary School (8677 Archibald Avenue) and Cucamonga Elementary Park are located approximately 0.25 miles to the north of the rail corridor and are considered a section 4(f) resource and a noise sensitive land use.

CP Lilac to CP Rancho

- From MP 52.45 to 52.65, Curtis Elementary School (451 S. Lilac Avenue) is located approximately 0.17 miles south of the rail corridor and is considered a section 4(f) resource and a noise sensitive land use.
- From MP 54.08 to 54.20, Kelley Elementary School (380 S. Meridian Avenue) is located approximately 0.10 miles south of the existing rail corridor and is considered a section 4(f) resource and a noise sensitive land use.

4.7 OTHER ENVIRONMENTAL CONSIDERATIONS

4.7.1 Aesthetics

The rail corridor travels through primarily developed areas. According to the California Scenic Highway Mapping System, there are no designated or eligible scenic routes along the corridor. Public viewpoints of the area are generally from vehicles, residential homes, and industrial offices. The proposed improvements include construction of a second track that would generally be constructed at grade and/or track realignments. These tracks would be similar in appearance and would be constructed parallel to the existing tracks. Elevated features, such as sound walls, would not be constructed as part of the projects, which could block scenic public vistas.

4.7.2 Other Human Environment and Land Use Planning Considerations

Although an evaluation of existing land uses and structures was generally not part of the scope of this work, it should be noted that the effects of proposed improvements on the human environment will need to be evaluated in future studies. Studies of the following effects are likely:

- Air Quality
- Biological Resources
- Cultural Resources
- Hazards and Hazardous Materials
- Hydrology and Water Quality/Regulatory Permitting
- Land Use and Planning
- Noise and Vibration

Given that few if any active land uses would be disturbed by the proposed improvements, it is not likely that an extensive study of community impacts or environmental justice would be required.

4.8 CEQA AND NEPA CLEARANCE

Based on the environmental resource constraints identified in this Chapter and infrastructure and safety enhancements contemplated in Chapter 5.0 *Infrastructure Improvements and Safety Enhancements*, this section summarizes the anticipated CEQA and NEPA compliance process anticipated for the proposed improvements. The proposed improvements would be subject to the jurisdiction and regulations of a number of federal resource agencies, acts and processes, regardless of whether the proposed improvements are within or outside of the existing railroad right-of-way.

4.8.1 CEQA Compliance

Per Section 10501(b) of the Interstate Commerce Commission Termination Act (ICCTA), the Surface Transportation Board (STB) retains exclusive jurisdiction over "transportation by rail carriers" and expressly preempts any state and local regulations, including the California Environmental Quality Act (CEQA). Also, improvements would be statutorily exempt pursuant to CEQA Section 21080(b)(10) as follows:

"A project for the institution or increase of passenger or commuter services on rail or highway rights-of-way already in use, including modernization of existing stations and parking facilities."

4.8.2 NEPA Compliance

National Environmental Policy Act (NEPA) compliance for the two proposed double tracking projects is only required if a federal nexus exists and, if applicable; the participating federal agency is required to initiate the NEPA process per its implementing policies and procedures. In the case of the two double tracking projects, the most plausible federal nexus for the projects is the use of federal funding from the Federal Railroad Administration (FRA). If NEPA clearance is required, the projects are anticipated to be processed under NEPA through the preparation of a categorical exclusion (CE) or, potentially an environmental assessment (EA). Multiple technical studies would be required to determine if the two double tracking projects would satisfy criteria necessary to qualify for a CE. These include, but may not be limited to, the preparation of a biological assessment (BA), cultural resources report, H&H analysis, noise study, air quality impact analysis, environmental justice assessment, Phase 1 Environmental Site Assessment, and Section 4(f) analysis, as highlighted in Table 4-1.

If the findings of the technical studies indicate that no adverse environmental effects would result from the two double tracking projects, then a CE could be pursued. The proposed project improvements are located within the existing railroad right-of-way and acquisition of additional right-of-way will likely not be required (minor right of way takes may be required at grade crossings in order to accommodate wider sidewalks needed for pedestrian channelization enhancements). Based on this, environmental clearance for the two recommended double track projects is currently anticipated to be satisfied through a NEPA

Categorical Exclusion pursuant to FRA's "Procedures for Considering Environmental Impacts." Specifically, this project would qualify under FRA's class of action (16) which includes, "minor rail line additions including construction of side tracks, passing tracks, crossovers, (…) provided that such additions are not inconsistent with existing zoning, do not involve the acquisition of a significant amount of right-of-way, and do not significantly alter the traffic density characteristics of the existing rail lines or rail facilities." The FRA's CEs that could also be pursued for the Project include Class 22 (Bridge Rehabilitation, Reconstruction or Replacement).

If one or more of the technical studies conclude that an adverse effect could result, an EA would be necessary for NEPA compliance.

4.8.3 Regulatory Permits

The following federal laws and regulations must be considered in the context of each of the proposed improvements:

- NEPA
- Section 7 of the Endangered Species Act (ESA)
- Section 106 of the NHPA (National Historic Preservation Act)
- Sections 401, 402, and 404 of the CWA
- Section 14 of the Rivers and Harbors Act (33 U.S.C. §408)
- Section 4(f) of Department of Transportation Act (49 U.S.C. §303)
- Fish and Wildlife Coordination Act

5.0 INFRASTRUCTURE IMPROVEMENTS AND SAFETY ENHANCEMENTS

This section summarizes the results and capital costs associated with a strategic analysis of the San Bernardino Line (SBL) for potential infrastructure improvements and safety enhancements to help overcome existing operational constraints, improve travel times, and enhance corridor safety.

5.1 DOUBLE TRACK PROJECTS DESIGN

5.1.1 Course Level Screening of Alternatives

Several proposed double-track segments were investigated during the early stages of the study as summarized in Chapter 2 *Infrastructure Modeling and Validation*. Specifically, the project's initial (course) screening of alternatives evaluated the following potential double track corridors from an operations perspective:

- I-10 Corridor
- CP Amar to CP Irwin
- CP Barranca to CP White
- CP Archibald to CP Central
- CP Beech to CP Locust
- CP Lilac to CP Rancho

From a purely operational reliability and capacity perspective, the CP Beech to CP Locust double track segment underperformed relative to the other double track projects as described in Section 2.2.5 *Initial Screening Process,* and was considered a lower priority at this early stage. As a result, the team performed a qualitative assessment of the potential capital costs associated with the remaining four double track corridors in order to prioritize the projects. The study's initial capital cost assessment was focused on establishing a "qualitative" metric for each remaining double track project on a low, medium and high basis that used consistent unit pricing for each alternative. The qualitative capital cost metric was used in conjunction with the operations modeling results in order to help the stakeholders prioritize the remaining double track corridors.

As stated in Chapter 2 *Infrastructure Modeling and Validation*, the remaining five potential double track corridors yielded favorable results from an operations perspective and the project team developed high level cost comparisons in order to understand each project's order of magnitude construction cost. In general, the existing right of way widths within the limits of the four potential double track corridors primarily dictated the overall qualitative rating from a capital cost perspective as evidenced in Table 5-1 below. It's important to note that the team developed high level estimates for each alternative during the course level screening with the primary intent of comparing one alternative relative to another alternative.

Per Table 5-1, the existing right of way was highly constrained for the entire I-10 corridor and the western half of the CP Barranca to CP White single track corridor, and moderately constrained for the CP Amar to CP Irwin single track corridor. As a result, the three single track corridors exhibited high relative capital costs which ultimately led to the following single track corridors being considered a lower priority upon completion of the course level screening of alternatives (see Section 2.2.5 *Initial Screening Process*):

Table 5-1. Qualitative Capital Cost Assessment – By Alternative

Double Track Corridors	I-10 Corridor	CP Amar (MP 16.6) to CP Irwin (MP 20.4)	CP Barranca (MP 23.4) to CP White (MP 30.4)	Lone Hill Ave (MP 26.55) to CP White (MP 30.4) (ALT)	CP Central (MP 34.6) to CP Archibald (MP 40.2)	CP Lilac (MP 52.4) to CP Rancho (MP 55.3)
Cost	🔴	🟡	🟡	🟢	🟡	🟢
Right of Way Impacts	🔴	🟡	🔴	🟢	🟢	🟢

Legend:

Qualitative Rating	Cost Range ($M)	Right of Way Impacts (Miles of Potential ROW Acquisition)
High - 🔴	> $110 M	> 1.75
Medium - 🟡	$80 M - $110 M	0.25 – 1.75
Low - 🟢	< $80 M	< 0.25

I-10 Corridor

On August 14, 2013, the HDR team met with members of Metro, SANBAG, and the California High Speed Rail Authority (CHSRA) to update the CHSRA team on the study, to discuss the CHSRA's progress to date, and to promote continued coordination between Metrolink and the CHSRA. The CHSRA indicated that 18 areas had been identified for alignment refinements in the March 2011 *Preliminary Alternatives Analysis (PAA) Report Los Angeles to San Diego via the Inland Empire Section* document that include an area encompassing the I-10 corridor between LAUS and I-605. In this area, the California High Speed Rail (CHSR) tracks are proposed to occupy right-of-way currently used by the existing Metrolink SBL in the median of I-10.

The LA-SD CHSRA and stakeholders are considering multiple alternatives along or within the median of the I-10 Freeway corridor (which is currently occupied by the Metrolink SBL) including aerial structures, tunnel and/or trench options, and widening of the I-10 Freeway. These alternatives present significant challenges that will require further analysis by the CHSRA to determine their feasibility as summarized below.

Challenges Associated with each Metrolink SBL I-10 Alternative

- ***I-10 Freeway Widening*** – The HDR team evaluated the feasibility of widening the I-10 median in order to accommodate an additional Metrolink track between MP 8.82 and MP 11.5 (see I-10 corridor drawings in Appendix C2). The team concluded that this alternative would be cost

prohibitive due to the extensive right-of-way acquisition of over 250 affected homes. As a result, the team decided to drop the alternative from further consideration.

- ***I-10 Median Trench with Cantilevered Freeway Lanes*** – A trench in the median of the I-10 Freeway to accommodate a second mainline track was suggested by Metro as a potential alternative to freeway widening. A trench would eliminate ventilation-related costs associated with tunneling and would avoid a significant right of way acquisition effort. However, the team eliminated the alternative from further consideration due to concerns related to vehicles breaching the freeway barriers. In addition, a new trench would have to be approximately 65 feet deep to avoid impacting the existing arterial streets that cross underneath the freeway since it would be infeasible to rebuild the crossing arterial streets as freeway overpasses.

Conclusion

In addition to the project timeline issues discussed in Section 3.3.2 *California High Speed Rail*, the myriad of technical challenges, cost prohibitive infrastructure, right-of-way acquisitions, and perceived lack of public support led to the removal of this Metrolink double track alternative from further consideration. It has been agreed that Metro and SANBAG will continue to meet with the CHSRA to review proposed improvements in the I-10 corridor in order to minimize the potential for future conflicts between the proposed CHSR tracks and the existing SBL.

CP Amar to CP Irwin Double Track Corridor

As outlined in Chapter 2 *Infrastructure Modeling and Validation*, the project would provide 3.9 miles of new double track subsequently leading to 8.1 miles of continuous double track from the Walnut Creek Channel in the City of Baldwin Park (e.g. point closest to the restricted single track segment within the I-10 median) and ending at CP Irwin in the City of Irwindale. The Metrolink right-of-way is 33' wide for most of this segment, but ranges from 33' to 120' at the Metrolink Baldwin Park station.

Challenges Associated with this Corridor

The majority of this corridor consists of existing right-of-way widths ranging from 33' to 40'. As noted in Chapter 2 *Infrastructure Modeling and Validation*, any new signals and communications structures associated with this proposed project would require acquisition of additional property. The narrow right-of-way would lead to drainage challenges since longitudinal ditches could not be placed along the mainline tracks. The constrained right-of-way associated with this corridor would also preclude the construction of a future access road(s) for maintenance and signal crews which would significantly complicate routine maintenance activities.

The existing main track would also need to be shifted over the entire 3.9 mile stretch to accommodate a second main track which would affect 12 at-grade crossings and necessitate the realignment of several industry sidings. From an environmental perspective, there would be potential permitting hurdles associated with the replacement or modification to the single track deck girder bridge (MP 16.7) over the Walnut Creek Channel and the single track through-girder bridge (MP 19.8) across the Big Dalton Wash.

Another major hurdle is the existing I-10 undercrossing at MP 17.2 (see Figure 5-1) which is only one track wide and would require a complete reconstruction.

Figure 5-1. I-10 Undercrossing (MP 17.2) – South Portal

Photo courtesy Google Maps

The substantial modifications required to shift the existing main line, modify/reconstruct existing structures (most notably the I-10 freeway underpass) and right-of-way constraints present significant technical and cost-related obstacles for this potential double track project.

Conclusion

The elevated capital costs to mitigate the significant right-of-way constraints in this corridor relative to the other double track corridor candidates (see Table 5-1) coupled with the significant technical and cost related obstacles precluded this segment from being further investigated as part of this study.

CP Barranca to CP White Double Track Corridor

The operational benefits associated with this potential double track project are outlined in Chapter 2 *Infrastructure Modeling and Validation*. This proposed project would create 11.2 miles of continuous double track by connecting one existing double track segment that terminates at CP Barranca in the City of Covina with another existing double track segment that terminates at CP White in the City of Pomona. As depicted in Appendix A3, the Metro right-of-way is 33' wide along a 3.1 mile segment from Barranca Avenue to Lone Hill Avenue before varying in width between 50' and 250' east of Lone Hill Avenue.

Challenges Associated with this Corridor

The 3.1 mile segment between Barranca Avenue and Lone Hill Avenue has an existing right-of-way width of 33' as detailed in Appendix A3. The narrow right-of-way creates similar challenges to those associated with the CP Amar to CP Irwin corridor and any proposed signals and communications facilities (e.g. signal towers, signals, grade crossing bungalows, etc.) would require acquisition of additional right of way. Specifically, the team estimated that a new second main track would require a two feet minimum strip of continuous additional right-of-way in order to avoid implementing non-standard track centers less than 15 feet.

Additional right-of-way acquisition elevates the potential double track project's capital costs since residential areas, schools, and public parks are adjacent to both sides of this segment. As with the CP Amar to CP Irwin corridor, the narrow right-of-way from CP Barranca to Lone Hill Avenue would likely prohibit the construction of longitudinal drainage ditches and a future access road for maintenance and signal crews. The existing main track would need to be shifted over the entire 3.1 mile stretch from CP Barranca to Lone Hill Avenue to accommodate a second main track, which would also impact eight (8) at-grade crossings.

Conclusion

The significant right-of-way constraints and resulting infrastructure challenges between CP Barranca and Lone Hill Avenue precluded this 3.1 mile section from being further advanced in the study. The team concluded that only a 3.9 mile section of the original project from Lone Hill Avenue to CP White should be advanced since it ultimately leads to a 7.9 mile section of continuous double track from Lone Hill Avenue to CP Central.

Following removal of the previously mentioned potential double track projects, the team advanced the following double track projects into the fine level screening process as discussed in the next section:

- Lone Hill Avenue to CP White
- CP Central to CP Archibald
- CP Lilac to CP Rancho

5.1.2 Fine Level Screening of Alternatives

Overall Design Goals and Criteria

The project team advanced three (3) double track projects into the final level screening phase that included development of conceptual engineering plans, engineer's estimates of probable construction costs and more refined RTC models. The team advanced the three double track projects through the conceptual engineering phase while adhering to the following fundamental design tenets as agreed upon by the project stakeholders:

- Design infrastructure necessary to meet the operational goals for the project. Where possible, additional crossovers need to be located to maximize operational flexibility while utilizing existing signal facilities to reduce costs.
- Design and stage construction to minimize impact of construction activities on the railroad operations.
- Maximize the construction benefits while minimizing costs. The track alignments were designed around existing structural constraints to avoid the high cost of relocating/rebuilding structures and to avoid longer construction durations.
- Design an end product that enhances the corridor's safety for trains, passengers, and those who use the grade crossings.
- Design within the existing corridor right-of-way. A primary constraint was the existing corridor right-of-way and all efforts were made to keep the infrastructure improvements within the existing right-of-way.
- As discussed in Chapter 4 *Environmental Constraints*, the conceptual track alignments were designed in a manner to avoid impacting known environmentally sensitive areas.
- Design to minimize ongoing maintenance costs following completion of construction.

In addition, the team advanced the design of three double track corridors by adhering to the following standards and guidelines:

- SCRRA Design Standards:
  - SCRRA Engineering Standards (Series 1000 to 8000)
  - SCRRA Design Criteria Manual
  - SCRRA Highway – Rail Grade Crossing Recommended Design Practices and Standards Manual (Manual)
- CPUC General Orders (GO) 26-D and 75-D
- AREMA Manual for Railway Engineering (MRE)
- California Manual on Uniform Traffic Control Devices (MUTCD)

5.1.3 Track Design Goals

All three (3) proposed double track corridors have unique track conditions, railroad signal equipment, structures, at-grade crossings, right-of-way, stations, and challenges associated with double tracking the corridors. Despite the numerous differences amongst the corridors, the goals of the proposed track design are similar for each segment and include:

- Utilizing the current single mainline in its existing location where feasible to reduce costs associated with shifting track.
- If constrained right-of-way calls for costly reconstruction of structures/stations or significant property acquisition, the cost of shifting track is preferred.
- Installing crossovers or universal crossovers to maximize operational flexibility.
- Retain access to all existing industry tracks.

5.1.4 Grade Crossing Design Overview

An initial attempt was made to determine the types and placement of proposed safety enhancements for each roadway-rail grade crossing within the proposed double track corridors for capital cost estimation purposes. The conceptual grade crossing configurations are subject to change pending pedestrian counts and site diagnostic meetings to be conducted during preliminary engineering. It is important to note that formal traffic studies, topographic mapping, existing right-of-way delineation, utility mapping, and coordination with Cities was not part of the study's scope. In addition, queuing studies in support of advanced preemption design will need to be conducted during the next design stage in order to determine the presence and magnitude of queuing onto the tracks from nearby roadway intersections. **Lastly, proposed pedestrian safety improvements will ultimately be determined by a Safety Review Team to be designated at a future date by Metro, SANBAG and SCRRA and a formal CPUC diagnostic meeting will need to be conducted at each grade crossing during the preliminary engineering phase in order to determine the appropriateness of the conceptual grade crossing layouts included in this study.**

The fine level screening of alternatives evaluated the capital costs and operational benefits associated with three proposed double track corridors on the Metrolink San Bernardino Line from Lone Hill Avenue to CP White, CP Lilac to CP Rancho and CP Central to CP Archibald. The three proposed double track projects would necessitate construction of a second track across intersections within the projects' limits which would necessitate reconstructing portions of the intersections to adhere to the latest Metrolink engineering standards and design criteria. See Appendix D2 for proposed roadway-rail grade crossing layouts.

Methodology

The study includes conceptual grade crossing plans for each existing grade crossing located within the limits of the Lone Hill Avenue to CP White, CP Lilac to CP Rancho and CP Central to CP Archibald double track projects that adhere to the SCRRA Highway-Rail Grade Crossings Recommended Design Practices and Standards Manual (Manual). The proposed grade crossing plans were advanced to a 5% design level in order to support the development of a conceptual engineer's estimate of probable construction costs (see Appendix G) to provide the project stakeholders with accurate and reliable estimates to support the programming of funding. The conceptual grade crossing plans focus on enhancing safety at the numerous grade crossings by incorporating the following key design provisions summarized in the *List of Essential Design Practices, Standards and Policies* in Table 1-2 of the Manual:

Raised Median Extensions

Section 3.6 of the Manual summarizes the purpose, application, installation guidelines, and warrants for the use of raised median islands. Key guidelines of Section 3.6 applied to the conceptual grade crossing layouts include:

- Raised median islands shall be used on both approaches to the highway–rail grade crossing in order to prevent undesirable traffic movements such as driving around the automatic crossing gates or making U-turns in the vicinity of the highway-rail grade crossing.
- The raised median shall begin 10 feet from the centerline of the nearest track.
- The preferred minimum length of the median as measured from the highway-rail grade crossing gate shall be 100 feet, as measured from the gate arm. A design deviation may be requested if 100 feet is not obtainable, but in no case should the median be less than 60 feet in length.
- Median width shall be a minimum of nine (9) feet if a warning device is installed in the median and a minimum width of four (4) feet if no median warning device is installed. A two (2) foot minimum width median may be used with permission from Metrolink and the local roadway agency.
- Raised median curbs shall be eight (8) inches in height.

Grade Crossing Geometry

Section 3.5 of the Manual focuses on the relationship between roadway and railroad geometry and key guidelines of the Manual that were applied to the conceptual grade crossing layouts include:

- Active warning devices such as vehicle and pedestrian gates shall be installed 15 feet from the centerline of the nearest track.
- At a skewed crossing, active roadway warning devices shall be installed perpendicular to the roadway and 15 feet from the centerline of the nearest track as measured from the end of the roadway vehicle gate.
- A design deviation may be requested for active warning devices installed less than 15 feet from the centerline of the track, but in no case should an active warning device be installed less than 12 feet from the centerline of the track.

Many existing roadway-rail grade crossings in the proposed double track corridors have existing active roadway warning devices that can be protected in place or relocated to meet the geometric guidelines summarized in Section 3.5 of the Manual as stipulated above. See Appendix D2 for proposed roadway-rail grade crossing layouts.

Pedestrian Safety Enhancements

Section 4 of the Manual covers pedestrian-rail grade crossings at length and key guidelines that were applied to the conceptual grade crossing layouts include:

- Pedestrian safety enhancements shall adhere to the guidelines included in Section 4.11 and Figure 4-2 of the Manual. **The use of pedestrian gates and other pedestrian safety features will ultimately be determined by a Safety Review Team to be designated at a future date by Metro, SANBAG and SCRRA.**
- The 10 minute walk rule is referenced to determine if a crossing has or has the potential for pedestrian activity generated by schools, hospitals, or other substantial pedestrian generators within a 10 minute (one-third to one-half of a mile) radius of the crossing. See Appendix D1 for a matrix detailing crossings that are affected by the 10 minute rule. **It is important to note that a pedestrian study will need to be conducted during the preliminary engineering stage to determine pedestrian volumes, types of pedestrians, and pedestrian behavior for all roadway-grade crossings included in the proposed double track corridors.**
- Provide clear, well defined pedestrian travel ways at the crossing that discourage improper pedestrian behavior such as circumventing pedestrian gates, encroaching onto the railroad right-of-way, and encroaching onto the roadway. Fencing and railing should be provided along the sidewalks with additional striping and raised markers across the tracks to direct pedestrians along the proper path.

5.1.5 Drainage Design Overview

For cost estimating purposes, an initial attempt was made to determine the types of drainage additions and/or modifications for the three proposed double track corridors as part of the fine level screening of alternatives. A majority of the existing drainage structures in the proposed Lone Hill Avenue to CP White, CP Lilac to CP Rancho, and CP Central to CP Archibald double track corridors cross perpendicular to the track and therefore must be lengthened to clear the new second track. In addition, there are parallel drainage ditches that would need to be removed and reconstructed following construction of the second track.

Exact lengths of culvert extensions and reconstructed drainage ditches will be determined during the preliminary engineering phase. Tables 5-2, 5-3, and 5-4 provide a summary of the affected existing drainage facilities in conjunction with recommended mitigations (refer to track schematics in Appendix C1 for locations of existing drainage structures along all three double track projects).

Capital cost estimates for these recommended drainage modifications are included in Appendix G.

Table 5-2. Drainage Impacts – Lone Hill Avenue to CP White

Description	MP	Recommendation
12” x 22’ Corrugated Metal Pipe (CMP)	MP 26.58	Extend
24” x 20’ Reinforced Concrete Pipe (RCP)	MP 26.61	Extend
Concrete Lined Channel	MP 27.00 – 27.20	This channel runs parallel to the existing track and it will need to be reconstructed south of the proposed second track.
8” x 40’ Polyvinyl Chloride (PVC)	MP 27.54	Extend
12” x 35’ PVC	MP 27.60	Extend
24” x 24’ Clay Pipe (CP)	MP 27.80	Extend
8” x 23’ PVC	MP 27.89	Extend
24” x 24’ CMP	MP 27.95	Extend
8” x 22’ PVC	MP 28.56	Extend
2 - 48" x 20' CIP	MP 28.89	Extend
12” x 40’ PVC	MP 29.28	Extend
36” x 68’ CMP	MP 30.14	Extend
8” x 25’ PVC	MP 30.14	Extend

Table 5-3. Drainage Impacts – CP Lilac to CP Rancho

Description	MP	Recommendation
42” x 46’ CMP	MP 52.70	Extend
3 - 24” x 46’ RCP	MP 52.70	Extend
48” x 41’ CMP	MP 54.19	Extend
36” x 37’ RCP	MP 54.24	Extend

Table 5-4. Drainage Impacts – CP Central to CP Archibald

Description	MP	Recommendation
2 - 36" x 25' RCP	MP 35.03	Extend
2 - 48" x 24' RCP	MP 35.15	Extend
4' x 3' x 22' RCA	MP 35.90	Extend
4' x 3' x 22' RCA	MP 36.10	Extend
48" CMP	MP 39.40	Extend

5.1.6 Structural Design Overview

For cost estimating purposes, an initial attempt was made to determine the types of new double/single track bridges and/or bridge modifications for the three proposed double track corridors as part of the fine level screening of alternatives. Structures within the proposed Lone Hill Avenue to CP White, CP Lilac to CP Rancho, and CP Central to CP Archibald double track corridors are primarily single-track structures. In order to accommodate a second track, the existing structures would need to be widened, replaced with double-track structures, or an adjacent single-track structure would need to be constructed.

For overpass structures, the proposed track alignments had to account for proper clearances between the existing overpass abutments and/or piers to the track centerlines. In addition, pier protection walls would have to be added around the columns of the existing SR 57 overpass due to insufficient clearances between the proposed track centerlines and existing columns (refer to the Lone Hill Avenue to CP White typical sections included in Appendix C1). The proposed locations of retaining walls were not identified during this conceptual phase of design and will need to be further evaluated during the preliminary engineering phase. As a result, allowances have been included in the conceptual cost estimates to account for the likelihood of retaining walls as summarized in the conceptual cost estimates included in Appendix G. Tables 5-5, 5-6, and 5-7 provide summaries of the existing structures that will be impacted along with recommended mitigation measures.

Table 5-5. Structure Impacts – Lone Hill Avenue to CP White

Existing Structure Description	MP	Recommendation
SR - 57 Freeway Overpass	MP 27.10	Construct pier protection walls as depicted in the SR-57 overpass's typical section and plan included in Appendix C1. Caltrans owns the overpass and will likely have to approve the proposed plans.
8' x 9' x 118' Brick Arch Culvert	MP 27.61	Construct 120' bridge – A single track structure will be constructed south of the existing single track structure to accommodate the new track.
10' x 5' RCB and 2 - 48" x 20' Steel Pipes	MP 28.89	Widen 10' x 5' RCB – Widen the structure to accommodate a second track
10' x 4.5' x 14' RCB	MP 29.10	Widen 10' x 4.5' x 14' RCB – Widen the structure to accommodate a second track.
10' x 18' x 59' RCB (Marshall Creek)	MP 29.17	Widen RCB – Widen the structure to accommodate a second track.
11' x 21' x 43' RCB	MP 29.63	Widen 11' x 21' x 43' RCB – Widen the structure to accommodate a second track.
Proposed Retaining Wall(s)	To be determined	Retaining walls will likely need to be constructed at various locations throughout the segment. The height, type, and locations will need to be determined during the preliminary engineering phase.

There are no existing structures in the proposed CP Lilac to CP Rancho double track corridor that would be impacted by the addition of a second track (including the UPRR Colton Cutoff Overpass). However, a large retaining wall is anticipated at one location and other retaining walls may be determined during the preliminary engineering phase as summarized in Table 5-6.

Table 5-6. Structure Impacts – CP Lilac to CP Rancho

Existing Structure Description	MP	Recommendation
Proposed Retaining Wall (Known)	MP 54.15 – MP 54.35	A retaining wall is required from MP 54.15 to MP 54.35 and the wall's final height and type will be determined during the preliminary engineering phase.
Proposed Retaining Wall(s)	To be determined	Additional retaining walls may need to be constructed at various locations throughout the segment. The height, type, and locations will need to be determined during the preliminary engineering phase.

Table 5-7. Structure Impacts – CP Central to CP Archibald

Existing Structure Description	MP	Recommendation
64' Pre-Stressed Concrete Slab Girder (PCSG)	MP 34.90	Construct new double track bridge.
28' PCSG	MP 37.70	Construct new double track bridge.
60' PCSG	MP 38.30	Construct new double track bridge.
90' PCSG	MP 38.90	Construct new double track bridge.
142' Steel Plate Girder (Cucamonga Creek)	MP 39.20	Construct new 142' single track bridge at MP 39.20. Proposed track centers will need to be at least 20' in order to accommodate construction without impacting operations on the existing bridge.
3 - 30' Culvert Bridge (Unknown Diameter)	MP 39.55	Construct new double track bridge.
Proposed Retaining Wall(s)	To be determined	Additional retaining walls may need to be constructed at various locations throughout the segment. The height, type, and locations will be determined during the preliminary engineering phase.

5.1.7 Signal Design Overview

By creating greater operational flexibility through the addition/extension of new double track sections, it is necessary to evaluate the existing railroad signal, communication, and highway at-grade railroad crossing systems to determine the modifications necessary to adapt to the new track conditions. By reviewing highway at-grade railroad crossings and railroad signal locations, a determination of the extent of changes necessary to support the additional track can be made.

Noting the importance of the San Bernardino Line and the high volume of rail traffic, it was determined that railroad signal work crews would be required to conduct night work for the majority of railroad

signal and crossing equipment installations. Consequently, night work escalations were factored into the signals and communications related unit costs as summarized in Appendix G.

Regulations and Standards

In evaluation of the existing railroad signal and communication system and determination of the proposed modifications to that system per the proposed track changes, the following regulations and standards were utilized:

- Code of Federal Regulations Title 49, Parts 234 and 236
- CPUC General Orders 26-D and 75-D
- California Manual on Uniform Traffic Control Devices
- AREMA Signal and Communications Manual
- SCRRA Design Criteria Manual
- SCRRA Highway-Rail Grade Crossings Recommended Design Practices and Standards Manual (Manual)
- SCRRA Signal Engineering Standards (Section 8000)

Highway At-Grade Railroad Crossings – All Study Sections

An initial review of the existing conditions was needed to determine the extent of changes necessary at the highway at-grade railroad crossings. Individual crossings were evaluated for compliance with current standards and requirements, and proposed crossing warning devices were added for additional coverage where necessary.

Each crossing in the study sections was initially reviewed for the need of pedestrian related modifications for capital cost estimation purposes. However, pedestrian traffic counts were not obtained in this study and the treatment recommendations are subject to change pending subsequent design phases. Pedestrian decision point charts included in Figure 4-2 of the Manual were utilized in order to determine which crossing warning devices were to be recommended in regards to pedestrian safety at each location. The decision charts and grade crossing layouts are provided in Appendices D1 and D2 and it is important to note that the use of pedestrian gates and other pedestrian safety features will ultimately be determined by a Safety Review Team to be designated at a future date by Metro, SANBAG and SCRRA.

The majority of existing crossing warning devices and crossing enclosures will be relocated at locations where new tracks conflict with existing railroad signal equipment as depicted in Appendix D2. However, crossing enclosures will need to be field inspected during the preliminary engineering phase in order to determine their applicability for relocation. Specifically, existing crossing enclosures will need to be evaluated for space constraints through review of signal maintenance plan detail sheets in conjunction with a field review.

New crossing signal enclosures may need to be installed due to size restrictions if warranted during the preliminary engineering phase. Any existing railroad crossing enclosures that are proposed to be removed will be evaluated by SCRRA for salvage of equipment and the enclosure itself. Installation of new crossing signal enclosures for temporary purposes may be necessary at the grade crossings located within proposed double track limits prior to construction of a second mainline. Details on proposed crossing warning device modifications are provided in Appendix D2 and are subject to change pending the preliminary engineering phase.

Railroad Signals and Communication – All Study Sections

An inventory of existing railroad signal and communication locations was developed for facilities located within the limits of the three double track projects included in the fine level screening of alternatives. For cost estimation purposes, the team developed proposed railroad signal layouts that are referenced in the proposed track layout plans included in Appendix C1. In addition, PTC has been implemented within all study sections and all related PTC modification/installation costs have been incorporated into the overall cost estimates for each double track alternative (see Appendix G).

PTC will need to be unaffected throughout construction of the double track projects which means modifications to the wayside PTC equipment and back office server will be necessary when proposed signal equipment is placed in service. In addition, changes to the dispatch system at the Metrolink Operations Center (MOC) will also be necessary as new/modified control points are placed in service. All PTC and/or ATCS radio antennas that conflict with the new track will be relocated where the railroad signal location will remain in service.

5.1.8 Stations Overview

In general, station configuration is dictated by a variety of factors including right-of-way widths, pedestrian access, elevations, Metrolink Engineering Standards Series ES3000 and Section 7.7 of the SCRRA Design Criteria Manual.

The HDR team analyzed the existing Metrolink stations along the San Bernardino Line and prepared conceptual station improvement plans for each Metrolink station that can be found in Appendix F1 of this study. The HDR team focused more attention on the existing stations located in the proposed double track limits, which include the Metrolink Fairplex, Upland, and Rialto Stations as further illustrated in Appendix C1.

El Monte Bus to Rail Connection

Early in the project, Metro directed the team to develop a high level track alternative concept that would provide a direct linkage between the SBL and the recently constructed El Monte Bus Station, which is the largest bus terminal west of Chicago that serves between 22,000 and 25,000 passengers per day. Providing a direct link between the El Monte Bus Station and the Metrolink SBL would promote direct intermodal connectivity between the local/regional bus and Metrolink commuter rail system that currently does not exist at this location.

The concept would include a new station with an elevated center platform (similar to the Metro Chinatown station) to the south of the existing SBL mainline on the elevated Rio Hondo River Bridge adjacent to Santa Anita Avenue in El Monte (refer to Appendix F2). To serve both sides of the station, an additional siding track would need to accompany the station starting just west of the Rio Hondo River and terminating west of the existing Metrolink El Monte Station. The siding has the potential to provide additional capacity and improved rail operations if it's designed with sufficient length and provided an appropriate CP during preliminary engineering.

The team prepared three (3) alternative concepts and Metro selected Concept 1 that includes a new El Monte station with an at-grade pedestrian connection directly to the El Monte bus way as depicted in Appendix F2. The concept was also presented to Metrolink operations staff and they were supportive of further developing a bus to rail connection at El Monte. However, significant infrastructure and financial obstacles exist including:

- Constrained right-of-way,
- Potential permitting issues associated with construction adjacent to the Rio Hondo River,

- High cost of building an additional aerial structure adjacent to the existing Rio Hondo River Bridge,
- Cost of a new bridge over Valley Boulevard,
- Recent advancement of the El Monte Gateway development and
- The planned Santa Fe Trail Plaza located directly west of the existing Metrolink El Monte Station.

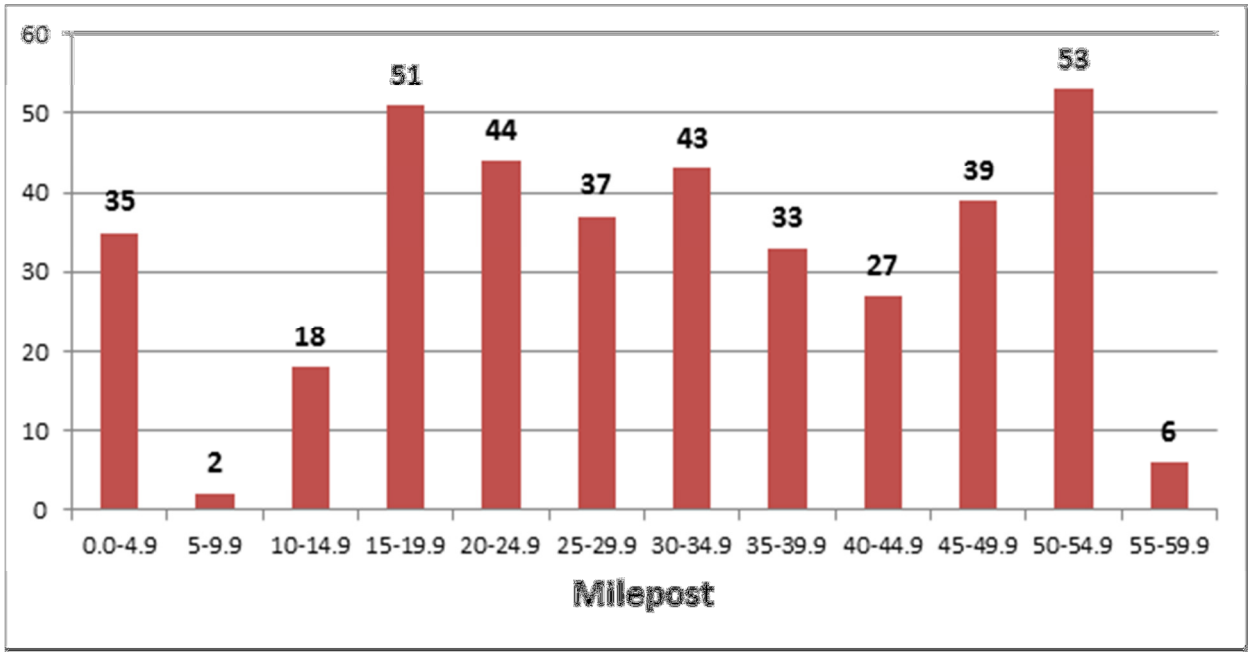
The preferred concept (Concept 1) was not further advanced under the SBL Study and a future study is warranted in order to determine the concept's approximate construction cost, operational benefits, and engineering challenges.

5.1.9 Corridor Safety Overview

The HDR team evaluated the existing fencing conditions along the San Bernardino Line in order to review the existing fence type and integrity, and to identify areas in need of new fencing. Recommendations on fencing type and length were based on the Series 5000 Metrolink Engineering Standards in conjunction with input from Metrolink's System Safety Department.

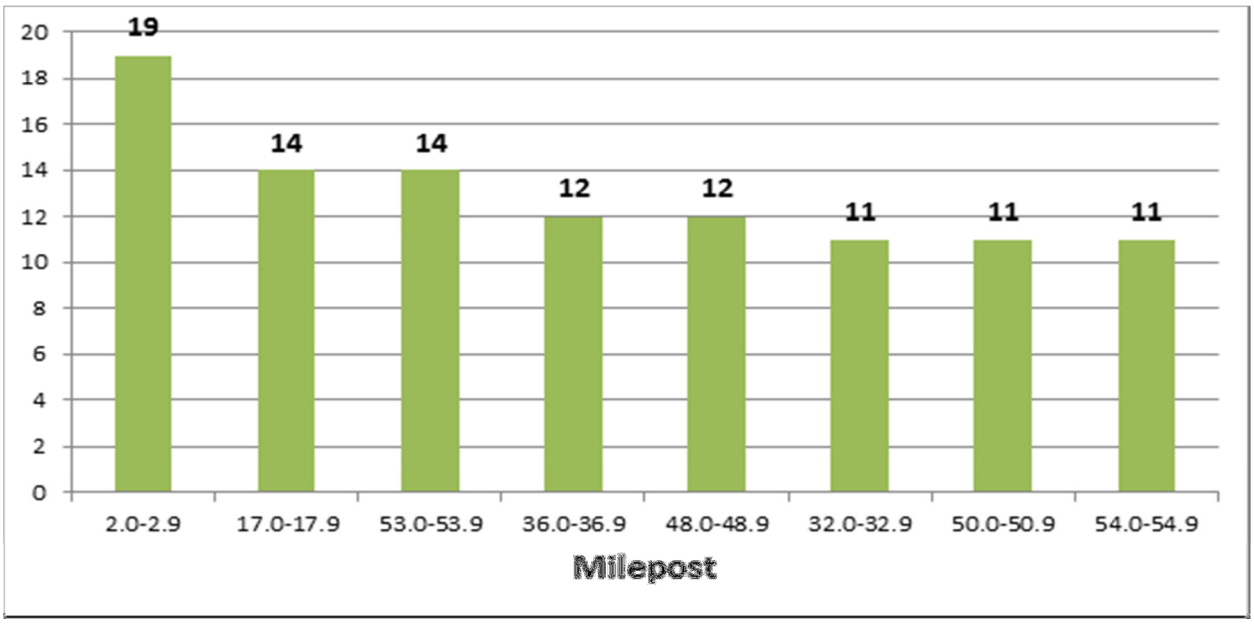
The analysis was initiated by reviewing track head-end-videos to identify areas lacking corridor fencing which were recorded based on milepost limits. The data was then refined based on coordination with Metrolink's System Safety Department which maintains a Google Earth database and spreadsheet that track trespass incidents along the corridor. It was determined that areas exhibiting high volumes of trespass incidents were in need of fencing enhancements, and Figure 5-2 graphically presents the number of trespass incidents by milepost over a three month period in 2013 according to Metrolink's latest database.

Figure 5-2. Trespass Incidents by Mileposts (July – September 2013)



The trespass data in Figure 5-2 was then further refined by identifying each one mile section of the corridor that exhibited 10 or more incidents as summarized in Figure 5-3.

Figure 5-3. Mileposts with 10 or More Trespass Incidents (July – September 2013)



The team concluded that a one mile section of the corridor that exhibited more than 10 trespass incidents should be deemed a "hot spot" or priority area for proposed fencing. During a project design team meeting on October 9th, the team received concurrence from Metrolink's System Safety Department regarding the recommended fencing areas and an exhibit summarizing the hot spot areas can be found in Appendix E1.

Once the hot spots were established, proposed fencing types for each location were determined based on the Series 5000 Metrolink Engineering Standards along with input from Metrolink's System Safety Department. Specifically, a preferred fence type was based on land use, right-of-way condition, and property ownership. In most cases, wire mesh fencing was the preferred fence type, but the various fencing types and their selection criteria per Metrolink include:

- Welded Wire Mesh – Preferred right-of-way fence
- Chain Link – Used only for maintenance of existing chain link fences
- Tubular Steel – Used in areas with property leases and storage facilities where aesthetics are a concern as directed by SCRRA
- Concrete Block Wall – Used for commercial and residential developments
- Temporary K Railing – Used for all parking leased areas

For funding considerations, it is important to note that the SBL includes numerous one mile segments devoid of corridor fencing that were not recommended for new fencing if the segment (such as Railroad Avenue near Bassett) did not experience more than 10 trespass incidents. However, if a sealed corridor had to be implemented, wire mesh fencing would be utilized along the entire length of the SBL except in residential areas where block wall would be required.

In general, the existing fencing along the SBL is in need of upgrades since there are numerous areas where non standard fencing is utilized such as at MP 2.2 where a simple wire rope is utilized. In order to prioritize the critical locations, the milepost segments noted in Figures 5-2 and 5-3 would take priority given the number of observed trespass incidents. Appendix E2 *Security Fencing Recommendations by*

Type provides an overview of areas where existing fence should be upgraded to a wire mesh fence or block wall in order to comply with Metrolink's Engineering Standards.

The total length of recommended new corridor fencing was calculated for each potential double track project included in the fine level screening of alternatives and summarized in Table 5-8 below. It is important to note that additional security fencing was not warranted for the proposed Lone Hill Avenue to CP White double track corridor given the absence of hot spots as detailed in Figure 5-3. Appendices E1 and E2 provide a summary of additional areas along the SBL outside the limits of the three potential double track projects that still warrant additional security fencing.

Table 5-8. Recommended Security Fence Types for Proposed Double Track Locations

Double Track Segment	Recommended Fence Type	Total Length	Estimated Cost
Lone Hill Avenue to CP White	None Warranted at this Time	Not Applicable	Not Applicable
CP Central to CP Archibald	Welded Wire Mesh	0.8 Mile	$212k
	Concrete Block Wall	0.2 Mile	$279k
CP Lilac to CP Rancho	Welded Wire Mesh	0.6 Mile	$159k
	Concrete Block Wall	0.3 Mile	$419k

The HDR team collaborated with SCRRA, Metro and SANBAG on attempting to determine the current costs associated with maintaining existing fencing along the corridor. However, it was found that maintenance budgets specific to fencing are not enumerated by SCRRA, which made it difficult to estimate future annual maintenance costs for programming purposes.

Refer to Appendix G for conceptual cost estimates for the proposed right of way corridor fencing summarized in Appendices E1 and E2.

5.1.10 Lone Hill Avenue to CP White (MP 26.55 – MP 30.4) Conceptual Design

Track

A crossover and universal crossover will need to be added to proposed double track project in order to yield the full operational benefits of adding a new second main track. The proposed track alignment associated with the Lone Hill Avenue to CP White double track project is depicted in Appendix C2 which includes the following track alignment considerations:

- The centerline of the proposed track needs to be placed 15' offset from the existing track's centerline except where noted on the plans.
- A #20 crossover needs to be placed at the west end of the double track segment.
- A #20 universal crossover needs to be placed at the east end of the double track segment.
- The industry track turnout at MP 27.5 near the South Cataract Avenue at-grade crossing needs to be relocated to the west end of the industry spur to eliminate a 3-track crossing at South Cataract Avenue. This change will need to be coordinated with the spur track's owner to ensure that freight rail cars can be properly located for its operations.
- Multiple track shifts are necessary throughout the segment to minimize impacts to existing infrastructure such as the:
    - SR 57 overpass,
    - Industry spur track near South Cataract Avenue,
    - Arch culvert at MP 27.61,

  - Industry spur near Wheeler Avenue,
  - Pomona Fairplex platform and
  - Narrow right of way at D Street and Fairplex Drive.
- Track shifts through grade crossings will need to occur at S. San Dimas Avenue and Fairplex Drive in order to avoid impacting existing constraints.

Signals

The Lone Hill Avenue to CP White double track project's signal work would include the following substantial areas of work:

- Removal of the existing single track bidirectional intermediate signal at Lone Hill Avenue (MP 26.55),
- Installation of a new end of double track control point east of Lone Hill Avenue (MP 26.55),
- The modification of the existing single track bidirectional intermediate signal to a double track bidirectional intermediate signal at San Dimas Avenue (MP 27.80) and Wheeler Avenue (MP 29.28) and
- The modification of end of double track control point named CP White to a universal crossover (two #20 crossovers) control point railroad east of White Avenue (MP 30.40).

New fiber interfaces will need to be installed to tie the location into the fiber backbone where new railroad signal enclosures are to be installed. The proposed railroad signal enclosures will require further investigation during the preliminary engineering phase to determine if the existing signal enclosures can remain, be relocated, or be replaced. The aforementioned proposed railroad signal equipment is further detailed in Appendix C2 and detailed estimates for each location are provided in Appendix G.

Grade Crossings

The proposed Lone Hill Avenue to CP White double track project consists of 10 at-grade crossings located within Los Angeles County that will need to be reconfigured in order to accommodate the second track. From west to east, the following existing at-grade crossings are included in the double track limits:

1) South Cataract Avenue
2) South San Dimas Avenue
3) South Walnut Avenue
4) South San Dimas Canyon Road
5) Ganey Ceramics (private crossing)
6) Wheeler Avenue
7) Fairplex Drive
8) Arrow Highway
9) Paper Pak Industries (private crossing)
10) White Avenue

A pedestrian treatment summary matrix is provided in Appendix D1 and conceptual grade crossing layouts for all 10 at-grade crossings are provided in Appendix D2. With the exception of the skewed at-grade crossing at Arrow Highway, the Metrolink tracks cross perpendicular to the at grade roadway crossings. Furthermore, the crossing roadways are orientated in the north-south direction and the

Metrolink tracks are on an east-west bearing. The team placed the project's western control point directly east of Lone Hill Avenue in order to avoid having to reconstruct the existing single track grade crossing to reduce capital costs. The conceptual at-grade crossing layouts were designed in accordance with the guidelines established in the Series 4000 Metrolink Engineering Standards in conjunction with the Manual.

5.1.11 CP Lilac to CP Rancho (MP 52.4 – MP 55.1) Conceptual Design

Track

Universal crossovers have been added to the track alignment to realize the full operational benefit associated with the second main track. In addition, a number of existing industry tracks had to be reconnected into the realigned existing track and/or new track. The following list details the key track alignment considerations associated with the CP Lilac to CP Rancho double track project which are graphically depicted in the track plans and typical sections located in Appendix C1.

- The centerline of the proposed track needs to be placed 15' offset from the existing track's centerline except where noted on the plans.
- The track centerline spacing at the Rialto Avenue grade crossing had to be significantly widened to avoid conflicting with the existing piers of the Colton Cutoff overpass as evidenced in the grade crossing plans included in Appendix D2.
- A #20 universal crossover will have to be constructed at the west end of the double track segment.
- An industry spur's #10 turnout located between South Cactus Avenue and South Lilac Avenue will have to relocated.
- A #20 universal crossover will have to be constructed between South Eucalyptus Avenue and South Pepper Avenue.
- Multiple track shifts are necessary throughout the segment to minimize impacts to existing infrastructure such as the:
    - Industry spur near South Cactus Avenue,
    - Rialto Station and
    - Colton Cutoff overpass at MP 54.5.

Signals

The CP Lilac to CP Rancho double track project's signal work will consist of the following key work areas:

- Removal of the existing end of siding and installation of a universal crossover (two #20 crossovers) and turnout switch control point named CP Lilac railroad west of Lilac Avenue (MP 52.40),
- Installation of a double crossover (two #20 crossovers) control point railroad west of Pepper Avenue (MP 53.98),
- Removal of the existing single track bidirectional intermediate signal railroad east of Pepper Avenue (MP 53.98),
- Installation of a hot box/dragging equipment detector for the new track railroad west of Rancho Avenue (MP 54.90) to complement the existing track's hot box/dragging equipment detector and

- Installation of a new end of double track remote location as part of CP Rancho railroad east of Rancho Avenue (MP 55.30).

In order to accommodate the second track, railroad signal enclosures will likely have to be replaced within this section of proposed double track except at Lilac Avenue, Rancho Avenue and CP Rancho. The double track project's proposed railroad signal equipment is graphically depicted in the grade crossing plans included in Appendix C2 and detailed estimates for the aforementioned signal and communications facilities are included in Appendix G.

Grade Crossings

The CP Rancho to CP Lilac double track project includes eight (8) at-grade crossings located within San Bernardino County that lack pedestrian treatments such as pedestrian channelization and gates. From west to east, the following existing at-grade crossings will have to be reconfigured in order to accommodate a second track:

1) S. Lilac Avenue
2) S. Willow Avenue
3) S. Riverside Avenue
4) S. Sycamore Avenue
5) S. Acacia Avenue
6) S. Eucalyptus Avenue
7) S. Pepper Avenue
8) W. Rialto Avenue

A pedestrian treatment summary matrix is provided in Appendix D1 and conceptual grade crossing layouts for all 8 at-grade crossings are provided in Appendix D2. With the exception of the skewed at-grade crossing at West Rialto Avenue, the Metrolink tracks cross perpendicular to the at grade roadway crossings. Furthermore, the crossing roadways are orientated in the north-south direction and the Metrolink tracks are on an east-west bearing. The team placed the project's eastern control point directly west of Rancho Avenue in order to avoid having to reconstruct the existing single track grade crossing to reduce capital costs. The conceptual at-grade crossing layouts were designed in accordance with the guidelines established in the Series 4000 Metrolink Engineering Standards in conjunction with the Manual.

As previously mentioned, the Rialto Avenue at-grade crossing features unique engineering considerations as described below:

Rialto Avenue At-Grade Crossing

The proposed track center spacing across Rialto Avenue will need to be approximately 40' in order to avoid the existing columns of the UPRR Colton Cutoff overhead structure located immediately south of the at-grade crossing. In addition, the crossing will need to include 100' long concrete median islands per to be located between the tracks as depicted in the conceptual grade crossing plans included in Appendix D2.

Metrolink Rialto Station

The Metrolink Rialto Station (MP 52.9) is located within the proposed limits of the CP Lilac to CP Rancho double track project at 261 South Palm Avenue (to the west of South Riverside Avenue) in the City of Rialto. The existing station layout consists of a single side platform adjacent to the north side of the existing single track as depicted in Figure 5-4.

Figure 5-4. Rialto Station

Photo courtesy Google Maps

In order to accommodate the proposed second track, an additional side platform will need to be constructed on the south side of the new main track. The edge of the proposed platform will be offset 5.3 feet from the centerline of the proposed track and will be approximately 710 feet long in order to emulate the existing platform per Section 7.7 of the Metrolink Design Criteria Manual. Appendix F1 includes a conceptual layout for the Metrolink Rialto Station that will need to be further developed during the preliminary engineering phase.

A six (6) foot high wire mesh inter-track fence will need to be placed in between the tracks within the station limits and it will need to extend both east and west of the platforms by approximately 150 feet per Section 7.12 of the Metrolink Design Criteria Manual.

Pedestrian circulation between the station platforms will be accommodated by either an underpass or overpass located near the ticketing building that will have minimum dimensions of nine (9) feet wide by nine (9) feet high. The underpass or overpass will be installed per ADA regulations and emergency at-grade crossings may be constructed on both sides of the platforms.

The construction cost for the Metrolink Rialto Station improvements is $6.5 Million per the detailed engineers estimate provided in Appendix G.

5.1.12 CP Central to CP Archibald (MP 34.6 – MP 40.2) Conceptual Design

Track

Universal crossovers have been added to the track alignment to realize the full operational benefit associated with the second main track. In addition, a number of existing industry tracks had to be reconnected into the realigned existing track and/or new track. The following list details the key track alignment considerations associated with the CP Central to CP Archibald double track project which are graphically depicted in the track plans and typical sections located in Appendix C1.

- The centerline of the proposed track needs to be placed 15' offset from the existing track's centerline except where noted on the plans.
- Need to construct a #14 crossover west of Montclair Station at CP Vista to create a universal crossover with an existing #14 crossover.
- Need to remove a #20 crossover at CP Central.
- Need to construct a universal #20 crossover between Baker Avenue and Vineyard Avenue.
- Need to relocate an industry spur's #10 turnout just west of Archibald Avenue.
- Multiple track shifts are necessary throughout the segment to minimize impacts to existing infrastructure such as the:
    - Upland Station and
    - Industry spur near Archibald Avenue
- Track shifts through grade crossings will occur at South Euclid Avenue and Archibald Avenue in order to minimize impacts to existing infrastructure.

Signals

The CP Central to CP Archibald double track project's signal work will consist of the following key work areas:

- Adding a new single crossover to create a universal crossover (two #14 crossovers) control point at CP Vista railroad west of the Monte Vista underpass (MP 34.00),
- Removal of the existing end of double track control point named CP Central railroad west of Central Avenue (MP 34.58),
- Modification of the existing single track bidirectional intermediate signal to a double track bidirectional intermediate signal at Euclid Avenue (MP 36.80),
- Removal of the existing single track bidirectional intermediate signal at Baker Avenue (MP 38.60),
- Installation of a new universal crossover (two #20 crossovers) control point east of Baker Avenue (MP 38.60),
- Removal of the existing end of double track control point named CP Archibald railroad east of Archibald Avenue (MP 40.20) and
- Installation of a new double track intermediate signal railroad east of Archibald Avenue (MP 40.20).

In order to accommodate the second track, railroad signal enclosures will likely have to be replaced within this section of proposed double track except at Central Avenue, Benson Avenue, Hellman Avenue and Archibald Avenue. The double track project's proposed railroad signal equipment is graphically depicted in the grade crossing plans included in Appendix C2 and detailed estimates for the aforementioned signal and communications facilities are included in Appendix G.

Metrolink Upland Station

The Metrolink Upland Station (MP 36.9) is located within the limits of the CP Central to CP Archibald double track project at 300 East "A" Street in Upland, CA, near the intersection of South 2nd Avenue and East "A" Street. The existing station is served by a single side platform located to the north of the existing track.

In order to accommodate the proposed second track, an additional side platform will need to be constructed on the south side of the new main track. The edge of the proposed platform will be offset 5.3 feet from the centerline of the proposed track and will be approximately 700 feet long in order to emulate the existing platform per Section 7.7 of the Metrolink Design Criteria Manual. Appendix F1 includes a conceptual layout for the Metrolink Upland Station that will need to be further developed during the preliminary engineering phase.

Figure 5-5. Metrolink Upland Station

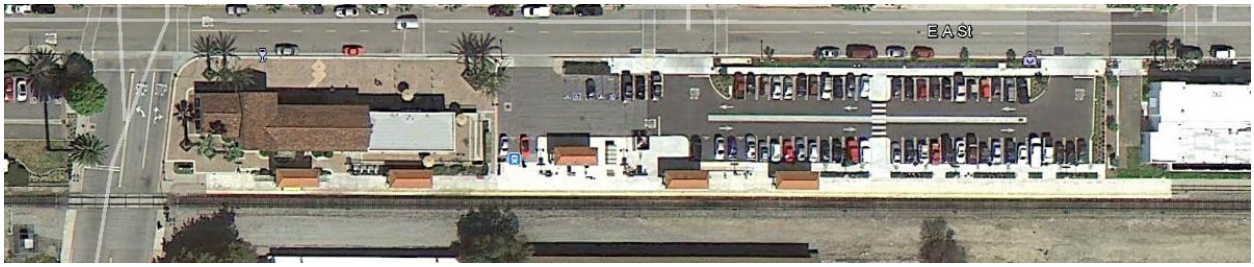


Photo courtesy Google Maps

A six (6) foot high wire mesh inter-track fence will need to be placed in between the tracks within the station limits and it will need to extend 150' to the east and west to the "A" Street right of way per Section 7.12 of the Metrolink Design Criteria Manual.

Pedestrian circulation between the station platforms will be accommodated by either an underpass or overpass located near the ticketing building that will have minimum dimensions of nine (9) feet wide by nine (9) feet high. The underpass or overpass will be installed per ADA regulations and emergency at-grade crossings may be constructed on both sides of the platforms.

The estimated cost of construction for the Metrolink Upland Station improvements is $6.5 Million as detailed in the engineers estimate included in Appendix G.

5.2 CAPITAL COSTS

Conceptual Cost Estimates:

Upon completion of the conceptual engineering layouts for each double track alternative in the fine level screening of alternatives, the HDR team advanced conceptual cost estimates for the three double track projects following the procedures outlined in the Metrolink Design Procedures Manual. The estimates include construction related costs along with "soft costs" consisting of agency and design related costs in order to provide the stakeholders with an accurate understanding of the total project costs. Metrolink "soft costs" were prepared in accordance with Section 5.7 *Project Cost Estimate* of the Metrolink Design Procedures Manual dated July 2010 and the SANBAG "soft costs" were prepared in accordance with formal direction from SANBAG's Chief of Transit and Rail Programs. The detailed cost estimates are included in Appendix G and Table 5-9 provides a summary of costs for the three aforementioned double track alternatives.

Table 5-9. Summary of Capital Costs

Double Track Corridor	Agency	Project Total
Lone Hill Avenue to CP White	METRO	$71.6 M
CP Central to CP Archibald	SANBAG	$103.17 M
CP Lilac to CP Rancho	SANBAG	$70.90 M

An extensive funding analysis for these proposed double track corridors is presented in Chapter 6 *Funding and Financing Strategies.*

6.0 FUNDING AND FINANCING STRATEGIES

This section provides the funding analysis completed for the San Bernardino Line (SBL) Infrastructure Improvement Strategic Plan. As described below, a key challenge for this analysis was developing a conceptual funding strategy that addresses the requirements for two transportation authorities that have separate programming priorities and requirements.

Metro Long Range Transportation Plan (LRTP)

The guiding policy for Metro's funding decisions on transportation projects and programs in Los Angeles County is the adopted 2009 Long Range Transportation Plan (LRTP). Major capital projects and programs that are identified in the 2009 LRTP have priority for future programming of funds. While these projects and programs require further Board approval at various stages of their development, they are priorities for further planning, design, construction, and the pursuit of additional funding. In addition to the LRTP, Metro annually updates its Capital Program, which is a financial plan of proposed capital projects, their costs, and schedules. The Capital Program is designed to meet Metro's infrastructure needs in a responsive and efficient manner. It incorporates the current and future needs of Metro and is updated annually during the annual budgeting process. Appropriations for the capital plan is approved on a life-of project basis and thus do not lapse at the end of the fiscal year. This helps to provide flexible funding over the life of a project and authorizes staff to re-appropriate unexpended revenues and expenses from prior years.

SANBAG Measure I Ten-Year Delivery Plan

The guiding policy for SANBAG's funding decisions is the January 2012 Measure I Ten-Year Delivery Plan. As stated in the Ten-Year Delivery Plan, the purpose of the Plan is to provide a transparent list of projects that will be developed during the next 10 years and to define the scope, schedule, and budget for these projects, given current information and assumptions. The Ten-Year Delivery Plan establishes a common understanding among members of the SANBAG Board, staff, member agencies, and citizens of San Bernardino County; it sets a baseline upon which future changes in revenues, costs, scopes, and schedules, are measured; it enables SANBAG to meet the requirements of bond rating agencies for the future sale of bonds; and it provides the basis for the preparation of SANBAG's annual budgets for capital projects. The 10-Year Delivery Plan is scheduled to be updated every two years to ensure revenue and cost projections stay current.

While the recommended improvement projects developed in the San Bernardino Line Infrastructure Improvement Strategic Plan were not included in either the 2009 LRTP or the Ten-Year Delivery Plan, these projects have the ability to be included in upcoming discussion at both agencies as part of either the annual budget process or future near term/long range transportation plans.

The following sections include a summary of estimated annual project costs for track improvements in need of funding; identification of the most likely near term funding sources for these projects, a summary of other potential sources that may not be available in the near term but could provide funding in the future, and a discussion of conceptual funding scenarios for the recommended projects.

Finally, it should be noted that two primary funding sources in the previously completed Antelope Valley Strategic Plan were not included in this Strategic Plan. Specifically, the FRA High Speed Intercity Passenger Rail Program (HSIPR) and Proposition 1A California High Speed Rail Bonds were not included in this analysis. Based on a meeting with representatives from the California High Speed Rail Authority, it was determined that the earliest the San Bernardino Line may see improvements related to high speed rail would be after FY 2030. As one of the key goals of this study was to identify improvement projects that could be implemented in the near term, the decision was made to exclude

HSIPR funds from this analysis. Proposition 1A High Speed Rail funds, for reasons further explained in Chapter 6.5.4 *Proposition 1A High Speed Rail Bonds – Early Investment*, were also excluded.

6.1 Estimated Project Costs and Funding Need by Year

The following tables summarize the estimated project costs for the two double track improvement projects described in *Sections 5.1.10* and *5.1.11*, Lone Hill to CP White in Los Angeles County and CP Lilac to CP Rancho in San Bernardino County. These costs are expressed in Year of Expenditure (YOE) dollars assuming the start of preliminary engineering and environmental work in FY 2015/16, final design in FY 2016/17, and substantial completion by FY 2019/2020. In October 2013, the Metro Board programmed $3 million in Measure R 3% funds to begin environmental and preliminary engineering on Lone Hill to CP White double track improvements. This project is expected to have completed environmental clearance under NEPA in late 2015/early 2016.

Base costs (in 2013 dollars) are estimated to be $60.5M for Lone Hill to CP White, and $65.8M for CP Lilac to CP Rancho. Escalated at 3 percent annually over the implementation schedule shown below, those costs grow to $70.4M and $75.9M, respectively, indicating an overall funding need of $146.3M. (Note: annual escalation over the implementation schedule shown in Table 6-1 and Table 6-2 results in a higher project cost than the escalated cost shown in Attachment G. Both estimates are derived from the same base year costs.)

Table 6-1. Lone Hill Avenue to CP White, Project Cost by Year (in millions, YOE $)

Task	Duration	2015	2016	2017	2018	2019	2020	Total
Preliminary Engineering	June 2014 - June 2015	1.9	-	-	-	-	-	**1.9**
Final Design	Jan 2016 - Jan 2017	-	1.7	2.0	-	-	-	**3.7**
Construction	July 2017 - Dec 2018	-	-	-	43.8	22.6	-	**66.4**
Total		**$1.9**	**$1.7**	**$2.0**	**$43.8**	**$22.6**	**-**	**$71.9**

Table 6-2. CP Lilac to CP Rancho, Project Cost by Year (in millions, YOE $)

Task	Duration	2015	2016	2017	2018	2019	2020	Total
Preliminary Engineering	Jan 2015 - Jan 2016	0.9	1.1	-	-	-	-	**2.0**
Final Design	Aug 2016 - Aug 2017	-	3.2	0.6	-	-	-	**3.8**
Construction	Feb 2018 - July 2019	-	-	-	19.2	47.5	4.1	**70.8**
Total		**$0.9**	**$4.3**	**$0.6**	**$19.2**	**$47.5**	**$4.1**	**$76.7**

6.2 Identification and Screening of Potential Funding Sources

The HDR Team worked with Metro and SANBAG to identify a "long list" of potential funding sources and revenue streams that not only generate the required level of investment required by the estimated capital costs identified in Chapter 6.1 (approximately $149M), but also represent the most realistic sources in terms of near-term availability. The "long list" encompassed a wide range of federal, State, regional, and local funding sources as enumerated individually in this section.

The "long" list of sources was narrowed into a "short" list based on input from the Project Sponsors and the HDR Team's review of each agency's existing and projected funding commitments, as described in both Metro's LRTP and SANBAG's Ten-Year Delivery Plan. In some cases, the projected funding commitments were based on conceptual capital cost estimates for future projects that are identified as recipients of a given funding source, but for which a specific amount of funding has yet to be

programmed or committed. As such, these projections of future funding availability are approximations and subject to change, but were confirmed by the Project Sponsors as being generally consistent with their own internal programming estimates.

For competitive funding programs, the HDR Team evaluated the project's correlation with program selection criteria and the level of program funding capacity. For FTA Section 5309 Core Capacity, for example, the primary evaluation factor is a 10 percent increase in capacity. For AB 32 Cap and Trade Auction Revenues, the selection criteria has not yet been finalized, but an initial Draft Investment Plan released by the implementing agency indicates that the quantifiable greenhouse gas reduction benefits, especially those directed toward disadvantaged communities, is likely to be a key factor in project competitiveness.

The results of the screening process are shown below in Table 6-3, organized by programming agency (i.e. the entity responsible for determining the use of particular funding programs or sources). For funding availability, three (3) classifications were used: (1) potential near-term availability (in green); (2) limited availability, either based on the projected amount available or the timing of availability being contingent on other factors (in yellow); (3) fully committed to other projects (in red).

Table 6-3. Screening Results – Summary of Potential Funding Sources and Estimated Availability

Programming Agency/Source	Availability	Estimated Range
Metro		
Measure R 3%	●	$20+M annually until FY 2039, PTC first priority.
Proposition C 10%	●	$7M-18M annually
SANBAG		
Measure I 8%	●	$50M-80M cumulative in FY 30-40
Local Transportation Funds (LTF)	●	
CMAQ	●	$10M-15M annually after FY 30
State Transit Assistance (STA)	●	<$1M annually
Caltrans		
Proposition 1B Highway-Railroad Crossing Safety Account (HRCSA)	●	
CHSR		
Proposition 1A High Speed Rail Bonds - Early Investment	●	SB Line not eligible for Phase I
CARB		
AB 32 Cap and Trade Auction Revenues	●	$50M proposed for rail modernization in FY 15, with up to $100-$400M annually thereafter (10% set-aside for disadvantaged communities)
FTA		
Section 5309 New Starts Core Capacity	●	Not likely to be competitive based on ridership projections

Legend:

- Potential Near-Term Availability
- Limited Availability
- Fully Committed to Other Projects

Sources with estimated near-term funding availability, consistent with the project implementation schedule identified by the Project Sponsors, were carried forward for further consideration as the basis for a realistic, fiscally-constrained implementation strategy. Certain sources with limited availability *and* the potential to be used as part of a financing strategy—namely Measure I 8% and Proposition C 10%—were also carried forward.

Other sources with limited availability or those fully committed to other projects were evaluated in Chapter 6.5 of this report for potential applicability to other types of future infrastructure improvements on the San Bernardino Line.

Chapters 6.3 through 6.5 include a detailed program description and discussion of existing funding commitments for each source.

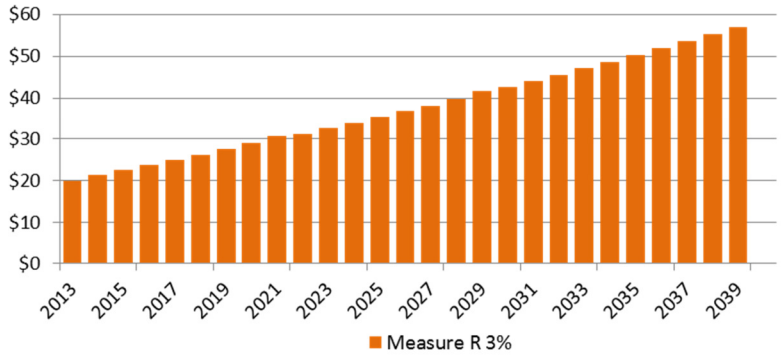
6.3 Sources with Near-Term Funding Availability

6.3.1 Metro Measure R 3%

Program Description

Measure R is a half-cent transportation sales tax approved in November 2008 by Los Angeles County voters to meet the transportation needs of the County. Collection of the tax dedicated to public transit and highway improvements began on July 1, 2009 and will continue for a period of 30 years. The Measure R Ordinance specified that three (3) percent of sales tax collected will be used for Metrolink Capital Improvement Projects within Los Angeles County (Measure R 3%) which is estimated to be $1.1 billion over the 30 year sales tax program.

Figure 6-1. Measure R 3% Estimated Funding Availability



Existing Funding Commitments

As shown in Figure 6-1, Measure R 3% generated approximately $20M in FY 2013, and is expected to grow 3-4% annually through FY 2039. Some funding from this source has been programmed for other projects, as summarized in Table 6-4 below.

Collectively, these projects represent a commitment of nearly $122 million in Measure R 3% funds, out of the $1.1 billion YOE that the sales tax is projected to generate over a 30-year period. Additional planned projects likely to be funded with Measure R 3%, including grade separations and other improvements to the Metrolink Antelope Valley Line, may result in less future funding availability than shown in Figure 6-1.

Table 6-4. Metro Board Programming Actions on Measure R 3% Funds

Project	Total (M)
PTC 09-10 (May 2009)	$10.68
PTC 10-11 (June 2010)	$17.40
ROTEM 20 car option (December 2010)	$18.00
Doran Street Improvements (May 2011)	$6.60
Van Nuys and Raymer PE/NEPA (June 2011)	$0.59
AVL Study (September 2011)	$1.00
Metrolink Rehab Program for FY 2012-13 (June 2012)	$5.75
Metrolink OCTA/Rotem Repayment Year 1 (June 2012)	$4.10
Regional Rail Capital Funding Plan (July 2012)	$18.00
SBDO Line Strategic Study	*$1.00*
LAUS Run Thru Tracks	*$4.00*
Project Study Reports (up to 4)	*$2.00*
LA County Grade Crossing Safety Program	*$2.00*
LA County Grade Separation Priority Program	*$0.50*
LA County Station Needs Assessment	*$0.50*
Brighton to Roxford Engineering and Environmental Clearance	*$3.00*
Hollywood Way Station -- Antelope Valley Line	*$2.00*
Lancaster Station -- add storage capacity	*$3.00*
Rancho Vista Environmental (September 2012)	$3.00
Metrolink OCTA/Rotem Repayment Year 2 (June 2013)	$4.50
Santa Clarita Joint Development Project (June 2013)	$0.25
LOSSAN Start Up Costs (June 2013)	$0.35
Bob Hope Airport Supplemental Funding (May 2013)	$1.70
Vincent Siding Final Design (Oct 2013)	$1.00
Vincent Siding & Platform Construction (Oct 2013)	$6.50
San Bernardino Line Preliminary Engineering (Oct 2013)	$3.00
La Mirada Noise Study (Oct 2013)	$0.10
Van Nuys and Raymer Final Design (January 2014)	$0.00
Branford Street (Feb. 2014)	$1.33

6.3.2 AB 32 Cap and Trade Auction Revenues

Program Description

The Global Warming Solutions Act of 2006, commonly referred to as AB 32, established the goal of reducing greenhouse gas (GHG) emissions statewide to 1990 levels by 2020. To help achieve this goal, the California Air Resources Board (CARB) adopted regulations to establish a new cap-and-trade program that places a "cap" on aggregate GHG emissions from entities responsible for roughly 80 percent of the State's GHG emissions. The ARB will issue carbon allowances that these entities will, in turn, be able to "trade" (buy and sell) on the open market. As part of its plan to issue allowances, ARB will hold quarterly auctions at which time a portion of these allowances will be made available for purchase.

The Legislature adopted—and the Governor signed—a budget for FY 2014/15 that includes the first investment plan for Cap and Trade auction revenues. A Transit and Intercity Rail Capital Program will be established and make available $24.8 million in the first year for commuter and interregional rail and bus rapid transit projects. After FY 2014/15, 10% of annual auction revenue proceeds will be dedicated to this program. The State Transportation Agency will develop guidelines and score applications, while the California Transportation Commission will allocate funds.

Starting on January 1, 2015, fuel distributors will be "covered entities," meaning that they must comply with the carbon cap and purchase carbon allowances through the quarterly CARB auctions to offset their GHG emissions. Based on the number of allowances projected to be sold in future years by CARB, AB 32 proceeds could range from $1.2 billion to $4.3 billion annually, bounded at the low end by the reserve price for allowances (the price "floor" set by CARB to ensure market stability) and at the high end by a significant increase in the market price of carbon. This means the Transit and Intercity Rail Capital Program will generate from $120 million to $430 million per year.

Under AB 1532, the Greenhouse Gas Reduction Fund Investment Plan and Communities Revitalization Act, there is a 25% set aside of AB 32 cap and trade auction revenues for projects that *benefit* "disadvantaged communities" disproportionately impacted by pollution and climate change, and at least 10% must be spent *within* disadvantaged communities designated by the California Environmental Protection Agency (CalEPA). The SB Line is located within designated communities and could be eligible for the 25% set aside. However, Metrolink staff noted that it may be very difficult for commuter rail projects to demonstrate GHG reductions without a load factor of at least 50%. If service frequencies on the SB Line are increased, this may ultimately reduce load factors and work at cross purposes with project competitiveness for cap and trade funding.

Existing Funding Commitments

Auction revenue proceeds collected in FY 2012/13 were pledged to assist utilities in complying with new State requirements for renewable energy production. In the FY 2013/14 Budget, the Governor transferred $500 million from the cap and trade program to the State's General Fund, with the commitment to repay borrowed funds in future years. For the upcoming FY 2014/15 budget, $24.8 million will fund competitive grants for existing rail operators to integrate rail systems and to provide connectivity to high-speed rail.

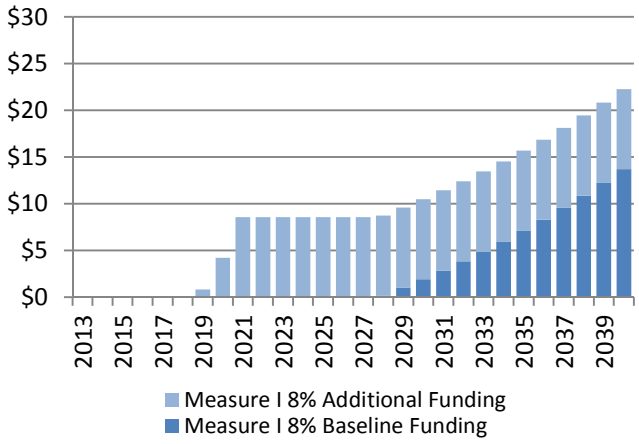
6.4 Sources with Limited Availability

6.4.1 SANBAG Measure I 8%

Program Description

Based on the SANBAG Measure I 2010 – 2040 Strategic Plan, approximately 8% of Measure I funds, or $362M over 30 years (2010-2040), is projected to be available for Metrolink. Eligible expenditures of Metrolink/Rail Service funds include purchase of additional commuter rail passenger cars and locomotives for use on Metrolink lines serving San Bernardino County; construction of additional track capacity necessary to operate more passenger trains on Metrolink lines serving San Bernardino County; construction of additional parking spaces at

Table 6-5. Projected Measure I 8% Availability



Metrolink stations in San Bernardino County; and provision of funds to match State and federal funds used to maintain the railroad track, signal systems, and road crossings for passenger rail service in San Bernardino County, construction and operation of a new passenger rail service between the cities of San Bernardino and Redlands.

Year	Baseline	Add'l	Total (M)
2019	$0.0	$0.8	$0.8
2020	$0.0	$4.2	$4.2
2021	$0.0	$8.6	$8.6
2022	$0.0	$8.6	$8.6
2023	$0.0	$8.6	$8.6
2024	$0.0	$8.6	$8.6
2025	$0.0	$8.6	$8.6
2026	$0.0	$8.6	$8.6
2027	$0.0	$8.6	$8.6
2028	$0.2	$8.6	$8.8
2029	$1.0	$8.6	$9.6
2030	$1.9	$8.6	$10.5
2031	$2.9	$8.6	$11.4
2032	$3.9	$8.6	$12.4
2033	$4.9	$8.6	$13.5
2034	$6.0	$8.6	$14.5
2035	$7.1	$8.6	$15.7
2036	$8.3	$8.6	$16.9
2037	$9.6	$8.6	$18.1
2038	$10.9	**$8.6**	$19.4
2039	$12.3	$8.6	$20.8
2040	$13.7	$8.6	$22.3
Total	**$82.5**	**$176.6**	**$259.1**

Existing Funding Commitments

Measure I 8% generated approximately $8.8M in FY 2012/13. Rail projects recommended for Measure I 8% funding in SANBAG's Ten-Year Delivery Plan include Metrolink's extension to downtown San Bernardino ($14.8M), Redlands Rail from downtown San Bernardino to University of Redlands ($37.3M), and the Gold Line extension to Montclair ($4.0M, for preliminary engineering only). In addition, over the Ten-Year Delivery Plan period, a total of $52 million in Measure I 8% bond proceeds are identified for future transit capital projects. SANBAG has also indicated that approximately $2.0M per year is being used to meet San Bernardino County's share of system wide operating subsidies for Metrolink.

The SANBAG Board considered a motion at its February 2014 meeting to set rail implementation priorities in the Ten-Year Delivery Plan. This motion, which would have prioritized the double tracking of the Metrolink San Bernardino Line over the Gold Line Extension to Montclair, was sent back to the Commuter Rail and Transit Committee for further consideration. Currently, the anticipated approach is to give equal funding prioritization to both projects. Therefore, additional funding previously assumed to be programmed for the Gold Line Extension may be available for the double tracking of the Metrolink San Bernardino Line sooner than originally anticipated (i.e. prior to Board reprioritization). Figure 6-1 reflects both the baseline level of Measure I 8% funding available independent of Gold Line Extension implementation and additional funding previously assumed to be programmed for the Gold Line Extension (in the form of debt service repayment on Measure I bonds for the project).

Assuming the continued growth of Metrolink operating subsidies, and projecting out debt service associated with the bonding program, the HDR Team calculates that there may be available cash from Measure I 8% for capital projects as early as FY 2019, contingent upon SANBAG Board actions with regard to equal prioritization of funding for both the double tracking of the Metrolink San Bernardino Line and the Gold Line Extension. The total amount of Measure I 8% baseline funding for the CP Lilac to Rancho double track improvements is in the range of $50-80M (in YOE dollars), with $177M potentially available through FY 2040 in additional Measure I 8% funding previously programmed for the Gold Line Extension.

6.4.2 Metro Proposition C 10%

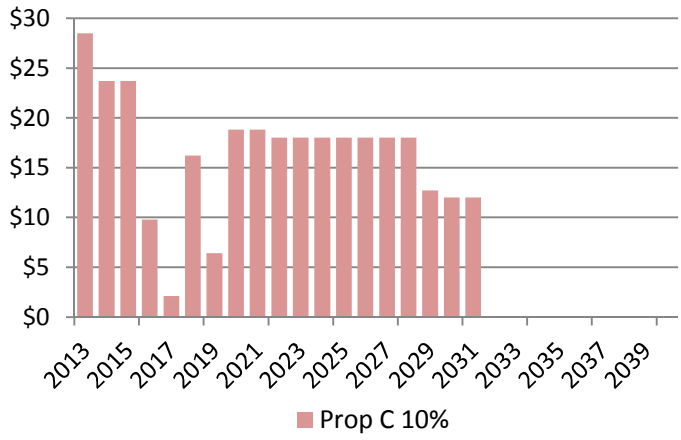
Table 6-6. Prop C 10% Available, by Year

Year	Amount (M)
2013	$28.5
2014	$23.7
2015	$23.7
2016	$9.8
2017	$2.1
2018	$16.2
2019	$6.4
2020	$18.8
2021	$18.8
2022	$18.0
2023	$18.0
2024	$18.0
2025	$18.0
2026	$18.0
2027	$18.0
2028	$18.0
2029	$12.7
2030	$12.0
2031	$12.0
2032	$0.0

Program Description

Proposition C is a permanent voter-enacted half-cent sales tax for public transit purposes approved by voters in 1990. Metro is responsible for administering its funds. Funds flow to Metro, which allocates them to itself and other agencies according to the LACMTA Formula Allocation Procedure, the LACMTA Call for Projects, and LACMTA Board actions. These funds can be leveraged by bonding for capital projects.

Figure 6-2. Prop C 10% Estimated Funding Availability



Metro's current Long Range Financial Plan includes $2.8 billion in Prop C 10% Commuter Rail funds for Metrolink. Of the $2.8 billion, $1.8 billion is allocated to Metro's share of the Metrolink operating subsidy and the remaining $1.0 billion is projected to be used for rehabilitation projects.

Existing Funding Commitments

For FY 2013/14, Metro budgeted a total of $71.76M in Proposition C 10% funds for Metrolink operations, the renovation and rehabilitation program, and ROW security, representing a nearly 20% increase over FY 2012/13, primarily reflecting the costs of implementing Positive Train Control (PTC). Future increases in Metrolink operating and rehabilitation costs, including contractual rate increases for train and engine crews, equipment maintenance, and track and signal maintenance, are limiting Metro's ability to commit Proposition C 10% funds to new capital projects.

As shown in Table 6-6 and Figure 6-3, approximately $7-28M is estimated to be available annually from FY 2013 through FY 2031 for Metrolink capital after netting out other anticipated uses of these funds for Metrolink operations, the renovation and rehabilitation program, and ROW security. As Proposition C 10% is an ongoing revenue source, future updates to the LRTP will identify any additional Proposition C 10% funds that may become available for capital improvements after FY 2031.

6.4.3 Proposition 1B Highway-Railroad Crossing Safety Account (HRCSA)

Program Description

Proposition 1B, passed by California voters in November 2006, provides $250 million for the completion of high-priority grade separation and railroad crossing safety improvements.

Existing Funding Commitments

In August 2008, the CTC allocated these funds to 22 high-priority grade separations and crossings based in part on the priority list established by the California Public Utilities Commission (PUC), the level of

non-State funding match provided by the project sponsors, and project readiness, defined as the ability to start construction by December 2010. In the event that some of the projects on this initial list do not use their allocation in a timely manner, some funding may become available and another solicitation may be held. Around $20 million in HRCSA funds may become available in June 2014.

6.4.4 Congestion Mitigation and Air Quality (CMAQ) Improvement Funds

Program Description

This federal program provides funding to regions that are in non-attainment or maintenance of National Ambient Air Quality Standards (NAAQS) established by the Federal Clean Air Act of 1990. Funds are sub allocated by the State to counties and regions, including Metro and SANBAG, based on a weighted population formula in which regions with ozone and carbon monoxide levels that exceed federal standards receive a larger share of CMAQ funding.

Metro's current long range financial plan assumes future funding will reflect air quality improvements in Los Angeles County. Metro is part of the South Coast Air Quality Basin in Southern California and the deadline for compliance with the latest updated air quality standards is 2020. Accordingly, the annual revenue forecast is reduced beginning in FY 2015, again in FY 2020, and again in FY 2026. Specifically, the financial plan assumes the agency will receive a total of approximately $283 million in FY 2013 and FY 2014. From FY 2015 to FY 2019, Metro would receive an average of approximately $110 million per year. From FY 2020 to FY 2025, annual levels will be reduced to $80 million per year; and, from FY 2026 to FY 2040, Metro assumes it would receive $60 million per year.

Existing Funding Commitments

Metro's current long range financial plan includes approximately $800 million in CMAQ funding for transit projects over the FY 2013 to FY 2040 period. Of this total, approximately $400 million has been programmed to support implementation of new rail transit corridors. An additional $340 million is projected to support the first three years of operating and maintenance costs for new rail transit corridors. While no commuter rail improvement projects are currently programmed to receive CMAQ funds, the projects are eligible to receive funding if opportunities arise in the future.

SANBAG's projected share of CMAQ funds have been programmed in the Measure I Ten-Year Delivery Plan and are allocated in the following priority: i) Regional Programs, ii) transit capital projects, iii) freeway high-occupancy vehicle (HOV) projects. Projects programmed to receive funding include: Redland Passenger Rail Project ($40 million); Metrolink Extension to the downtown San Bernardino Transit Center ($10.3 million) and annual capital contributions to Omnitrans of between $5 million and $7 million per year.

6.5 Sources Fully Committed or Not Carried Forward for Further Consideration

6.5.1 FTA Section 5309 Core Capacity Program

Program Description

While the FTA has not released its proposed criteria for Core Capacity project eligibility as of December 2013, the American Public Transportation Association (APTA) Policy and Planning Committee has prepared preliminary definition and criteria for submittal to FTA. Based on this preliminary definition, and as noted in MAP-21, an eligible project must demonstrate a 10 percent increase in capacity, considering both line and vehicle capacity. A "project" may be made up of several elements (e.g., platform lengthening, power, signalization, vehicles), including:

- *Rolling Stock.* Vehicles alone are not eligible for Core Capacity funds, but may be an element included in a project (e.g., new double track, platform lengthening, or systems improvements yields capacity increase, but additional cars are required).
- *Train Storage.* Train storage as a stand-alone project would also be ineligible, but could be included as a necessary element of a larger project (e.g., additional cars needed for double track project require storage).
- *Station capacity.* A station reconfiguration project could be eligible for Core Capacity funds if the sponsor can demonstrate that circulation improvements will reduce dwell times enough to increase practical train throughput.
- *Station lengthening*. A project that allows longer trains with more cars to operate or multiple buses at a station at one time could be eligible.

Similar to New Starts projects, MAP-21 calls for Core Capacity projects to be evaluated and rated based on project justification criteria and local financial commitment, with "capacity needs of the corridor" an additional criterion unique to such projects.

Existing Funding Commitments
No commitments have been made within this program and no funds were programmed in MAP 21

6.5.2 Local Transportation Funds (LTF)

Program Description

The Transportation Development Act (TDA) of 1971 created in each California county a Local Transportation Fund (LTF) for the transportation purposes specified in the Act (also known as the "Mills-Alquist Deddeh Act," PUC Section 99200). Revenues to the LTF are derived from ¼ cent of the 7.25-cent retail sales tax collected statewide. The State Board of Equalization returns the ¼ cent to each county according to the amount of tax collected in that county. Metro and SANBAG are responsible for allocating funds within their respective counties.

Existing Funding Commitments

Metro has programmed approximately 90 percent of LTF funds for bus operating and capital costs. The only rail project currently identified to receive LTF funds is the North Hollywood Pedestrian Connector. Finally, the current financial plan includes approximately $1.0 million per year for unnamed Agency-wide capital projects.

SANBAG allocates funds to eligible projects based on the specific priority order outlined in PUC Section 99233. The statutory prioritization order reflects the following:

1) Administration;
2) Planning and programming;
3) Pedestrian and bicycle projects;
4) Passenger rail projects (Metrolink, Redlands Rail, other regional rail activities);
5) Consolidated Transportation Service Agency (VTrans); and
6) Transit Operations (Omnitrans).

LTF funds have been programmed in the Measure I Ten-Year Delivery Plan based on the above prioritization lists. This includes $24.2 million in LTF funds programmed for the Metrolink Extension Project and $12.8 million programmed for the Redlands Passenger Rail Project.

6.5.3 State Transit Assistance (STA)

Program Description

In addition to the LTF, the TDA provides for a second source of transit revenue through the STA fund. These revenues are derived from a portion of the state sales tax on gasoline and diesel. Although voters approved Proposition 42 requiring that a portion of the sales tax on fuel be transferred to STA, on a year to year basis there had been extreme volatility in the level the Legislature decided to transfer to the STA versus using these funds to support the General Fund.

In March 2010, the Governor signed ABx 86 and ABx 89 (Gas Tax Swap legislation) which: (1) eliminated the statewide sales tax on gasoline; (2) increased the excise tax on gasoline by 17.3 cents; and (3) increased the sales tax on diesel fuel by 1.75 percent. From these acts, $400 million was appropriated to transit operators to help them fund operations in FY 2010 and FY 2011. Approximately $350 million or 75 percent of the revenue from the increase in diesel fuel sales tax was scheduled to be directed to regional transportation planning agencies for apportionment and allocation to transit operators beginning in FY 2012.

Metro and SANBAG receives allocations from the State under two PUC codes: (1) 99313 (By Population); and (2) 99314 (Operators). Metro uses STA funds for bus and rail operations only. Consistent with historical allocations and with assumptions used to develop the Measure I Ten-Year Delivery Plan, SANBAG restricts the use of the STA-Population allocation to capital projects. At this time and due to the 2010 Gas Tax Swap legislation, SANBAG allows the STA-Operators allocation funds to be used for both operating and capital expenditures.

Existing Funding Commitments

Based on the above, only SANBAG's STA-Population share would be used for capital projects. Reflecting the current planned expansion of the regional rail program, SANBAG's proposed annual STA–Population allocation distribution between FY 2014 and FY 2017 assumes the following:

- Omnitrans: 25 percent (approximately $2.8 million);
- Desert and Mountain areas: 25 percent (approximately $2.8 million); and
- Regional Rail: 50 percent (approximately $5.5 million).

Beginning in FY 2018, this distribution is proposed to change to the following:

- Omnitrans: 50 percent (approximately $5.5 million);
- Desert and Mountain areas: 25 percent (approximately $2.8 million); and
- Regional Rail: 25 percent (approximately $2.8 million).

Related to regional rail, the SANBAG 10-Year Delivery Plan includes $2.3 million for the Metrolink Extension and $21.8 million for the Redland Passenger Rail Project.

6.5.4 Proposition 1A High Speed Rail Bonds – Early Investment

Program Description

The Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century, approved by California voters as Proposition 1A on November 4, 2008, authorized the California Transportation Commission, upon appropriation by the Legislature, to allocate $950 million in funding for capital improvements to intercity rail lines, commuter rail lines and urban rail systems that provide direct connectivity to the State's high-speed rail (HSR) system or that provide capacity enhancements and safety improvements.

The Southern California Association of Governments (SCAG) signed a Memorandum of Understanding (MOU) in April 2012 with the California High Speed Rail Authority. Under the MOU, an additional $500 million in Proposition 1A funds is to be advanced for early investment in shared regional rail and HSR corridors, including the Metrolink corridor from Palmdale to Anaheim. The release of Proposition 1A Early Investment funds is contingent upon a 1:1 percent match with non-Prop 1A funds from regional rail agencies, which have yet to be identified. The Proposition 1A funds can only be spent on improvements located on the Phase 1 alignment. Because the San Bernardino Line is part of Phase II of the CHSR system, it is not eligible for Proposition 1A funding.

Existing Funding Commitments

SCAG, in collaboration with regional agencies, has prioritized a list of early investment projects to be funded with Proposition 1A funds under the MOU, including the SCRIP, double track, grade separation, and other improvements along the Palmdale – Anaheim corridor.

6.6 FINANCING STRATEGIES

In Chapter 6.1, the potential timing and amount of revenues available from Metro and SANBAG to implement track improvements were identified. The Project Sponsors have three primary options available to deliver these improvements:

- Option 1 - on a pay-as-you-go basis, using any combination of local, regional, State, federal, or private funding sources,
- Option 2 - using tax-exempt bonds, secured against each County's respective sales tax measure programs, and
- Option 3 – using a jointly secured Railroad Rehabilitation and Improvement Financing (RRIF) loan, with a combination of funding sources from both Counties pledged as repayment.

This section discusses in greater detail the two potential financing approaches (Options 2 and 3) available to Metro and SANBAG . It should be noted that these options are not mutually exclusive and could be combined as part of an overall funding and financing strategy. Metro or SANBAG could combine Options 1 and 2, using available cash to reduce the level of bond financing required for the project. Options 1 and 3 could also be combined, although it is unlikely that Option 3 would be utilized without the joint financial participation of both agencies. Similarly, Options 2 and 3 would not likely be combined, given the transaction costs associated with each debt instrument relative to the size of the bond/loan being issued.

6.6.1 Tax-Exempt Sales Tax Bonds

The issuance of tax-exempt sales tax bonds is the conventional approach for financing capital improvement projects. Both Metro and SANBAG have highly-rated sales tax financing programs with established access to the capital markets.

Metro Measure R

Since the Measure R sales tax took effect in April 2009, approximately $158M in Measure R tax-exempt sales tax bonds has been issued. Metro's most recent issuance was in 2010 at a long-term rate of 5.00%. The structure of Metro's Measure R program dedicates a portion of annual sales tax revenues for specific purposes. To date, no debt has been issued against the Measure R 3% program for Metrolink improvements; hence, sufficient debt capacity exists to fund the entirety of the $70 million in identified improvements located within Los Angeles County.

SANBAG Measure I

SANBAG's Measure I program, since its extension in November 2004, has issued a total of $165M in sales tax bonds across all programs. Additionally, SANBAG's Ten-Year Delivery Plan provides a summary bonding schedule that estimates the timing and amount of future issuances required to deliver all projects in the Plan. For these future issuances, a long-term average interest rate of 5.75% is assumed. Over the ten-year period ending in FY 2022, a total of $52 million in net bond proceeds is assumed for the Metrolink/Rail component (8%) of the Measure I program.

Table 6-7. Measure I 8% Scheduled Bond Insurances through FY 2022

FY	Issuance (in millions)
2012	$3.0
2014	$22.0
2016	$27.0
2018	-
2020	-
2022	-
Total	**$52.0**

6.6.2 Railroad Rehabilitation and Improvement Financing (RRIF) Loan

Program Description

Administered by the FRA, the RRIF Program provides direct federal loans and loan guarantees to finance the development of railroad infrastructure. The FRA gives priority to projects that provide public benefits, including benefits to public safety, the environment and economic development.

Loans may be used to acquire, improve or rehabilitate intermodal or rail equipment or facilities, including track, track components, bridges, yards, buildings and shops.

Loan Terms

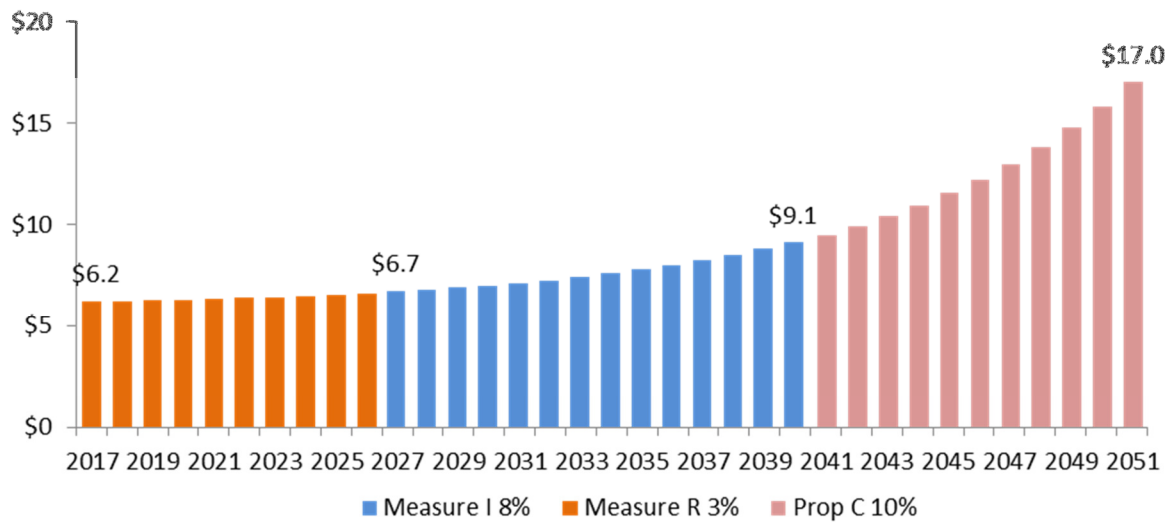
- Direct loans for up to 100% of the project cost
- Repayment periods up to 35 years
- Deferred repayment for up to 6 years
- Interest rates equal to U.S. Treasury rate for comparable-term securities
- A Credit Risk Premium is assessed upfront as a percentage of the total loan amount and varies by the overall risk of each unique transaction.
- Credit Risk Premium can be reduced with collateral, though collateral is not required
- Borrower pays an investigative fee for a financial advisor and outside counsel, if necessary (shall not exceed one half of one percent of the loan amount)

Loan Strategy

The RRIF loan strategy would accelerate implementation of the SANBAG track improvements by leveraging upfront available revenues from Metro's Measure R 3% program to service RRIF loan debt payments in the early years until revenues are available from SANBAG's Measure I 8% program. Metro and SANBAG would jointly secure the RRIF loan over the 35-year term using a combination of Measure R 3%, Measure I 8%, and Proposition C 10% revenues. Figure 6-4 illustrates a potential graduated debt

service repayment schedule on a $150M, 35-year RRIF loan issued at a rate of 3.90%. The purpose of the graduated repayment structure would be to backload repayment of loan principal to the maximum extent allowable by the RRIF program, consistent with identified funding availability. As such, annual payments would increase from $6.2M in Year 1 to $17.0M in Year 35. In Years 1-10, payments would be pledged from Measure R 3% revenues, Years 11-24 from Measure I 8% revenues, and finally Years 25-35 from Proposition C 10% revenues (assuming availability in those years).

Figure 6-3. Potential RRIF Loan Repayment Structure



To ensure an equitable division of debt service responsibilities and to comply with the Measure R requirements related to the use of sales tax funds on infrastructure projects within Los Angeles County, the net present value (NPV) of debt payments pledged by each agency would be proportional to each agency's share of project costs. For example, if both double track improvements were to be implemented, Metro's total share of project costs would be 48.5% ($60.5M of the combined $124.6M cost, in base year 2013 dollars). Accordingly, Metro's total stream of debt service payments on a NPV basis would also be equal to 48.5%.

The primary advantage of the RRIF approach would be to leverage local funds at a below-market interest rate using a program that would be consistent with Metro's proposed America Fast Forward Program and, at the same time, would avoid competition with Metro's other priorities with respect to FTA New Starts and/or the United Stated Department of Transportation (USDOT) Transportation Infrastructure Finance and Innovation Act (TIFIA) loan program. The flexibility of RRIF loan repayment terms would also allow Metro and SANBAG to sculpt debt service payments to match each agency's available cash flows over the 35-year loan term through the combination of Measure R 3%, Measure I 8%, and Proposition C 10% revenues.

6.7 Analysis of Implementation Options

The three implementation options identified in Chapter 6.6 – pay-as-you-go (Option 1), independent project delivery with conventional sales tax financing (Option 2), and joint project delivery with RRIF financing (Option 3) – provide certain advantages as well as certain challenges for Metro and SANBAG.

Table 6-8. Summary of Implementation Options

Option	1	2	3
Implementation	Independent	Independent	Joint
Financing Mechanism	Cash/Internal Borrowing	Sales Tax Bonds	RRIF Loan
Interest Rate	0%	4.50% - 5.75%	3.90% - 4.40%
Maximum Loan Term	n/a	25	35
Estimated Earliest Delivery Date			
Lilac to Rancho	2035-2040	2025-2030	2017/18
Lone Hill to White	2018/19	2018/19	2018/19

This section of the report lays out some of the key considerations associated with each option. The purpose of this analysis is not to recommend a preferred option, but rather to inform the Project Sponsors' decision-making process and encourage continued interagency discussion on the available options.

6.7.1 Option 1 – Independent Delivery Using a Pay-as-You-Go Approach

Under Option 1, Metro and SANBAG would use available cash to implement the improvements located within each agency's County on a pay-as-you-go basis. Each agency would take individual responsibility for delivering the necessary amount of funding. This approach would afford Metro and SANBAG maximum flexibility and autonomy to obtain environmental clearance for their respective improvement projects on their own timetable. By implementing these projects independently, each agency would also be unaffected by potential schedule and cost impacts associated with the other agency's project.

Currently, SANBAG does not have enough near-term cash available through its various funding programs to pursue Option 1 at this time. The earliest it could do so based on projected availability of Measure I 8% would be FY 2035, although other funding opportunities may arise in the interim allowing the CP Lilac to Rancho project to be accelerated. Given fiscal constraints, only Metro would realistically be able to take advantage of a pay-as-you-go approach through the near-term availability of Measure R 3% funds. Assuming an accrual rate of approximately $20M year for Measure R 3%, Metro would either have to reserve the full annual amount of its Measure R 3% funds for three to four years to meet the capital funding needs of the CP Lone Hill to White segment or borrow internally against future anticipated cash proceeds. Under this approach, the CP Lone Hill to White segment could be implemented as early as FY 2018 or FY 2019, according to Metro staff.

There are also risks to take into consideration with a pay-as-you-go approach, namely the potential for "available" or uncommitted Measure R 3% cash funds to be used for other short-term needs or other projects with a higher prioritization. In FY 2012/2013, a portion of Measure R 3% was used to "backfill" Metro's subsidy allocation commitments to Metrolink's rehabilitation program normally paid from its Proposition C 10% program. With the cost of these subsidies likely to increase at a rate faster than the growth in sales tax revenues, the risk of Measure R 3% being drawn upon as a supplement to the Metrolink rehabilitation program also increases, reducing the amount of cash available for new capital projects over time. Options 2 and 3, by contrast, offer the advantage of "locking in" Measure R funds through a loan commitment, but also higher costs associated with financing.

6.7.2 Option 2 - Independent Project Delivery Using Conventional Sales Tax Financing

Under Option 2, Metro and SANBAG would, similar to Option 1, take individual responsibility for delivering the improvements located within each agency's County through the issuance of sales tax bonds using available debt capacity in their respective Measure programs.

In terms of financing capacity, Metro is constrained by the FY 2039 sunset date of its Measure R 3% program and the limited availability of Proposition C 10% revenues, which together reduce opportunities

for the issuance of longer-dated sales tax bonds. There is the potential for a 30-year extension of the Measure R half-cent sales tax to be put before voters as early as November 2016. A Measure R extension would likely contain the same provision for 3 percent of sales tax dollars to be dedicated to the commuter rail program. If passed, this would create an additional stream of revenue beyond FY 2039 that could be leveraged to finance additional projects, but such an extension may not have a measurable impact on the financing options available to Metro or implementation schedule of the Lone Hill to CP White double track improvement, which Metro intends to begin implementing before 2018.

SANBAG has identified the level of bonding that it intends to pursue for the implementation of projects identified in its 10-Year Delivery Plan, which covers through FY 2023. Recently, the SANBAG Board of Directors recommended giving equal funding priority to the CP Lilac to Rancho double track improvement and Gold Line Extension to Montclair. Depending on the outcome of this programming effort, Measure I 8% bond capacity could be available for the double track improvements as early as FY 2019 under a "best case" scenario. At that time, 20 years prior to the expiration of Measure I in FY 2040, the term of any Measure I bonds would be shorter and consequently the leverage achieved through the bonding program would be significantly reduced. In addition, delayed implementation would lead to significant inflation impacts.

6.7.3 Option 3 – Joint Project Delivery Using Railroad Rehabilitation Improvement Financing

Option 3 would provide a financing option likely to be less costly than conventional sales tax bonding, because RRIF loans are subsidized by the federal government and the rates are linked to the 30-year Treasury note, currently at 3.89% (as of December 4, 2013). RRIF loans also provide a maximum 35-year amortization period, longer than the typical sales tax bond. In fact, due to the sun setting of Measure R in FY 2039 and Measure I in FY 2040, the maximum tenor of a sales tax bond used in Option 2 would be 25 years, resulting in higher annual debt service payments (but potentially lower overall interest costs over the life of the bond). By reducing annual debt service payments, the longer RRIF loan term would allow Metro and SANBAG to balance its financial commitments to the San Bernardino Line with other regional rail priorities that also draw upon the Measure R and Measure I programs.

Under Option 3, SANBAG would be a key beneficiary of acceleration in project delivery, avoiding the inflation impacts associated with delayed implementation. Completion of CP Lilac to Rancho would provide a safer and more reliable passenger rail experience for SANBAG constituent's years earlier than currently planned, and reduce diesel emissions associated with freight trains in communities already disproportionately affected by environmental impacts related to goods movement. Metro may also directly benefit from a coordinated procurement, which could yield cost savings through economies of scale, as the scope of work for each double track segment is likely to require similar forms of construction expertise.

The benefits of securing a RRIF loan may ultimately extend beyond the accelerated implementation of projects identified in this report. Metro and SANBAG can use a jointly secured RRIF loan as a strategic opportunity to solidify and strengthen each agency's relationships with the FRA, thereby enabling a pipeline of regional rail improvements to be underwritten by the FRA more easily in the future, as the FRA becomes more familiarized with the financial profile of each of the Project Sponsors. Option 3 also presents an opportunity for Metro and SANBAG to clarify their long-range capital programming priorities and jointly deliver projects that will be of mutual benefit to commuters in both Counties.

Challenges with RRIF Loan Approach

The Team also identified a number of challenges associated with the RRIF Loan approach:

- **RRIF Senior Lien Requirement.** Metro would require a RRIF loan to be subordinate to its sales tax revenue bonds. FRA, on the other hand, requires a senior lien on revenues pledged as

repayment. This issue was identified during a RRIF Loan Workshop held with FRA Deputy Administrator Karen Hedlund on November 5, 2013. One potential workaround is to create a special purpose vehicle (SPV), a legal entity separate from Metro and SANBAG to which both agencies would make payments adequate for the RRIF loan repayment. The RRIF loan would then have a senior lien on the revenues of that SPV. This approach was successfully used to secure Metro's first TIFIA loan (on its Crenshaw/LAX Light Rail Transit project) to address the same issue.

- **Upfront Cost of Credit Risk Premium (CRP)**. FRA requires the Credit Risk Premium (CRP) on a RRIF loan to be paid upfront; unlike other types of fees, it cannot be capitalized into the loan. The sales tax revenues being proposed to secure the RRIF loan are generally considered to be more stable and creditworthy than user-based fees (such as fare revenues); however, the CRP associated with this project is likely to be higher than zero percent. Upfront payment of the CRP would be an additional point of negotiation to be resolved between Metro and SANBAG. The back loading of the debt repayment schedule may also increase the CRP—and overall financing cost—associated with the loan.
- **Measure I 8% Availability.** SANBAG's annual debt service is estimated to range from $6.7-9.1 million annually under a graduated repayment schedule (see Figure 6-3). Available Measure I 8% revenues are forecast to be less than annual debt service. Therefore, SANBAG would have to identify and commit additional revenues for this option to be viable.
- **Availability of Funds After FY 2040.** To take full advantage of the 35-year loan term offered by the RRIF program, Metro would have to pledge Proposition C 10% for all debt service payments after FY 2040, at which point both Measure R and Measure I will have expired. As described in Chapter 6.4.3, Proposition C 10% funds are, as a first priority, currently used for Metrolink operating subsidies and its renovation and rehabilitation program, the cost of which have been increasing at a faster rate than sales tax revenue annual growth. Over the long term, should cost growth continue to outpace revenue growth, the availability of Proposition C 10% funds for new transit capital projects may be severely limited.
- **Restrictions on Use of Measure R 3%.** The original Measure R ballot initiative contains language prohibiting the use of Measure R 3% funds on infrastructure projects with a "physical imprint" outside County borders. Metro legal counsel would need to further clarify the permissibility of securing a RRIF loan that commingles Measure R 3% with other repayment sources for projects in both Los Angeles and San Bernardino Counties.

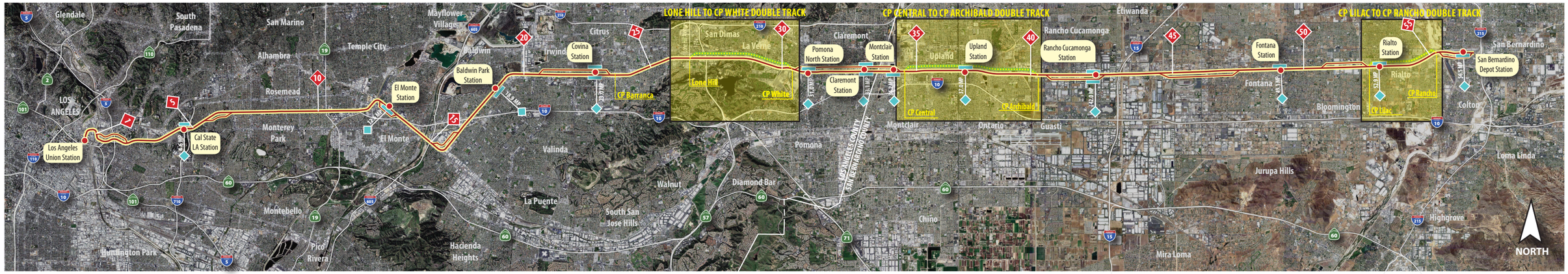
APPENDIX A

Maps

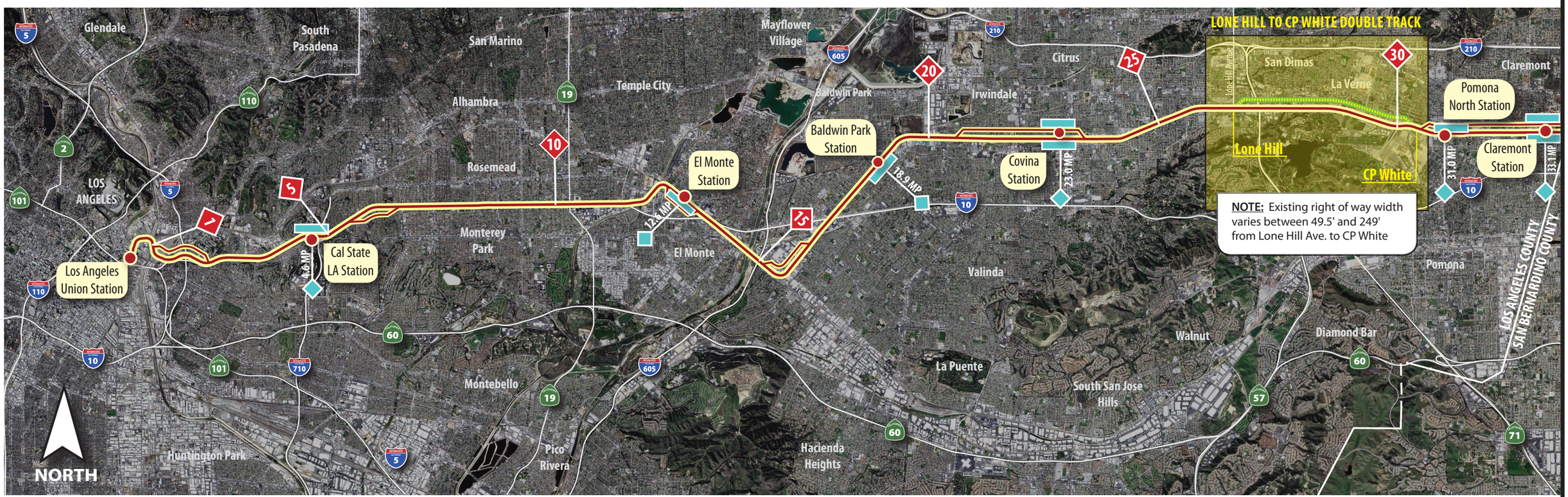
APPENDIX A1

San Bernardino Line Double Track Projects

SAN BERNARDINO LINE DOUBLE TRACK PROJECTS



Los Angeles County Portion



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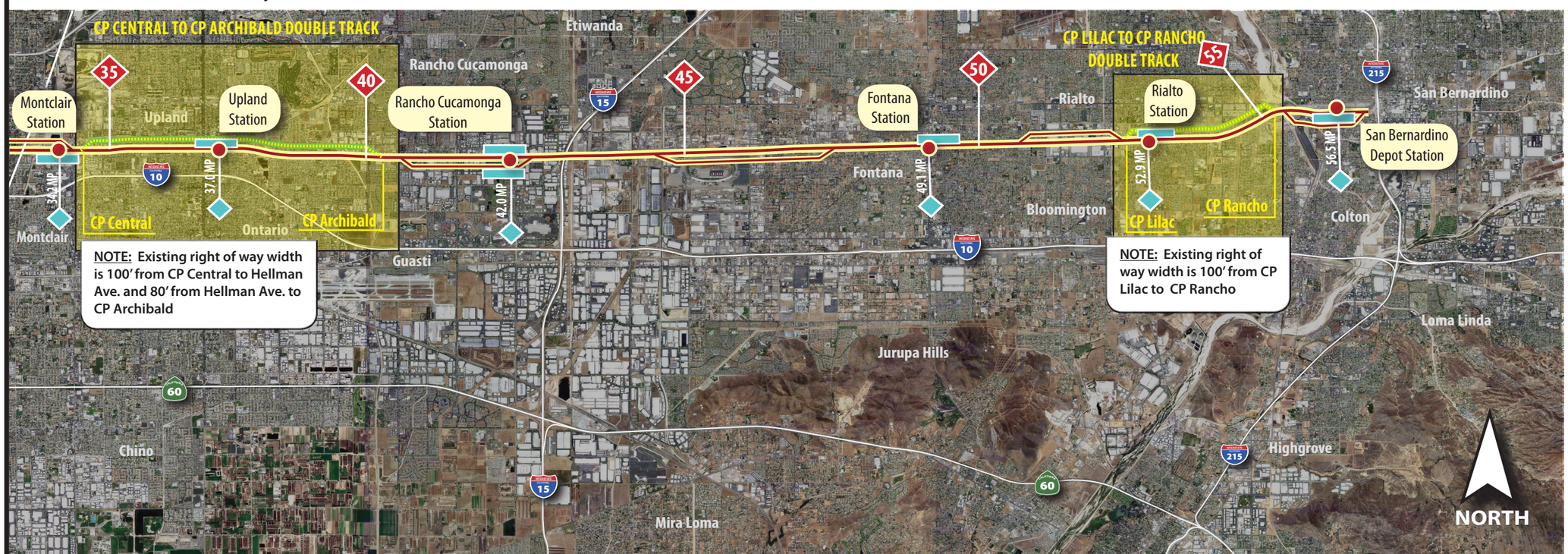
Metro | Governments SANBAG Working Together | METROLINK | HDR

SAN BERNARDINO LINE DOUBLE TRACK PROJECTS

San Bernardino County Portion



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APPENDIX A2

San Bernardino Line Planned Capital Improvement Projects and Private Development

FUTURE CAPITAL IMPROVEMENT PROJECTS ON THE SAN BERNARDINO LINE

Los Angeles County Portion

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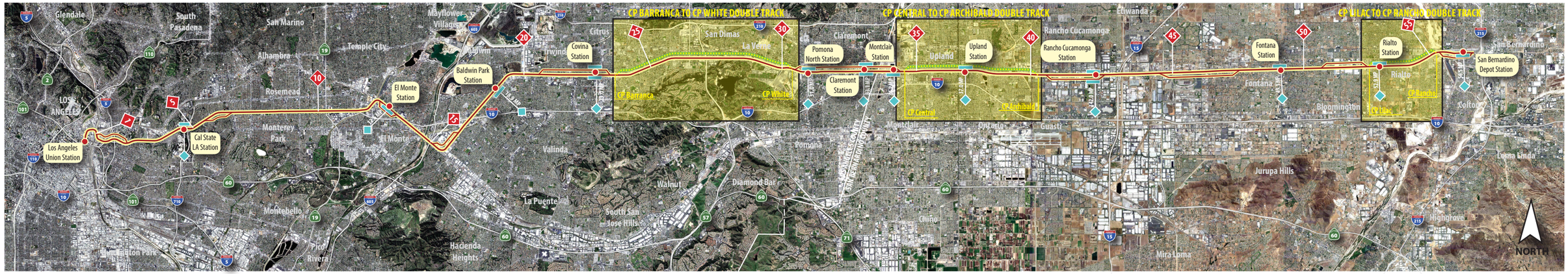
FUTURE CAPITAL IMPROVEMENT PROJECTS ON THE SAN BERNARDINO LINE



San Bernardino County Portion

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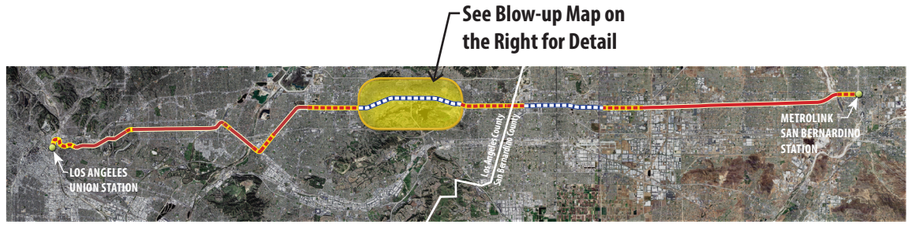
PAGE 2 OF 2

APPENDIX A3

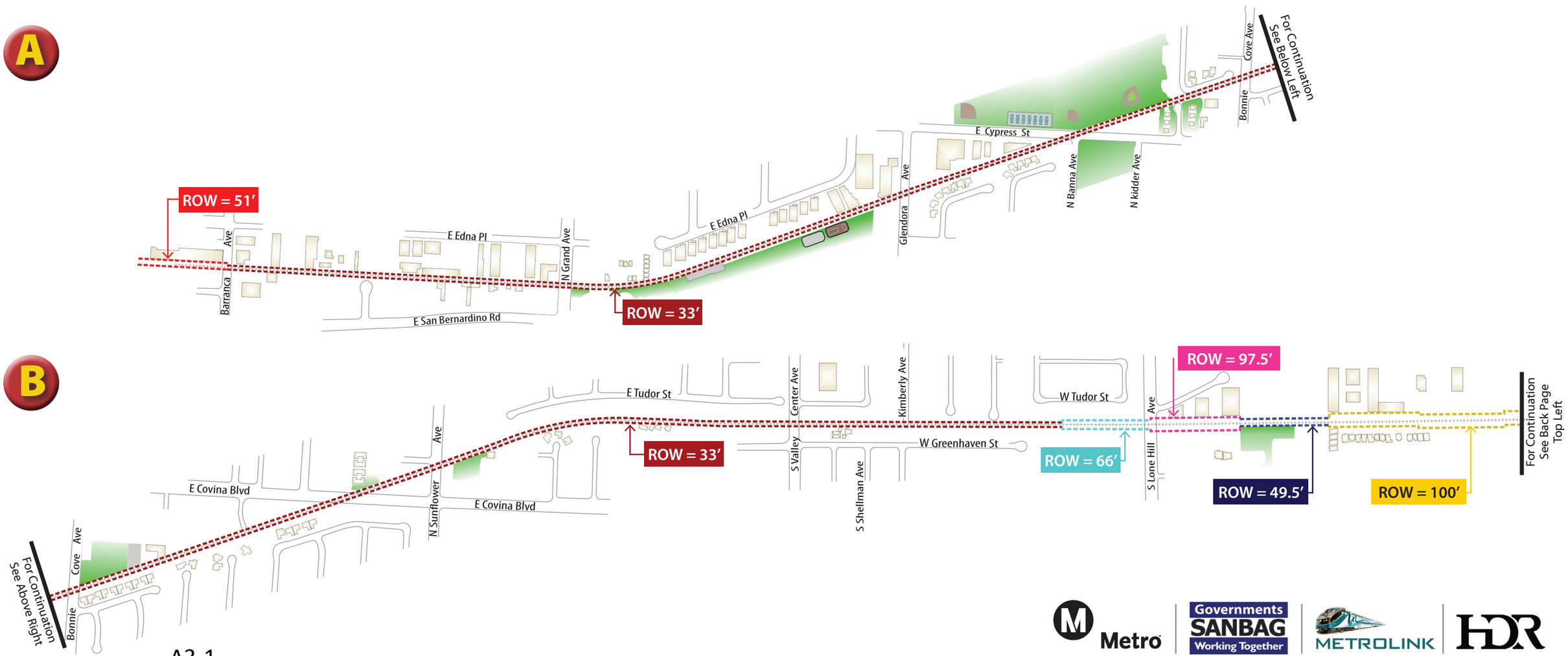
CP Barranca to CP White Right-of-Way

CP Barranca to CP White Right-of-Way Widths

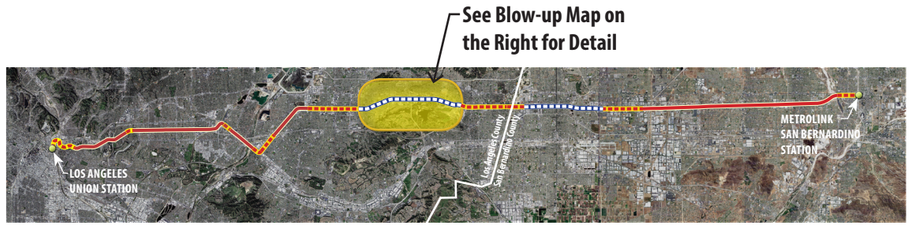


TRACK MAP LEGEND

- San Bernardino Existing Single Track
- San Bernardino Existing Double Track
- San Bernardino Proposed Double Track

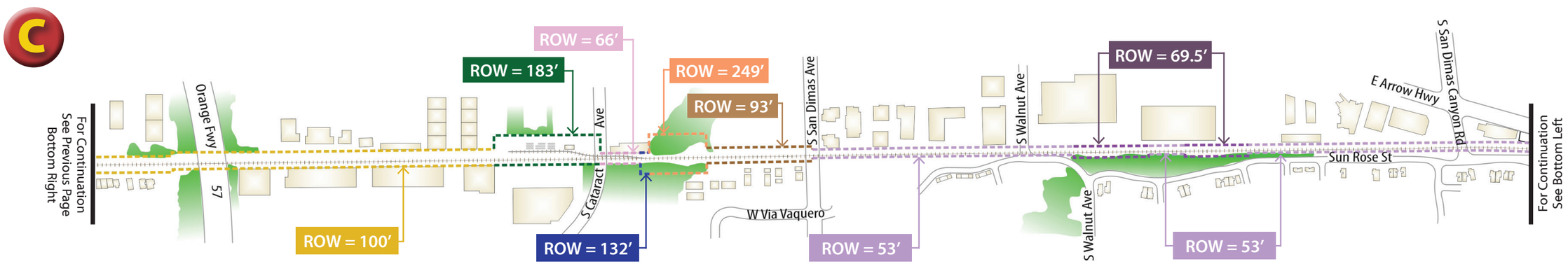


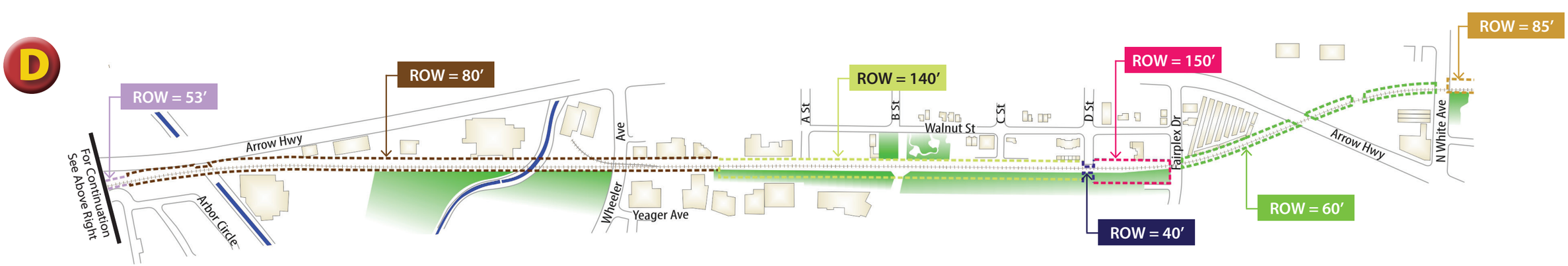
CP Barranca to CP White Right-of-Way Widths



TRACK MAP LEGEND

- San Bernardino Existing Single Track
- San Bernardino Existing Double Track
- San Bernardino Proposed Double Track





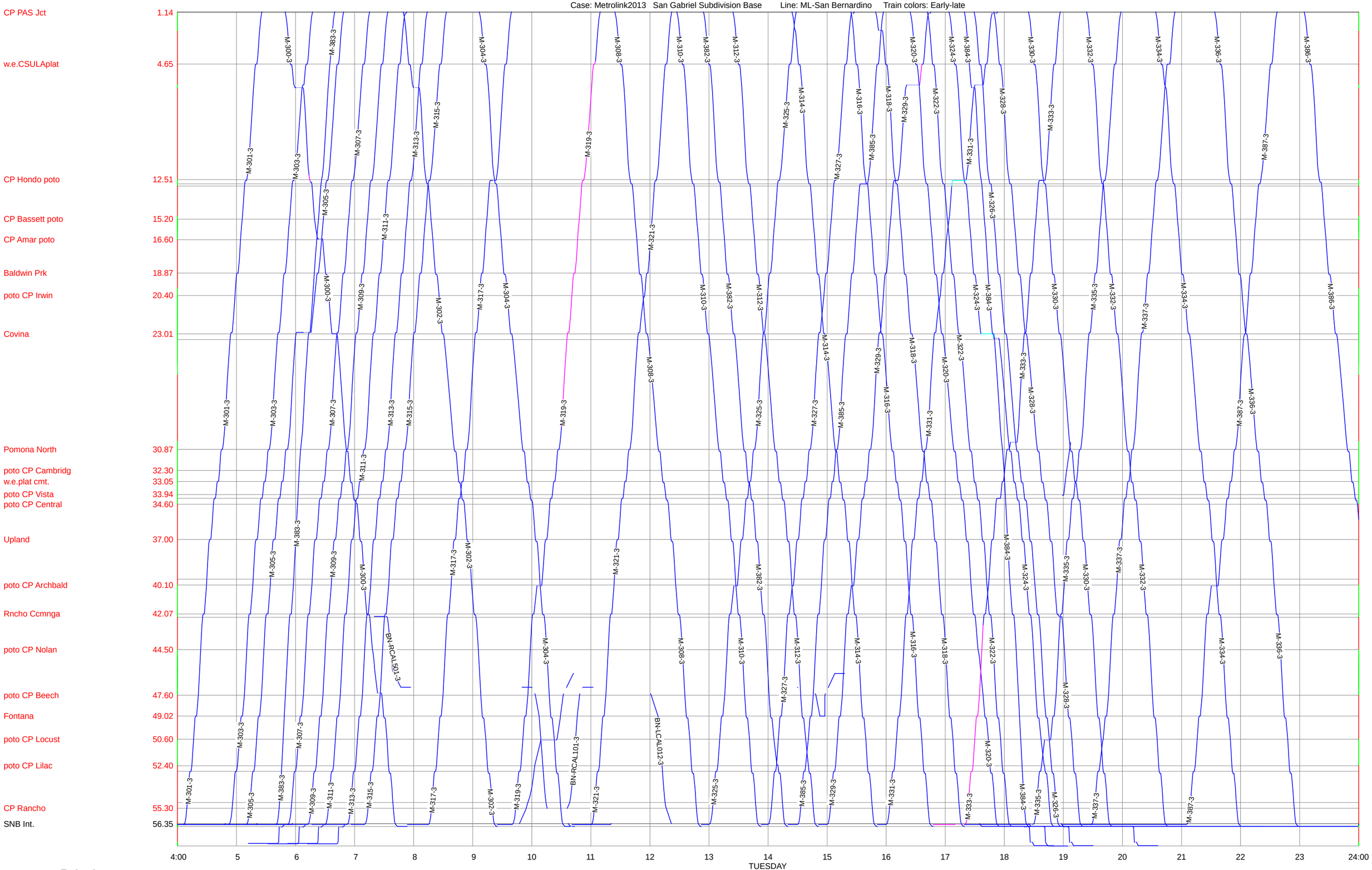
APPENDIX B

Infrastructure Modeling

APPENDIX B1

SBL Stringline Chart

Case: Metrolink2013 San Gabriel Subdivision Base Line: ML-San Bernardino Train colors: Early-late



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APPENDIX B2

Existing and Proposed Train Schedules

Eastbound

Metrolink Service No.	M-300	M-302	M-304	M-308	M-310	M-382	M-312	M-314	M-316	M-318	M-320	M-322	M-324	M-384	M-326	M-328	M-330	M-332	M-334	M-336	M-386
L.A. Union Station	5:45:00 AM	7:45:00 AM	9:02:00 AM	11:20:00 AM	12:20:00 PM	12:50:00 PM	1:20:00 PM	2:20:00 PM	3:20:00 PM	3:45:00 PM	4:20:00 PM	4:38:00 PM	5:00:00 PM	5:15:00 PM	5:25:00 PM	5:45:00 PM	6:20:00 PM	7:20:00 PM	8:30:00 PM	9:30:00 PM	11:00:00 PM
Cal State L.A.	5:56:00 AM	7:55:00 AM	9:11:00 AM	11:30:00 AM	12:30:00 PM	1:00:00 PM	1:30:00 PM	2:30:00 PM	3:30:00 PM	3:55:00 PM	4:30:00 PM	4:48:00 PM	5:10:00 PM		5:35:00 PM	5:55:00 PM	6:30:00 PM	7:30:00 PM	8:40:00 PM	9:40:00 PM	11:10:00 PM
El Monte	12:00:00 AM	8:09:00 AM	9:21:00 AM	11:40:00 AM	12:40:00 PM	12:00:00 AM	1:40:00 PM	2:40:00 PM	3:40:00 PM	4:05:00 PM	4:40:00 PM	4:58:00 PM	5:20:00 PM		5:45:00 PM	6:05:00 PM	6:40:00 PM	7:39:00 PM	8:49:00 PM	9:49:00 PM	12:00:00 AM
Baldwin Park	6:31:00 AM	8:22:00 AM	9:29:00 AM	11:48:00 AM	12:48:00 PM	1:18:00 PM	1:48:00 PM	2:48:00 PM	3:48:00 PM	4:13:00 PM	4:48:00 PM	5:06:00 PM	5:28:00 PM		5:53:00 PM	6:13:00 PM	6:48:00 PM	7:47:00 PM	8:57:00 PM	9:57:00 PM	11:27:00 PM
Covina	6:42:00 AM	8:29:00 AM	9:35:00 AM	11:55:00 AM	12:55:00 PM	1:25:00 PM	1:55:00 PM	2:55:00 PM	3:55:00 PM	4:20:00 PM	4:55:00 PM	5:13:00 PM	5:48:00 PM	5:44:00 PM	6:00:00 PM	6:20:00 PM	6:55:00 PM	7:54:00 PM	9:03:00 PM	10:03:00 PM	11:33:00 PM
Pomona (North)	6:52:00 AM	8:39:00 AM	9:45:00 AM	12:05:00 PM	1:05:00 PM	1:35:00 PM	2:05:00 PM	3:05:00 PM	4:05:00 PM	4:30:00 PM	5:05:00 PM	5:23:00 PM	5:59:00 PM		6:10:00 PM	6:30:00 PM	7:05:00 PM	8:04:00 PM	9:13:00 PM	10:13:00 PM	11:43:00 PM
Claremont	6:56:00 AM	8:43:00 AM	9:49:00 AM	12:09:00 PM	1:09:00 PM	1:39:00 PM	2:09:00 PM	3:09:00 PM	4:09:00 PM	4:34:00 PM	5:09:00 PM	5:27:00 PM	6:03:00 PM		6:14:00 PM	6:34:00 PM	7:09:00 PM	8:08:00 PM	9:17:00 PM	10:17:00 PM	11:47:00 PM
Montclair	6:59:00 AM	8:46:00 AM	9:52:00 AM	12:12:00 PM	1:12:00 PM	1:42:00 PM	2:12:00 PM	3:12:00 PM	4:12:00 PM	4:37:00 PM	5:12:00 PM	5:30:00 PM	6:06:00 PM		6:17:00 PM	6:37:00 PM	7:12:00 PM	8:11:00 PM	9:20:00 PM	10:20:00 PM	11:50:00 PM
Upland	7:07:00 AM	8:51:00 AM	9:57:00 AM	12:17:00 PM	1:17:00 PM	1:47:00 PM	2:17:00 PM	3:17:00 PM	4:17:00 PM	4:42:00 PM	5:17:00 PM	5:35:00 PM	6:11:00 PM		6:22:00 PM	6:42:00 PM	7:17:00 PM	8:16:00 PM	9:25:00 PM	10:25:00 PM	11:55:00 PM
Rancho Cucamonga	7:15:00 AM	8:58:00 AM	10:04:00 AM	12:24:00 PM	1:24:00 PM	1:54:00 PM	2:24:00 PM	3:24:00 PM	4:24:00 PM	4:49:00 PM	5:24:00 PM	5:42:00 PM	6:18:00 PM	6:04:00 PM	6:31:00 PM	6:49:00 PM	7:24:00 PM	8:23:00 PM	9:32:00 PM	10:32:00 PM	12:02:00 AM
Fontana	7:30:00 AM	9:07:00 AM	10:13:00 AM	12:33:00 PM	1:33:00 PM	2:03:00 PM	2:33:00 PM	3:33:00 PM	4:33:00 PM	4:58:00 PM	5:33:00 PM	5:50:00 PM	6:27:00 PM		6:40:00 PM	6:58:00 PM	7:33:00 PM	8:32:00 PM	9:41:00 PM	10:41:00 PM	12:11:00 AM
Rialto	7:35:00 AM	9:13:00 AM	10:19:00 AM	12:39:00 PM	1:39:00 PM	2:09:00 PM	2:41:00 PM	3:39:00 PM	4:39:00 PM	5:04:00 PM	5:39:00 PM	5:55:00 PM	6:35:00 PM		6:46:00 PM	7:04:00 PM	7:39:00 PM	8:38:00 PM	9:47:00 PM	10:47:00 PM	12:17:00 AM
San Bernardino	7:50:00 AM	9:30:00 AM	10:35:00 AM	12:50:00 PM	1:50:00 PM	2:20:00 PM	2:50:00 PM	3:50:00 PM	4:50:00 PM	5:25:00 PM	5:55:00 PM	6:10:00 PM	6:45:00 PM	6:20:00 PM	7:05:00 PM	7:20:00 PM	7:55:00 PM	8:50:00 PM	10:00:00 PM	11:00:00 PM	12:30:00 AM
Total schedule time	00:02:05:00	00:01:45:00	00:01:33:00	00:01:30:00	00:01:30:00	00:01:30:00	00:01:30:00	00:01:30:00	00:01:30:00	00:01:40:00	00:01:35:00	00:01:32:00	00:01:45:00	00:01:05:00	00:01:40:00	00:01:35:00	00:01:35:00	00:01:30:00	00:01:30:00	00:01:30:00	00:01:30:00

Westbound

Metrolink Service No.	M-301	M-303	M-305	M-383	M-307	M-309	M-311	M-313	M-315	M-317	M-319	M-321	M-325	M-327	M-385	M-329	M-331	M-333	M-335	M-337	M-387
San Bernardino	12:00:00 AM	4:52:00 AM	12:00:00 AM	5:40:00 AM	5:52:00 AM	12:00:00 AM	6:30:00 AM	12:00:00 AM	7:10:00 AM	8:15:00 AM	9:40:00 AM	11:00:00 AM	1:00:00 PM	2:00:00 PM	2:30:00 PM	3:00:00 PM	4:00:00 PM	5:10:00 PM	12:00:00 AM	7:28:00 PM	9:05:00 PM
Rialto	4:12:00 AM	4:58:00 AM	5:17:00 AM		5:58:00 AM	6:18:00 AM	6:36:00 AM	6:58:00 AM	7:16:00 AM	8:21:00 AM	9:46:00 AM	11:06:00 AM	1:06:00 PM	2:06:00 PM	2:36:00 PM	3:06:00 PM	4:06:00 PM	5:15:00 PM	6:31:00 PM	7:34:00 PM	9:11:00 PM
Fontana	4:17:00 AM	5:03:00 AM	5:23:00 AM		6:03:00 AM	6:23:00 AM	6:41:00 AM	7:03:00 AM	7:21:00 AM	8:26:00 AM	9:51:00 AM	11:11:00 AM	1:11:00 PM	2:11:00 PM	2:41:00 PM	3:11:00 PM	4:11:00 PM	5:20:00 PM	6:45:00 PM	7:39:00 PM	9:16:00 PM
Rancho Cucamonga	4:24:00 AM	5:11:00 AM	5:32:00 AM	5:53:00 AM	6:11:00 AM	6:31:00 AM	6:49:00 AM	7:11:00 AM	7:29:00 AM	8:34:00 AM	9:59:00 AM	11:19:00 AM	1:19:00 PM	2:19:00 PM	2:49:00 PM	3:19:00 PM	4:19:00 PM	5:32:00 PM	6:56:00 PM	7:47:00 PM	9:24:00 PM
Upland	4:31:00 AM	5:18:00 AM	5:39:00 AM		6:18:00 AM	6:38:00 AM	6:56:00 AM	7:18:00 AM	7:36:00 AM	8:41:00 AM	10:06:00 AM	11:26:00 AM	1:26:00 PM	2:26:00 PM	2:56:00 PM	3:26:00 PM	4:26:00 PM	5:46:00 PM	7:03:00 PM	7:54:00 PM	9:36:00 PM
Montclair	4:36:00 AM	5:23:00 AM	5:44:00 AM		6:23:00 AM	6:43:00 AM	7:01:00 AM	7:23:00 AM	7:41:00 AM	8:46:00 AM	10:11:00 AM	11:31:00 AM	1:31:00 PM	2:31:00 PM	3:01:00 PM	3:31:00 PM	4:31:00 PM	5:56:00 PM	7:08:00 PM	7:59:00 PM	9:41:00 PM
Claremont	4:39:00 AM	5:26:00 AM	5:47:00 AM		6:26:00 AM	6:46:00 AM	7:04:00 AM	7:26:00 AM	7:44:00 AM	8:49:00 AM	10:14:00 AM	11:34:00 AM	1:34:00 PM	2:34:00 PM	3:04:00 PM	3:34:00 PM	4:34:00 PM	5:59:00 PM	7:11:00 PM	8:02:00 PM	9:44:00 PM
Pomona (North)	4:43:00 AM	5:30:00 AM	5:52:00 AM		6:30:00 AM	6:50:00 AM	7:08:00 AM	7:30:00 AM	7:48:00 AM	8:53:00 AM	10:18:00 AM	11:38:00 AM	1:38:00 PM	2:38:00 PM	3:08:00 PM	3:38:00 PM	4:38:00 PM	6:05:00 PM	7:15:00 PM	8:06:00 PM	9:48:00 PM
Covina	4:52:00 AM	5:39:00 AM	12:00:00 AM	6:14:00 AM	6:39:00 AM	7:01:00 AM	7:17:00 AM	7:39:00 AM	7:57:00 AM	9:02:00 AM	10:27:00 AM	11:47:00 AM	1:47:00 PM	2:47:00 PM	12:00:00 AM	3:47:00 PM	4:47:00 PM	6:17:00 PM	7:24:00 PM	8:15:00 PM	12:00:00 AM
Baldwin Park	4:58:00 AM	5:45:00 AM	6:22:00 AM		6:45:00 AM	7:07:00 AM	7:23:00 AM	7:45:00 AM	8:03:00 AM	9:08:00 AM	10:33:00 AM	11:53:00 AM	1:53:00 PM	2:53:00 PM	3:23:00 PM	3:53:00 PM	4:53:00 PM	6:23:00 PM	7:30:00 PM	8:21:00 PM	10:03:00 PM
El Monte	5:07:00 AM	5:54:00 AM	6:32:00 AM		6:54:00 AM	7:16:00 AM	7:32:00 AM	7:54:00 AM	8:12:00 AM	9:20:00 AM	10:42:00 AM	12:02:00 PM	2:02:00 PM	3:02:00 PM	12:00:00 AM	4:12:00 PM	5:21:00 PM	6:40:00 PM	7:38:00 PM	8:29:00 PM	12:00:00 AM
Cal State L.A.	5:17:00 AM	6:05:00 AM	6:43:00 AM		7:05:00 AM	7:27:00 AM	7:43:00 AM	8:05:00 AM	8:23:00 AM	9:31:00 AM	10:54:00 AM	12:13:00 PM	2:13:00 PM	3:13:00 PM	3:49:00 PM	4:37:00 PM	5:41:00 PM	6:51:00 PM	7:49:00 PM	8:48:00 PM	10:22:00 PM
L.A. Union Station	5:30:00 AM	6:20:00 AM	7:01:00 AM	6:37:00 AM	7:20:00 AM	7:43:00 AM	7:50:00 AM	8:20:00 AM	8:40:00 AM	9:45:00 AM	11:15:00 AM	12:30:00 PM	2:30:00 PM	3:30:00 PM	4:05:00 PM	4:50:00 PM	6:05:00 PM	7:05:00 PM	8:25:00 PM	9:15:00 PM	10:40:00 PM
Total schedule time	00:05:30:00	00:01:28:00	00:07:01:00	00:00:57:00	00:01:28:00	00:07:43:00	00:01:20:00	00:08:20:00	00:01:30:00	00:01:30:00	00:01:35:00	00:01:30:00	00:01:30:00	00:01:30:00	00:01:35:00	00:01:50:00	00:02:05:00	00:01:55:00	00:20:25:00	00:01:47:00	00:01:35:00

Eastbound

Metrolink Service No.	M-300	M-302	M-304	M-308	M-310	M-382	M-312	M-314	M-316	M-318	M-320	M-322	M-324	M-384	M-326	M-328	M-328b	M-330	M-332	M-334	M-336	M-386
L.A. Union Station	5:45:00 AM	7:45:00 AM	9:02:00 AM	11:20:00 AM	12:20:00 PM	12:50:00 PM	1:20:00 PM	2:20:00 PM	3:20:00 PM	3:45:00 PM	4:20:00 PM	4:40:00 PM	5:00:00 PM	5:15:00 PM	5:25:00 PM	5:45:00 PM	6:05:00 PM	6:25:00 PM	7:20:00 PM	8:30:00 PM	9:30:00 PM	11:00:00 PM
Cal State L.A.	5:56:00 AM	7:55:00 AM	9:11:00 AM	11:30:00 AM	12:30:00 PM	1:00:00 PM	1:30:00 PM	2:30:00 PM	3:30:00 PM	3:55:00 PM	4:30:00 PM	4:54:00 PM	5:10:00 PM		5:35:00 PM	5:55:00 PM	6:15:00 PM	6:35:00 PM	7:30:00 PM	8:40:00 PM	9:40:00 PM	11:10:00 PM
El Monte	6:10:00 AM	8:09:00 AM	9:21:00 AM	11:40:00 AM	12:40:00 PM	1:10:00 PM	1:40:00 PM	2:40:00 PM	3:40:00 PM	4:05:00 PM	4:40:00 PM		5:20:00 PM		5:45:00 PM	6:05:00 PM	6:25:00 PM	6:45:00 PM	7:39:00 PM	8:49:00 PM	9:49:00 PM	11:19:00 PM
Baldwin Park	6:36:00 AM	8:22:00 AM	9:29:00 AM	11:48:00 AM	12:48:00 PM	1:18:00 PM	1:48:00 PM	2:48:00 PM	3:48:00 PM	4:13:00 PM	4:48:00 PM		5:28:00 PM		5:53:00 PM	6:13:00 PM	6:33:00 PM	6:53:00 PM	7:47:00 PM	8:57:00 PM	9:57:00 PM	11:27:00 PM
Covina	6:42:00 AM	8:29:00 AM	9:35:00 AM	11:55:00 AM	12:55:00 PM	1:25:00 PM	1:55:00 PM	2:55:00 PM	3:55:00 PM	4:20:00 PM	4:55:00 PM	5:15:00 PM	5:48:00 PM	5:49:00 PM	6:00:00 PM	6:20:00 PM	6:40:00 PM	7:00:00 PM	7:54:00 PM	9:03:00 PM	10:03:00 PM	11:33:00 PM
Pomona (North)	6:52:00 AM	8:39:00 AM	9:45:00 AM	12:05:00 PM	1:05:00 PM	1:35:00 PM	2:05:00 PM	3:05:00 PM	4:05:00 PM	4:30:00 PM	5:05:00 PM		5:59:00 PM		6:10:00 PM	6:30:00 PM	6:50:00 PM	7:10:00 PM	8:04:00 PM	9:13:00 PM	10:13:00 PM	11:43:00 PM
Claremont	6:56:00 AM	8:43:00 AM	9:49:00 AM	12:09:00 PM	1:09:00 PM	1:39:00 PM	2:09:00 PM	3:09:00 PM	4:09:00 PM	4:34:00 PM	5:09:00 PM		6:03:00 PM		6:14:00 PM	6:34:00 PM	6:54:00 PM	7:14:00 PM	8:08:00 PM	9:17:00 PM	10:17:00 PM	11:47:00 PM
Montclair	6:59:00 AM	8:46:00 AM	9:52:00 AM	12:12:00 PM	1:12:00 PM	1:42:00 PM	2:12:00 PM	3:12:00 PM	4:12:00 PM	4:37:00 PM	5:12:00 PM	5:29:00 PM	6:06:00 PM		6:17:00 PM	6:37:00 PM	6:57:00 PM	7:17:00 PM	8:11:00 PM	9:20:00 PM	10:20:00 PM	11:50:00 PM
Upland	7:07:00 AM	8:51:00 AM	9:57:00 AM	12:17:00 PM	1:17:00 PM	1:47:00 PM	2:17:00 PM	3:17:00 PM	4:17:00 PM	4:42:00 PM	5:17:00 PM		6:11:00 PM		6:22:00 PM	6:42:00 PM	7:02:00 PM	7:22:00 PM	8:16:00 PM	9:25:00 PM	10:25:00 PM	11:55:00 PM
Rancho Cucamonga	7:15:00 AM	8:58:00 AM	10:04:00 AM	12:24:00 PM	1:24:00 PM	1:54:00 PM	2:24:00 PM	3:24:00 PM	4:24:00 PM	4:49:00 PM	5:24:00 PM	5:39:00 PM	6:18:00 PM	6:09:00 PM	6:31:00 PM	6:49:00 PM	7:09:00 PM	7:29:00 PM	8:23:00 PM	9:32:00 PM	10:32:00 PM	12:02:00 AM
Fontana	7:30:00 AM	9:07:00 AM	10:13:00 AM	12:33:00 PM	1:33:00 PM	2:03:00 PM	2:33:00 PM	3:33:00 PM	4:33:00 PM	4:58:00 PM	5:33:00 PM		6:27:00 PM		6:40:00 PM	6:58:00 PM	7:18:00 PM	7:38:00 PM	8:32:00 PM	9:41:00 PM	10:41:00 PM	12:11:00 AM
Rialto	7:35:00 AM	9:13:00 AM	10:19:00 AM	12:39:00 PM	1:39:00 PM	2:09:00 PM	2:41:00 PM	3:39:00 PM	4:39:00 PM	5:04:00 PM	5:39:00 PM		6:35:00 PM		6:46:00 PM	7:04:00 PM	7:24:00 PM	7:44:00 PM	8:38:00 PM	9:47:00 PM	10:47:00 PM	12:17:00 AM
San Bernardino	7:50:00 AM	9:30:00 AM	10:35:00 AM	12:50:00 PM	1:50:00 PM	2:20:00 PM	2:50:00 PM	3:50:00 PM	4:50:00 PM	5:25:00 PM	5:55:00 PM	5:55:00 PM	6:45:00 PM	6:20:00 PM	7:05:00 PM	7:20:00 PM	7:35:00 PM	7:55:00 PM	8:50:00 PM	10:00:00 PM	11:00:00 PM	12:30:00 AM
Total schedule time	**00:02:05:00**	**00:01:45:00**	**00:01:33:00**	**00:01:30:00**	**00:01:30:00**	**00:01:30:00**	**00:01:30:00**	**00:01:30:00**	**00:01:30:00**	**00:01:40:00**	**00:01:35:00**	**00:01:15:00**	**00:01:45:00**	**00:01:05:00**	**00:01:40:00**	**00:01:35:00**	**00:01:30:00**	**00:01:30:00**	**00:01:30:00**	**00:01:30:00**	**00:01:30:00**	**00:01:30:00**

Westbound

Metrolink Service No.	M-301	M-303	M-305	M-383	M-307	M-309	M-311	M-313	M-315	M-315b	M-317	M-319	M-321	M-325	M-327	M-385	M-329	M-331	M-333	M-335	M-337	M-387
San Bernardino	4:06:00 AM	4:52:00 AM	5:15:00 AM	5:35:00 AM	5:52:00 AM	6:12:00 AM	6:32:00 AM	6:52:00 AM	7:12:00 AM	7:32:00 AM	8:15:00 AM	9:40:00 AM	11:00:00 AM	1:00:00 PM	2:00:00 PM	2:30:00 PM	3:00:00 PM	4:00:00 PM	5:10:00 PM	6:35:00 PM	7:28:00 PM	9:05:00 PM
Rialto	4:12:00 AM	4:58:00 AM	5:22:00 AM		5:58:00 AM	6:18:00 AM		6:58:00 AM	7:18:00 AM	7:38:00 AM	8:21:00 AM	9:46:00 AM	11:06:00 AM	1:06:00 PM	2:06:00 PM	2:36:00 PM	3:06:00 PM	4:06:00 PM	5:15:00 PM	6:41:00 PM	7:34:00 PM	9:11:00 PM
Fontana	4:17:00 AM	5:03:00 AM	5:28:00 AM		6:03:00 AM	6:23:00 AM		7:03:00 AM	7:23:00 AM	7:43:00 AM	8:26:00 AM	9:51:00 AM	11:11:00 AM	1:11:00 PM	2:11:00 PM	2:41:00 PM	3:11:00 PM	4:11:00 PM	5:20:00 PM	6:55:00 PM	7:39:00 PM	9:16:00 PM
Rancho Cucamonga	4:24:00 AM	5:11:00 AM	5:37:00 AM	5:50:00 AM	6:11:00 AM	6:31:00 AM	6:47:00 AM	7:11:00 AM	7:31:00 AM	7:51:00 AM	8:34:00 AM	9:59:00 AM	11:19:00 AM	1:19:00 PM	2:19:00 PM	2:49:00 PM	3:19:00 PM	4:19:00 PM	5:32:00 PM	7:06:00 PM	7:47:00 PM	9:24:00 PM
Upland	4:31:00 AM	5:18:00 AM	5:44:00 AM		6:18:00 AM	6:38:00 AM		7:18:00 AM	7:38:00 AM	7:58:00 AM	8:41:00 AM	10:06:00 AM	11:26:00 AM	1:26:00 PM	2:26:00 PM	2:56:00 PM	3:26:00 PM	4:26:00 PM	5:46:00 PM	7:13:00 PM	7:54:00 PM	9:36:00 PM
Montclair	4:36:00 AM	5:23:00 AM	5:49:00 AM		6:23:00 AM	6:43:00 AM	6:57:00 AM	7:23:00 AM	7:43:00 AM	8:03:00 AM	8:46:00 AM	10:11:00 AM	11:31:00 AM	1:31:00 PM	2:31:00 PM	3:01:00 PM	3:31:00 PM	4:31:00 PM	5:56:00 PM	7:18:00 PM	7:59:00 PM	9:41:00 PM
Claremont	4:39:00 AM	5:26:00 AM	5:52:00 AM		6:26:00 AM	6:46:00 AM		7:26:00 AM	7:46:00 AM	8:06:00 AM	8:49:00 AM	10:14:00 AM	11:34:00 AM	1:34:00 PM	2:34:00 PM	3:04:00 PM	3:34:00 PM	4:34:00 PM	5:59:00 PM	7:21:00 PM	8:02:00 PM	9:44:00 PM
Pomona (North)	4:43:00 AM	5:30:00 AM	5:57:00 AM		6:30:00 AM	6:50:00 AM		7:30:00 AM	7:50:00 AM	8:10:00 AM	8:53:00 AM	10:18:00 AM	11:38:00 AM	1:38:00 PM	2:38:00 PM	3:08:00 PM	3:38:00 PM	4:38:00 PM	6:05:00 PM	7:25:00 PM	8:06:00 PM	9:48:00 PM
Covina	4:52:00 AM	5:39:00 AM	6:13:00 AM	6:09:00 AM	6:39:00 AM	7:01:00 AM	7:07:00 AM	7:39:00 AM	7:59:00 AM	8:19:00 AM	9:02:00 AM	10:27:00 AM	11:47:00 AM	1:47:00 PM	2:47:00 PM	3:17:00 PM	3:47:00 PM	4:47:00 PM	6:17:00 PM	7:34:00 PM	8:15:00 PM	9:57:00 PM
Baldwin Park	4:58:00 AM	5:45:00 AM	6:27:00 AM		6:45:00 AM	7:07:00 AM		7:45:00 AM	8:05:00 AM	8:25:00 AM	9:08:00 AM	10:33:00 AM	11:53:00 AM	1:53:00 PM	2:53:00 PM	3:23:00 PM	3:53:00 PM	4:53:00 PM	6:23:00 PM	7:40:00 PM	8:21:00 PM	10:03:00 PM
El Monte	5:07:00 AM	5:54:00 AM	6:37:00 AM		6:54:00 AM	7:16:00 AM		7:54:00 AM	8:14:00 AM	8:34:00 AM	9:20:00 AM	10:42:00 AM	12:02:00 PM	2:02:00 PM	3:02:00 PM	3:41:00 PM	4:12:00 PM	5:21:00 PM	6:40:00 PM	7:48:00 PM	8:29:00 PM	10:11:00 PM
Cal State L.A.	5:17:00 AM	6:05:00 AM	6:48:00 AM		7:05:00 AM	7:30:00 AM	7:27:00 AM	8:05:00 AM	8:25:00 AM	8:45:00 AM	9:31:00 AM	10:54:00 AM	12:13:00 PM	2:13:00 PM	3:13:00 PM	3:49:00 PM	4:37:00 PM	5:41:00 PM	6:51:00 PM	7:59:00 PM	8:48:00 PM	10:22:00 PM
L.A. Union Station	5:30:00 AM	6:20:00 AM	7:01:00 AM	6:37:00 AM	7:20:00 AM	7:43:00 AM	7:50:00 AM	8:20:00 AM	8:40:00 AM	9:00:00 AM	9:45:00 AM	11:15:00 AM	12:30:00 PM	2:30:00 PM	3:30:00 PM	4:05:00 PM	4:50:00 PM	6:05:00 PM	7:05:00 PM	8:25:00 PM	9:15:00 PM	10:40:00 PM
Total schedule time	**00:01:24:00**	**00:01:28:00**	**00:01:46:00**	**00:01:02:00**	**00:01:28:00**	**00:01:31:00**	**00:01:18:00**	**00:01:28:00**	**00:01:28:00**	**00:01:28:00**	**00:01:30:00**	**00:01:35:00**	**00:01:30:00**	**00:01:30:00**	**00:01:30:00**	**00:01:35:00**	**00:01:50:00**	**00:02:05:00**	**00:01:55:00**	**00:01:50:00**	**00:01:47:00**	**00:01:35:00**

Eastbound

Metrolink Service No.	M-300	M-302	M-304	M-308	M-310	M-382	M-312	M-314	M-316	M-318	M-394	M-320	M-322	M-324	M-384	M-326	M-392	M-328	M-330	M-338	M-332	M-334	M-336	M-386
L.A. Union Station	5:45:00 AM	7:45:00 AM	9:02:00 AM	11:20:00 AM	12:20:00 PM	12:50:00 PM	1:20:00 PM	2:20:00 PM	3:20:00 PM	3:40:00 PM	4:00:00 PM	4:20:00 PM	4:40:00 PM	5:00:00 PM	5:15:00 PM	5:30:00 PM	5:45:00 PM	6:05:00 PM	6:25:00 PM	6:45:00 PM	7:20:00 PM	8:30:00 PM	9:30:00 PM	11:00:00 PM
Cal State L.A.	5:56:00 AM	7:55:00 AM	9:11:00 AM	11:30:00 AM	12:30:00 PM	1:00:00 PM	1:30:00 PM	2:30:00 PM	3:30:00 PM	3:50:00 PM		4:30:00 PM	4:50:00 PM	5:10:00 PM		5:40:00 PM		6:15:00 PM	6:35:00 PM	6:55:00 PM	7:30:00 PM	8:40:00 PM	9:40:00 PM	11:10:00 PM
El Monte	6:10:00 AM	8:09:00 AM	9:21:00 AM	11:40:00 AM	12:40:00 PM	1:10:00 PM	1:40:00 PM	2:40:00 PM	3:40:00 PM	4:00:00 PM		4:40:00 PM		5:20:00 PM		5:50:00 PM		6:25:00 PM	6:45:00 PM	7:05:00 PM	7:39:00 PM	8:49:00 PM	9:49:00 PM	11:19:00 PM
Baldwin Park	6:36:00 AM	8:22:00 AM	9:29:00 AM	11:48:00 AM	12:48:00 PM	1:18:00 PM	1:48:00 PM	2:48:00 PM	3:48:00 PM	4:08:00 PM		4:48:00 PM		5:28:00 PM		5:58:00 PM		6:33:00 PM	6:53:00 PM	7:13:00 PM	7:47:00 PM	8:57:00 PM	9:57:00 PM	11:27:00 PM
Covina	6:42:00 AM	8:29:00 AM	9:35:00 AM	11:55:00 AM	12:55:00 PM	1:25:00 PM	1:55:00 PM	2:55:00 PM	3:55:00 PM	4:15:00 PM	4:29:00 PM	4:55:00 PM	5:10:00 PM	5:48:00 PM	5:44:00 PM	6:05:00 PM	6:14:00 PM	6:40:00 PM	7:00:00 PM	7:20:00 PM	7:54:00 PM	9:03:00 PM	10:03:00 PM	11:33:00 PM
Pomona (North)	6:52:00 AM	8:39:00 AM	9:45:00 AM	12:05:00 PM	1:05:00 PM	1:35:00 PM	2:05:00 PM	3:05:00 PM	4:05:00 PM	4:25:00 PM		5:05:00 PM		5:59:00 PM		6:15:00 PM		6:50:00 PM	7:10:00 PM	7:30:00 PM	8:04:00 PM	9:13:00 PM	10:13:00 PM	11:43:00 PM
Claremont	6:56:00 AM	8:43:00 AM	9:49:00 AM	12:09:00 PM	1:09:00 PM	1:39:00 PM	2:09:00 PM	3:09:00 PM	4:09:00 PM	4:29:00 PM		5:09:00 PM		6:03:00 PM		6:19:00 PM		6:54:00 PM	7:14:00 PM	7:34:00 PM	8:08:00 PM	9:17:00 PM	10:17:00 PM	11:47:00 PM
Montclair	6:59:00 AM	8:46:00 AM	9:52:00 AM	12:12:00 PM	1:12:00 PM	1:42:00 PM	2:12:00 PM	3:12:00 PM	4:12:00 PM	4:32:00 PM		5:12:00 PM	5:27:00 PM	6:06:00 PM		6:22:00 PM		6:57:00 PM	7:17:00 PM	7:37:00 PM	8:11:00 PM	9:20:00 PM	10:20:00 PM	11:50:00 PM
Upland	7:07:00 AM	8:51:00 AM	9:57:00 AM	12:17:00 PM	1:17:00 PM	1:47:00 PM	2:17:00 PM	3:17:00 PM	4:17:00 PM	4:37:00 PM		5:17:00 PM		6:11:00 PM		6:27:00 PM		7:02:00 PM	7:22:00 PM	7:42:00 PM	8:16:00 PM	9:25:00 PM	10:25:00 PM	11:55:00 PM
Rancho Cucamonga	7:15:00 AM	8:58:00 AM	10:04:00 AM	12:24:00 PM	1:24:00 PM	1:54:00 PM	2:24:00 PM	3:24:00 PM	4:24:00 PM	4:44:00 PM	4:49:00 PM	5:24:00 PM	5:31:00 PM	6:18:00 PM	6:04:00 PM	6:36:00 PM	6:34:00 PM	7:09:00 PM	7:29:00 PM	7:49:00 PM	8:23:00 PM	9:32:00 PM	10:32:00 PM	12:02:00 AM
Fontana	7:30:00 AM	9:07:00 AM	10:13:00 AM	12:33:00 PM	1:33:00 PM	2:03:00 PM	2:33:00 PM	3:33:00 PM	4:33:00 PM	4:53:00 PM		5:33:00 PM		6:27:00 PM		6:45:00 PM		7:18:00 PM	7:38:00 PM	7:58:00 PM	8:32:00 PM	9:41:00 PM	10:41:00 PM	12:11:00 AM
Rialto	7:35:00 AM	9:13:00 AM	10:19:00 AM	12:39:00 PM	1:39:00 PM	2:09:00 PM	2:41:00 PM	3:39:00 PM	4:39:00 PM	5:08:00 PM		5:39:00 PM		6:35:00 PM		6:51:00 PM		7:24:00 PM	7:44:00 PM	8:04:00 PM	8:38:00 PM	9:47:00 PM	10:47:00 PM	12:17:00 AM
San Bernardino	7:50:00 AM	9:30:00 AM	10:35:00 AM	12:50:00 PM	1:50:00 PM	2:20:00 PM	2:50:00 PM	3:50:00 PM	4:50:00 PM	5:27:00 PM	5:10:00 PM	5:55:00 PM	5:50:00 PM	6:45:00 PM	6:20:00 PM	7:10:00 PM	6:55:00 PM	7:40:00 PM	7:55:00 PM	8:20:00 PM	8:50:00 PM	10:00:00 PM	11:00:00 PM	12:30:00 AM
Total schedule time	00:02:05:00	00:01:45:00	00:01:33:00	00:01:30:00	00:01:30:00	00:01:30:00	00:01:30:00	00:01:30:00	00:01:30:00	00:01:47:00	00:01:10:00	00:01:35:00	00:01:10:00	00:01:45:00	00:01:05:00	00:01:40:00	00:01:10:00	00:01:35:00	00:01:30:00	00:01:35:00	00:01:30:00	00:01:30:00	00:01:30:00	00:01:30:00

Westbound

Metrolink Service No.	M-393	M-301	M-395	M-303	M-305	M-383	M-307	M-309	M-311	M-313	M-315	M-339	M-317	M-319	M-321	M-325	M-327	M-385	M-329	M-331	M-333	M-335	M-337	M-387
San Bernardino	3:45:00 AM	4:06:00 AM	4:30:00 AM	4:52:00 AM	5:15:00 AM	5:45:00 AM	5:52:00 AM	6:12:00 AM	6:32:00 AM	6:52:00 AM	7:12:00 AM	7:32:00 AM	8:15:00 AM	9:40:00 AM	11:00:00 AM	1:00:00 PM	2:00:00 PM	2:30:00 PM	3:00:00 PM	4:00:00 PM	5:10:00 PM	6:25:00 PM	7:28:00 PM	9:05:00 PM
Rialto		4:12:00 AM		4:58:00 AM	5:22:00 AM		5:58:00 AM	6:18:00 AM		6:58:00 AM	7:18:00 AM	7:38:00 AM	8:21:00 AM	9:46:00 AM	11:06:00 AM	1:06:00 PM	2:06:00 PM	2:36:00 PM	3:06:00 PM	4:06:00 PM	5:15:00 PM	6:31:00 PM	7:34:00 PM	9:11:00 PM
Fontana		4:17:00 AM		5:03:00 AM	5:28:00 AM		6:03:00 AM	6:23:00 AM		7:03:00 AM	7:23:00 AM	7:43:00 AM	8:26:00 AM	9:51:00 AM	11:11:00 AM	1:11:00 PM	2:11:00 PM	2:41:00 PM	3:11:00 PM	4:11:00 PM	5:20:00 PM	6:45:00 PM	7:39:00 PM	9:16:00 PM
Rancho Cucamonga	3:58:00 AM	4:24:00 AM	4:43:00 AM	5:11:00 AM	5:37:00 AM	5:58:00 AM	6:11:00 AM	6:31:00 AM	6:45:00 AM	7:11:00 AM	7:31:00 AM	7:51:00 AM	8:34:00 AM	9:59:00 AM	11:19:00 AM	1:19:00 PM	2:19:00 PM	2:49:00 PM	3:19:00 PM	4:19:00 PM	5:32:00 PM	6:56:00 PM	7:47:00 PM	9:24:00 PM
Upland		4:31:00 AM		5:18:00 AM	5:44:00 AM		6:18:00 AM	6:38:00 AM		7:18:00 AM	7:38:00 AM	7:58:00 AM	8:41:00 AM	10:06:00 AM	11:26:00 AM	1:26:00 PM	2:26:00 PM	2:56:00 PM	3:26:00 PM	4:26:00 PM	5:46:00 PM	7:03:00 PM	7:54:00 PM	9:36:00 PM
Montclair		4:36:00 AM	4:55:00 AM	5:23:00 AM	5:49:00 AM		6:23:00 AM	6:43:00 AM		7:23:00 AM	7:43:00 AM	8:03:00 AM	8:46:00 AM	10:11:00 AM	11:31:00 AM	1:31:00 PM	2:31:00 PM	3:01:00 PM	3:31:00 PM	4:31:00 PM	5:56:00 PM	7:08:00 PM	7:59:00 PM	9:41:00 PM
Claremont		4:39:00 AM		5:26:00 AM	5:52:00 AM		6:26:00 AM	6:46:00 AM		7:26:00 AM	7:46:00 AM	8:06:00 AM	8:49:00 AM	10:14:00 AM	11:34:00 AM	1:34:00 PM	2:34:00 PM	3:04:00 PM	3:34:00 PM	4:34:00 PM	5:59:00 PM	7:11:00 PM	8:02:00 PM	9:44:00 PM
Pomona (North)		4:43:00 AM		5:30:00 AM	5:57:00 AM		6:30:00 AM	6:50:00 AM		7:30:00 AM	7:50:00 AM	8:10:00 AM	8:53:00 AM	10:18:00 AM	11:38:00 AM	1:38:00 PM	2:38:00 PM	3:08:00 PM	3:38:00 PM	4:48:00 PM	6:05:00 PM	7:15:00 PM	8:06:00 PM	9:48:00 PM
Covina	4:19:00 AM	4:52:00 AM	5:05:00 AM	5:39:00 AM	6:21:00 AM	6:19:00 AM	6:39:00 AM	7:01:00 AM	7:06:00 AM	7:39:00 AM	7:59:00 AM	8:19:00 AM	9:02:00 AM	10:27:00 AM	11:47:00 AM	1:47:00 PM	2:47:00 PM	3:17:00 PM	3:47:00 PM	4:57:00 PM	6:17:00 PM	7:24:00 PM	8:15:00 PM	9:57:00 PM
Baldwin Park		4:58:00 AM		5:45:00 AM	6:27:00 AM		6:45:00 AM	7:15:00 AM		7:45:00 AM	8:05:00 AM	8:25:00 AM	9:08:00 AM	10:33:00 AM	11:53:00 AM	1:53:00 PM	2:53:00 PM	3:23:00 PM	3:53:00 PM	5:03:00 PM	6:23:00 PM	7:30:00 PM	8:21:00 PM	10:03:00 PM
El Monte		5:07:00 AM		5:54:00 AM	6:37:00 AM		6:54:00 AM	7:24:00 AM		7:54:00 AM	8:14:00 AM	8:34:00 AM	9:20:00 AM	10:42:00 AM	12:02:00 PM	2:02:00 PM	3:02:00 PM	3:41:00 PM	4:25:00 PM	5:35:00 PM	6:40:00 PM	7:38:00 PM	8:29:00 PM	10:11:00 PM
Cal State L.A.		5:17:00 AM	5:22:00 AM	6:05:00 AM	6:48:00 AM		7:05:00 AM	7:35:00 AM		8:05:00 AM	8:25:00 AM	8:45:00 AM	9:31:00 AM	10:54:00 AM	12:13:00 PM	2:13:00 PM	3:13:00 PM	3:49:00 PM	4:37:00 PM	5:45:00 PM	6:51:00 PM	7:49:00 PM	8:48:00 PM	10:22:00 PM
L.A. Union Station	4:47:00 AM	5:30:00 AM	5:35:00 AM	6:20:00 AM	7:01:00 AM	6:47:00 AM	7:20:00 AM	7:48:00 AM	7:34:00 AM	8:20:00 AM	8:40:00 AM	9:00:00 AM	9:45:00 AM	11:15:00 AM	12:30:00 PM	2:30:00 PM	3:30:00 PM	4:05:00 PM	4:50:00 PM	6:05:00 PM	7:10:00 PM	8:15:00 PM	9:15:00 PM	10:40:00 PM
Total schedule time	00:01:02:00	00:01:24:00	00:01:05:00	00:01:28:00	00:01:46:00	00:01:02:00	00:01:28:00	00:01:36:00	00:01:02:00	00:01:28:00	00:01:28:00	00:01:28:00	00:01:30:00	00:01:35:00	00:01:30:00	00:01:30:00	00:01:30:00	00:01:35:00	00:01:50:00	00:02:05:00	00:02:00:00	00:01:50:00	00:01:47:00	00:01:35:00

Metrolink SB Line 2035 schedules revised 9/7/13, 9/30/2014
56 train schedule

	1		2						3			4	5		6	7				8								
Metrolink Train No.	901	**301**	**903**	**303**	**305**	**383**	**307**	**309**	**311**	**313**	**315**	**917**	**919**	**317**	**921**	**923**	**319**	**321**	**325**	**925**	**327**	**385**	**329**	**331**	**333**	**335**	**337**	**387**
Riverside-Downtown																												
San Bernardino	3:45	4:06	4:30	4:52	5:15	5:45	5:52	6:12	6:32	6:52	7:12	7:32	7:52	8:15	8:35	8:55	9:40	11:00	13:00	13:30	14:00	14:30	15:00	16:00	17:10	18:25	19:28	21:05
Rialto		4:12		4:58	5:22		5:58	6:18		6:58	7:18	7:38	7:58	8:21	8:41	9:01	9:46	11:06	13:06	13:36	14:06	14:36	15:06	16:06	17:15	18:31	19:34	21:11
Fontana		4:17		5:03	5:28		6:03	6:23		7:03	7:23	7:43	8:03	8:26	8:46	9:06	9:51	11:11	13:11	13:41	14:11	14:41	15:11	16:11	17:20	18:45	19:39	21:16
Rancho Cucamonga	3:58	4:24	4:43	5:11	5:37	5:58	6:11	6:31	6:45	7:11	7:31	7:51	8:11	8:34	8:54	9:14	9:59	11:19	13:19	13:49	14:19	14:49	15:19	16:19	17:32	18:56	19:47	21:24
Upland		4:31		5:18	5:44		6:18	6:38		7:18	7:38	7:58	8:18	8:41	9:01	9:21	10:06	11:26	13:26	13:56	14:26	14:56	15:26	16:26	17:46	19:03	19:54	21:36
Montclair		4:36	4:56	5:23	5:49		6:23	6:43		7:23	7:43	8:03	8:23	8:46	9:06	9:26	10:11	11:31	13:31	14:01	14:31	15:01	15:31	16:31	17:56	19:08	19:59	21:41
Claremont		4:39		5:26	5:52		6:26	6:46		7:26	7:46	8:06	8:26	8:49	9:09	9:29	10:14	11:34	13:34	14:04	14:34	15:04	15:34	16:34	17:59	19:11	20:02	21:44
Pomona (North)		4:43		5:30	5:57		6:30	6:50		7:30	7:50	8:10	8:30	8:53	9:13	9:33	10:18	11:38	13:38	14:08	14:38	15:08	15:38	16:38	18:05	19:15	20:06	21:48
Covina	4:19	4:52	5:09	5:39	6:13	6:19	6:39	7:01	7:06	7:39	7:59	8:19	8:39	9:02	9:22	9:42	10:27	11:47	13:47	14:17	14:47	15:17	15:47	16:47	18:17	19:24	20:15	21:57
Baldwin Park		4:58		5:45	6:27		6:45	7:07		7:45	8:05	8:25	8:45	9:08	9:28	9:48	10:33	11:53	13:53	14:23	14:53	15:23	15:53	16:53	18:23	19:30	20:21	22:03
El Monte		5:07		5:54	6:37		6:54	7:16		7:54	8:14	8:34	8:54	9:20	9:40	10:00	10:42	12:02	14:02	14:32	15:02	15:41	16:12	17:21	18:40	19:38	20:29	22:11
Cal State L.A.		5:17	5:30	6:05	6:48		7:05	7:27		8:05	8:25	8:45	9:05	9:31	9:51	10:11	10:54	12:13	14:13	14:43	15:13	15:49	16:37	17:41	18:51	19:49	20:48	22:22
L.A. Union Station	4:47	5:30	5:43	6:20	7:01	6:47	7:20	7:40	7:34	8:20	8:40	9:00	9:20	9:45	10:05	10:25	11:15	12:30	14:30	15:00	15:30	16:05	16:50	18:05	19:05	20:15	21:15	22:40
Total schedule time	1:02	1:24	1:13	1:28	1:46	1:02	1:28	1:28	1:02	1:28	1:28	1:28	1:28	1:30	1:30	1:30	1:35	1:30	1:30	1:30	1:30	1:35	1:50	2:05	1:55	1:50	1:47	1:35

		7								8		1	2		3					4	5	6	9		10			
Metrolink Train No.	**300**	**900**	**302**	**304**	**308**	**310**	**382**	**312**	**314**		**316**	**318**	**916**	**320**	**322**	**324**	**384**	**326**	**328**	**928**	**330**	**930**	**932**	**332**	**934**	**334**	**336**	**386**
L.A. Union Station	5:45	6:45	7:45	9:02	11:20	12:20	12:50	13:20	14:20	15:00	15:20	15:40	16:00	16:20	16:40	17:00	17:15	17:25	17:45	18:05	18:25	18:45	19:05	19:25	19:45	20:30	21:30	23:00
Cal State L.A.	5:56	6:56	7:55	9:11	11:30	12:30	13:00	13:30	14:30	15:10	15:30	15:50	12:00	16:30	16:50	17:10		17:35	17:55		18:35	18:55	19:15	19:35	19:55	20:40	21:40	23:10
El Monte	6:10	7:10	8:09	9:21	11:40	12:40	13:10	13:40	14:40	15:20	15:40	16:00	12:00	16:40		17:20		17:45	18:05		18:45	19:05	19:25	19:45	20:05	20:49	21:49	23:19
Baldwin Park	6:36	7:36	8:22	9:29	11:48	12:48	13:18	13:48	14:48	15:28	15:48	16:08	12:00	16:48		17:28		17:53	18:13		18:53	19:13	19:33	19:53	20:13	20:57	21:57	23:27
Covina	6:42	7:42	8:29	9:35	11:55	12:55	13:25	13:55	14:55	15:48	15:55	16:15	16:29	16:55	17:12	17:48	17:44	18:00	18:20	18:34	19:00	19:20	19:40	20:00	20:20	21:03	22:03	23:33
Pomona (North)	6:52	7:52	8:39	9:45	12:05	13:05	13:35	14:05	15:05	15:59	16:05	16:25	12:00	17:05		17:59		18:10	18:30		19:10	19:30	19:50	20:10	20:30	21:13	22:13	23:43
Claremont	6:56	7:56	8:43	9:49	12:09	13:09	13:39	14:09	15:09	16:03	16:09	16:29	12:00	17:09		18:03		18:14	18:34		19:14	19:34	19:54	20:14	20:34	21:17	22:17	23:47
Montclair	6:59	7:59	8:46	9:52	12:12	13:12	13:42	14:12	15:12	16:06	16:12	16:32	12:00	17:12	17:27	18:06		18:17	18:37		19:17	19:37	19:57	20:17	20:37	21:20	22:20	23:50
Upland	7:07	8:07	8:51	9:57	12:17	13:17	13:47	14:17	15:17	16:11	16:17	16:37	12:00	17:17		18:11		18:22	18:42		19:22	19:42	20:02	20:22	20:42	21:25	22:25	23:55
Rancho Cucamonga	7:15	8:15	8:58	10:04	12:24	13:24	13:54	14:24	15:24	16:18	16:24	16:44	16:49	17:24	17:36	18:18	18:04	18:31	18:49	18:54	19:29	19:49	20:09	20:29	20:49	21:32	22:32	0:02
Fontana	7:30	8:30	9:07	10:13	12:33	13:33	14:03	14:33	15:33	16:27	16:33	16:53	12:00	17:33		18:27		18:40	18:58		19:38	19:58	20:18	20:38	20:58	21:41	22:41	0:11
Rialto	7:35	8:35	9:13	10:19	12:39	13:39	14:09	14:41	15:39	16:35	16:39	17:01	12:00	17:39		18:35		18:46	19:04		19:44	20:04	20:24	20:44	21:04	21:47	22:47	0:17
San Bernardino	7:50	8:50	9:30	10:35	12:50	13:50	14:20	14:50	15:50	16:45	16:50	17:20	17:02	17:55	17:55	18:45	18:20	19:05	19:20	19:07	19:55	20:20	20:40	20:55	21:20	22:00	23:00	0:30
Total schedule time	2:05	2:05	1:45	1:33	1:30	1:30	1:30	1:30	1:30	1:45	1:30	1:40	1:02	1:35	1:15	1:45	1:05	1:40	1:35	1:02	1:30	1:35	1:35	1:30	1:35	1:30	1:30	1:30

1- 330 am express
2-express between 301 and 303
4 stop
3- Make 311 express
4- add local between 315 and
317
5- add local between 7:32 and
8:15 departures
6,7- add locals at eand of AM
peak period
8- add SB-LAUS EQ positioning
train to pm schedule

1- 318 leave 3:40pm
2- new express at 400pm
3- convert 322 to express, cal state, covina,
montclair, rancho, derpart 4:40
4- express between 328 and 330
5- 330 leave at 6:25
6- new local between 330 and 332
7- Add AM reverse peak train to reposition
EQ in SB
8- Add local at beginning of PM peak
9,10- Add locals at end of PM peak period

Trains in yellow are from 2020 schedule
Trains in green are added to attain 56 train daily service

Scheduling Restrictions:

A. Minimum train headways are 20 minutes
B. Maximum one reverse-peak train per hour during peak hours

APPENDIX B3

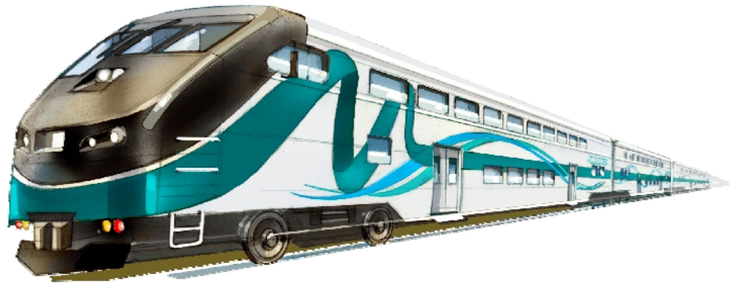
RTC Model Animations (DVD)

APPENDIX C

Track Plans

APPENDIX C1

200 Scale Plans



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SAN BERNARDINO LINE
STRATEGIC PLAN

SEGMENT 1
MP 26.5 LONE HILL AVE to MP 30.4 CP WHITE

SEGMENT 2
MP 34.6 CP CENTRAL to MP 40.2 CP ARCHIBALD

SEGMENT 3
MP 52.4 CP LILAC to MP 55.1 CP RANCHO

PREPARED BY

RSE

DECEMBER 17, 2013

DRAWING INDEX – SHEET 1 OF 1

SHEET NO.	DWG NO.	REV NO.	DESCRIPTION	DATE
DRAWING INDEX				
1	G001	0	INDEX OF DRAWINGS	121713
STRATEGIC PLAN OVERVIEW				
2	TC001	0	TRACK SCHEMATICS – PROPOSED DOUBLE TRACKS	121713
SEGMENT 1 – MP 26.5 LONE HILL AVE TO MP 30.4 CP WHITE				
3	TC101	0	TRACK SCHEMATIC	121713
4	T101	0	PROPOSED TRACK LAYOUT – SHEET 1 OF 4	121713
5	T102	0	PROPOSED TRACK LAYOUT – SHEET 2 OF 4	121713
6	T103	0	PROPOSED TRACK LAYOUT – SHEET 3 OF 4	121713
7	T104	0	PROPOSED TRACK LAYOUT – SHEET 4 OF 4	121713
8	T151	0	TYPICAL–SECTIONS – SHEET 1 OF 2	121713
9	T152	0	TYPICAL–SECTIONS – SHEET 2 OF 2	121713
SEGMENT 2 – MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD				
10	TC201	0	TRACK SCHEMATIC	121713
11	T201	0	PROPOSED TRACK LAYOUT – SHEET 1 OF 6	121713
12	T202	0	PROPOSED TRACK LAYOUT – SHEET 2 OF 6	121713
13	T203	0	PROPOSED TRACK LAYOUT – SHEET 3 OF 6	121713
14	T204	0	PROPOSED TRACK LAYOUT – SHEET 4 OF 6	121713
15	T205	0	PROPOSED TRACK LAYOUT – SHEET 5 OF 6	121713
16	T206	0	PROPOSED TRACK LAYOUT – SHEET 6 OF 6	121713
17	T251	0	TYPICAL–SECTIONS – SHEET 1 OF 2	121713
18	T252	0	TYPICAL–SECTIONS – SHEET 2 OF 2	121713
SEGMENT 3 – MP 52.4 CP LILAC TO MP 55.1 CP RANCHO				
19	TC301	0	TRACK SCHEMATIC	121713
20	T301	0	PROPOSED TRACK LAYOUT – SHEET 1 OF 3	121713
21	T302	0	PROPOSED TRACK LAYOUT – SHEET 2 OF 3	121713
22	T303	0	PROPOSED TRACK LAYOUT – SHEET 3 OF 3	121713
23	T351	0	TYPICAL–SECTIONS – SHEET 1 OF 2	121713
24	T352	0	TYPICAL–SECTIONS – SHEET 2 OF 2	121713

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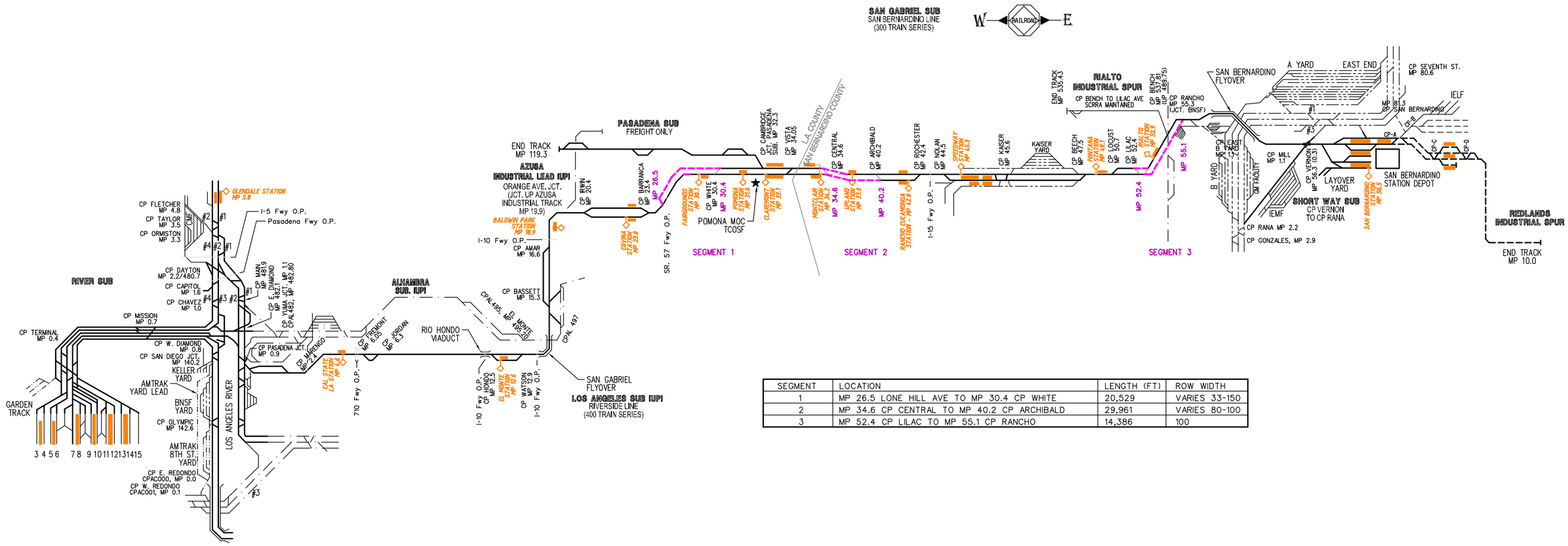
METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN

INDEX OF DRAWINGS

CONTRACT NO. 130534
DRAWING NO. G001
REVISION
SHEET NO. 1
SCALE N/A

SAN BERNARDINO LINE
INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN



SEGMENT	LOCATION	LENGTH (FT)	ROW WIDTH
1	MP 26.5 LONE HILL AVE TO MP 30.4 CP WHITE	20,529	VARIES 33-150
2	MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD	29,961	VARIES 80-100
3	MP 52.4 CP LILAC TO MP 55.1 CP RANCHO	14,386	100

SCRRA/METROLINK TRACKS

- MAIN TRACK OR CONTROLLED SIDINGS W/ CTC, TWC & SIGNALS
- OTHER THAN MAIN TRACK
- PROPOSED DOUBLE TRACKS
- MAIN TRACK (FUTURE)
- OTHER THAN MAIN TRACK (FUTURE)
- METROLINK STATION PLATFORMS

NON-SCRRA/METROLINK TRACKS

- BNSF TRACK
- UP TRACK
- AMTRAK TRACK

TRACK

- #1 MAIN TRACK 1
- #2 MAIN TRACK 2

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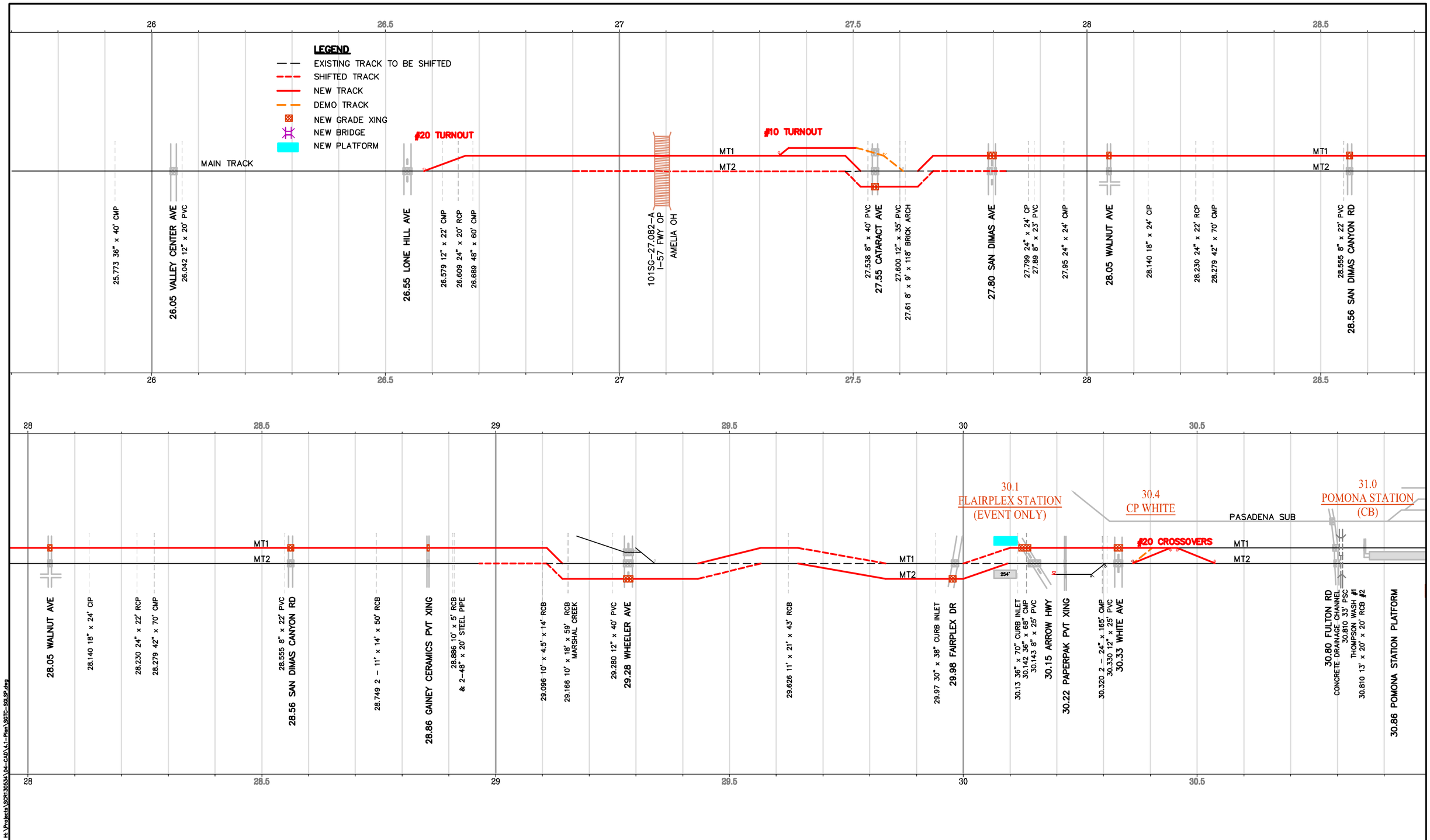
METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN

TRACK SCHEMATICS
PROPOSED DOUBLE TRACKS

CONTRACT NO. 130534
DRAWING NO. TC001
REVISION
SHEET NO. 2
SCALE N/A



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METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 1 – MP 26.5 LONE HILL AVE TO MP 30.4 CP WHITE
TRACK SCHEMATICS

CONTRACT NO. 130534
DRAWING NO. TC101
REVISION
SHEET NO. 3
SCALE 1" = 1000'

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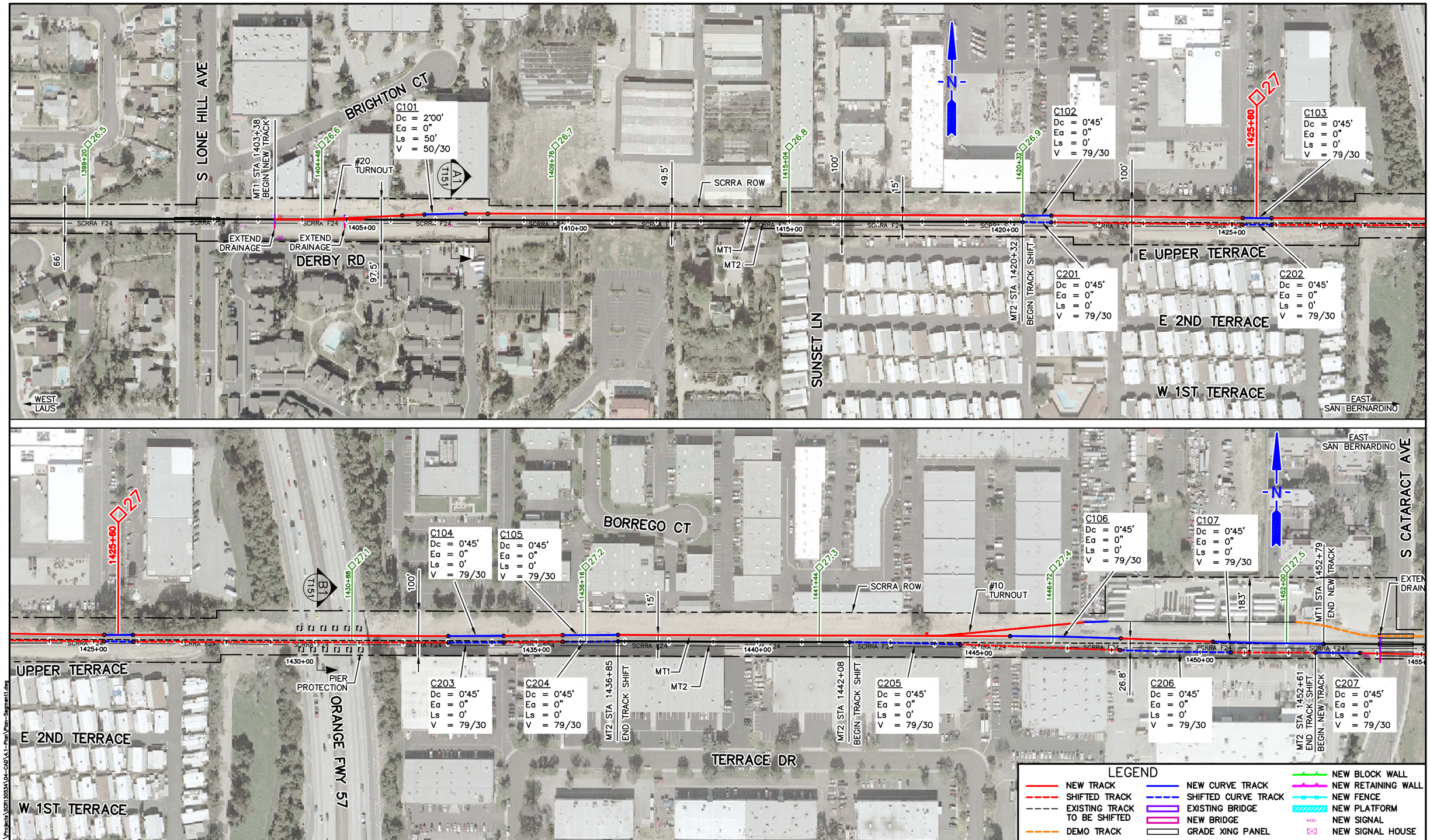

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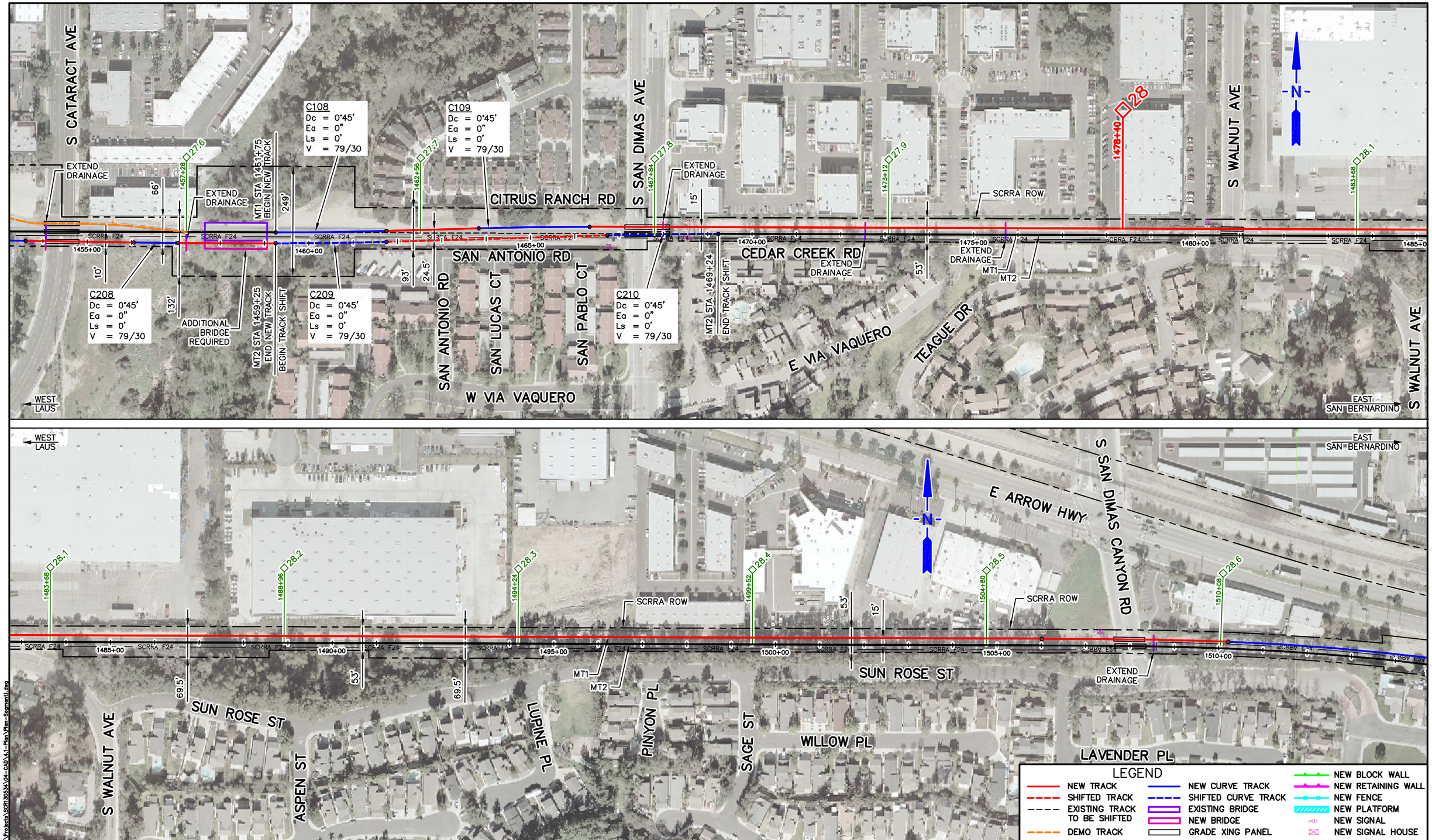
METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 1 – MP 26.5 LONE HILL AVE TO MP 30.4 CP WHITE
PROPOSED TRACK LAYOUT
SHEET 1 OF 4

CONTRACT NO. 130534
DRAWING NO. T101
REVISION
SHEET NO. 4
SCALE 1" = 200'

Jan 29, 2014 – 3:13pm H:\Projects\SCRI\30534\04-CAD\4.1-Plan\Plan-Segment1.dwg



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METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 1 – MP 26.5 LONE HILL AVE TO MP 30.4 CP WHITE
PROPOSED TRACK LAYOUT
SHEET 2 OF 4

CONTRACT NO. 130534
DRAWING NO. T102
REVISION
SHEET NO. 5
SCALE 1" = 200'

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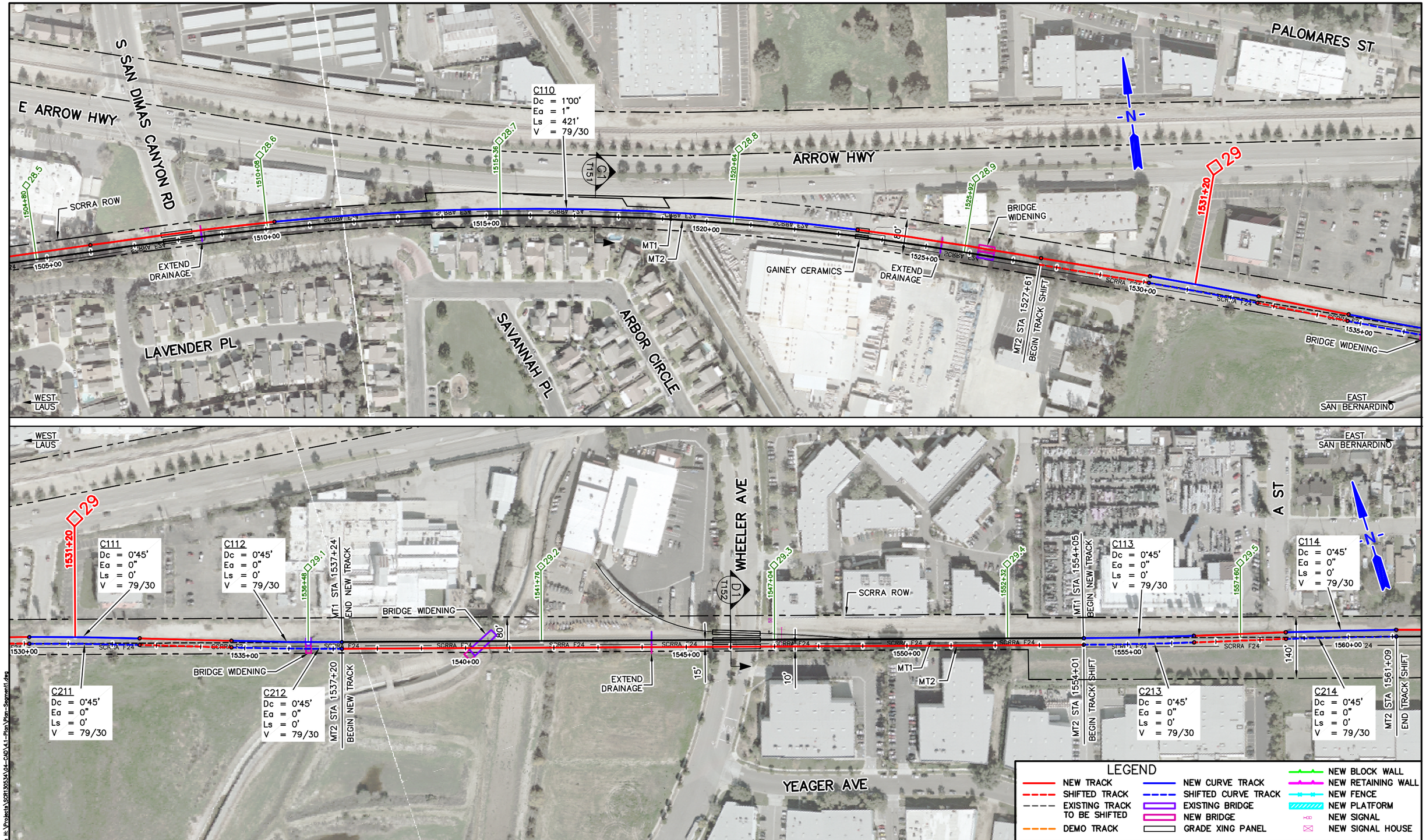

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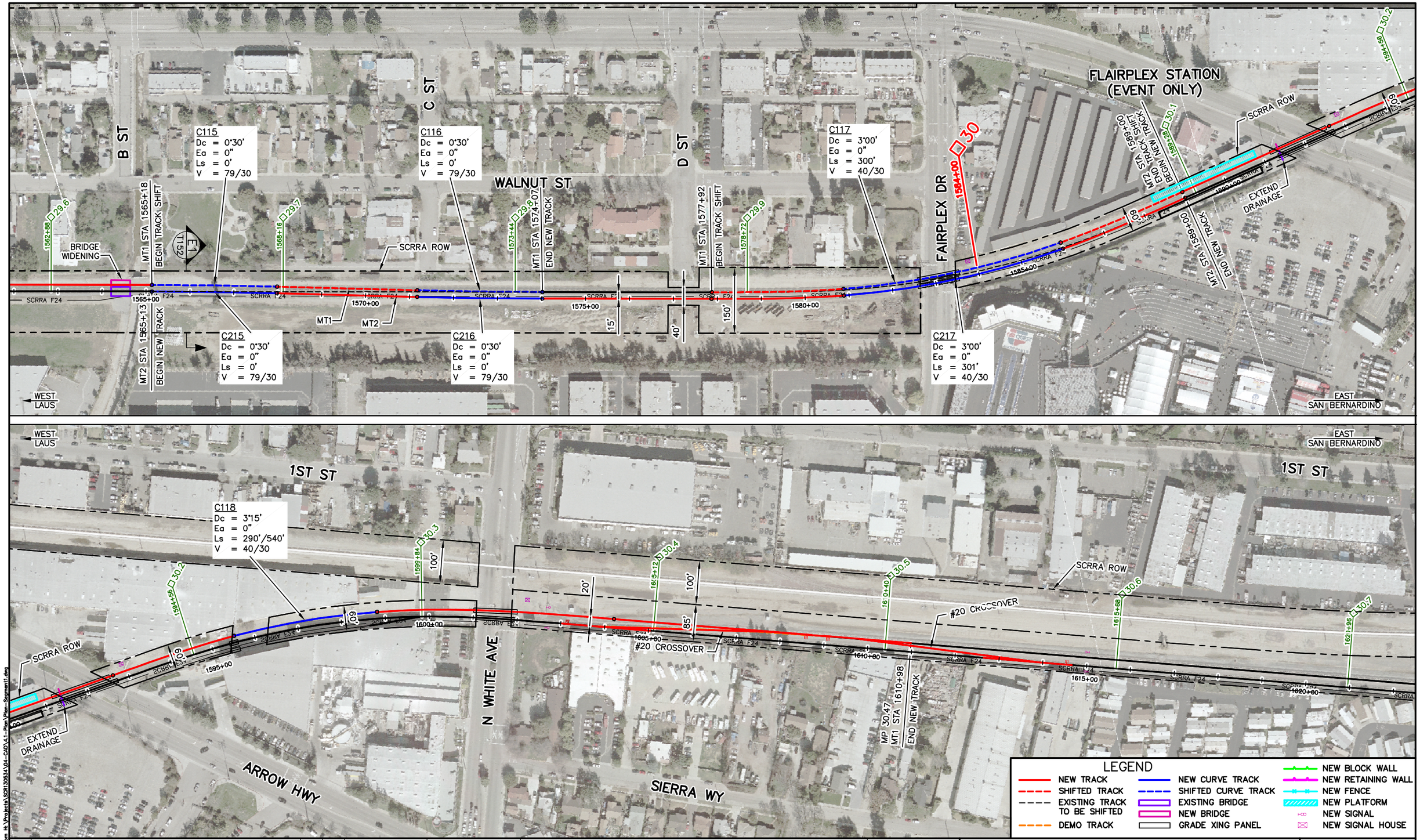
SEGMENT 1 – MP 26.5 LONE HILL AVE TO MP 30.4 CP WHITE
PROPOSED TRACK LAYOUT
SHEET 3 OF 4

CONTRACT NO. 130534
DRAWING NO. T103
REVISION
SHEET NO. 6
SCALE 1" = 200'

May 28, 2014 – 5:16pm H:\Projects\SCR130534\04-CAD\4.1-Plan\Plan-Segment1.dwg



C118
Dc = 3°15'
Ea = 0"
Ls = 290'/540'
V = 40/30

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METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 1 – MP 26.5 LONE HILL AVE TO MP 30.4 CP WHITE
PROPOSED TRACK LAYOUT
SHEET 4 OF 4

CONTRACT NO. 130534
DRAWING NO. T104
REVISION
SHEET NO. 7
SCALE 1" = 200'

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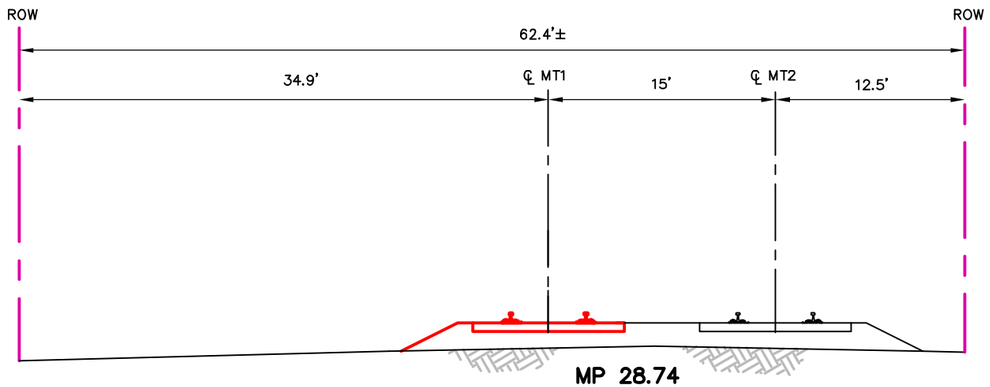
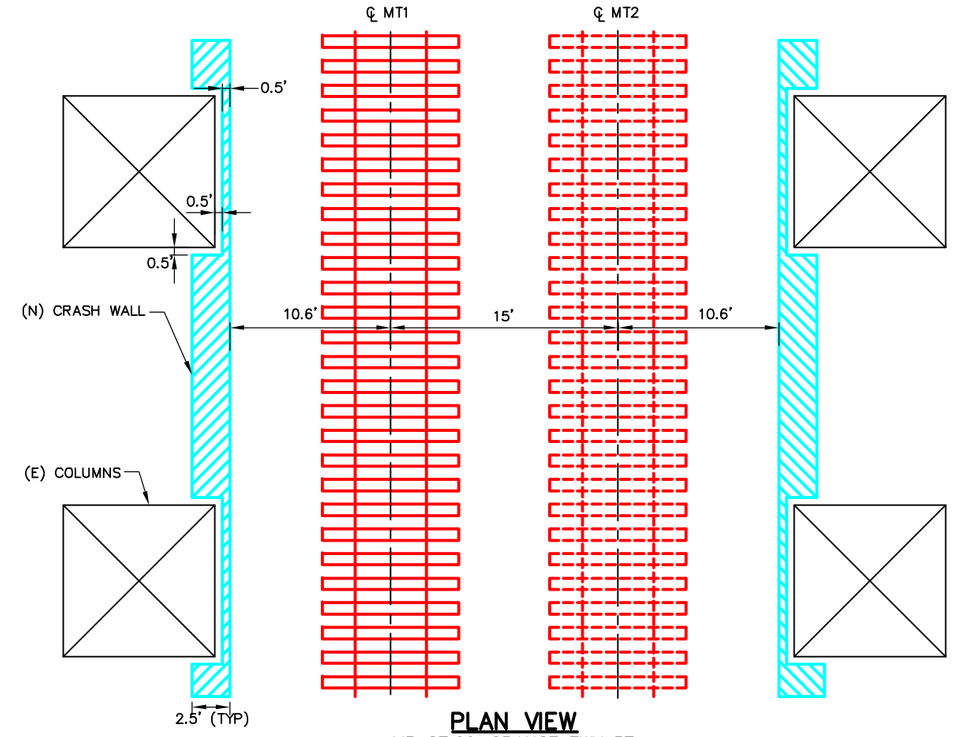
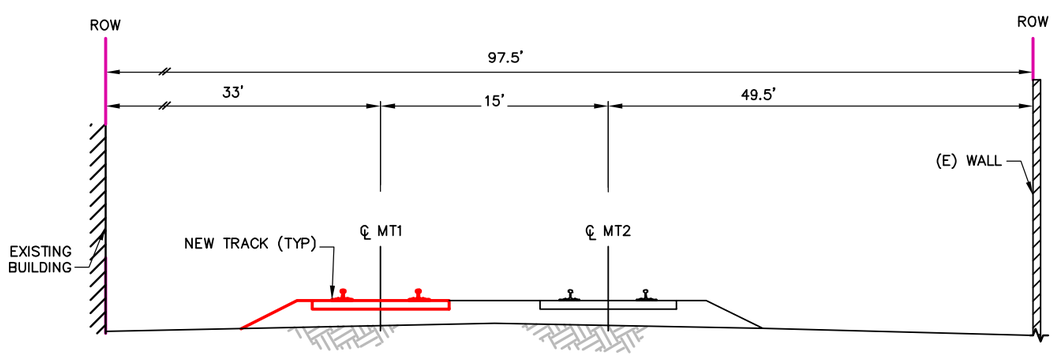


MP 28.74

C1 / T103 SECTION
1" = 10'

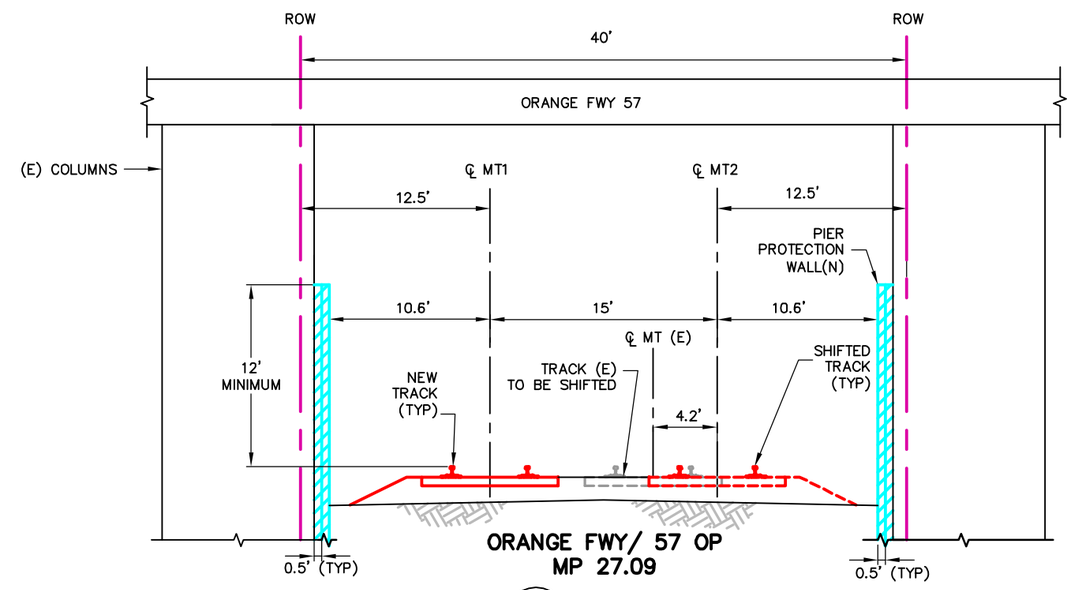


PLAN VIEW
MP 27.09–ORANGE FWY 57



MP 26.65

A1 / T101 SECTION
1" = 10'



ORANGE FWY/ 57 OP
MP 27.09

B1 / T102 SECTION
1" = 10'

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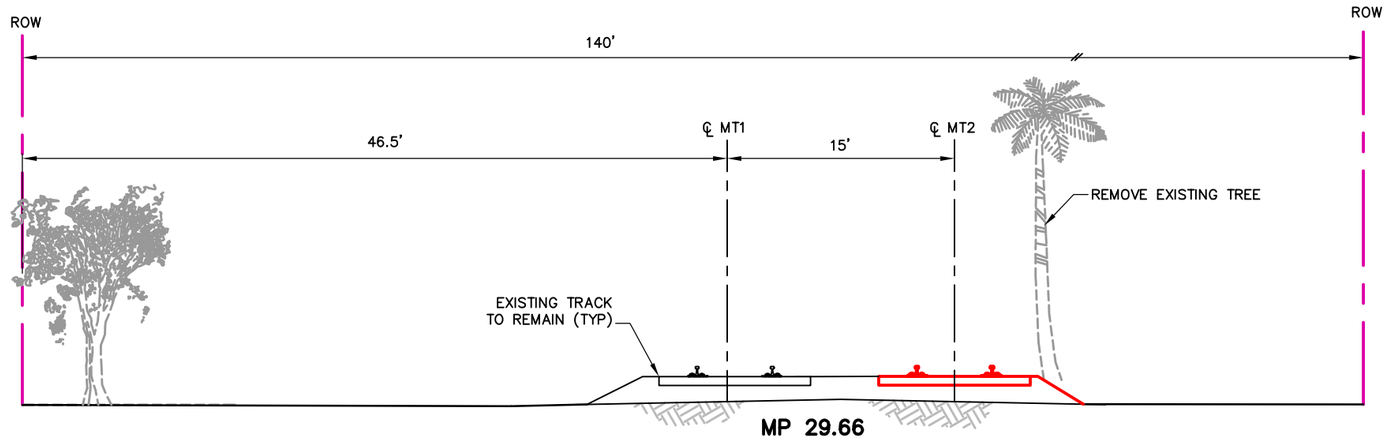
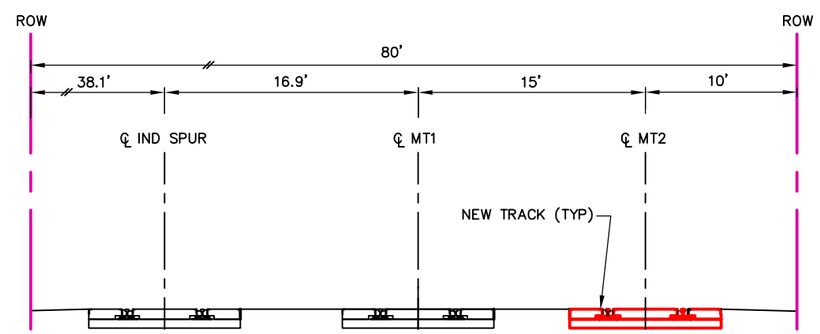
METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 1 – MP 26.5 LONE HILL AVE TO MP 30.4 CP WHITE
TYPICAL SECTIONS
SHEET 1 OF 2

CONTRACT NO. 130534
DRAWING NO. T151
REVISION
SHEET NO. 8
SCALE AS NOTED



MP 29.66

E1 / T104 SECTION
1" = 10'



WHEELER AVE GRADE CROSSING
MP 29.28

D1 / T104 SECTION
1" = 10'

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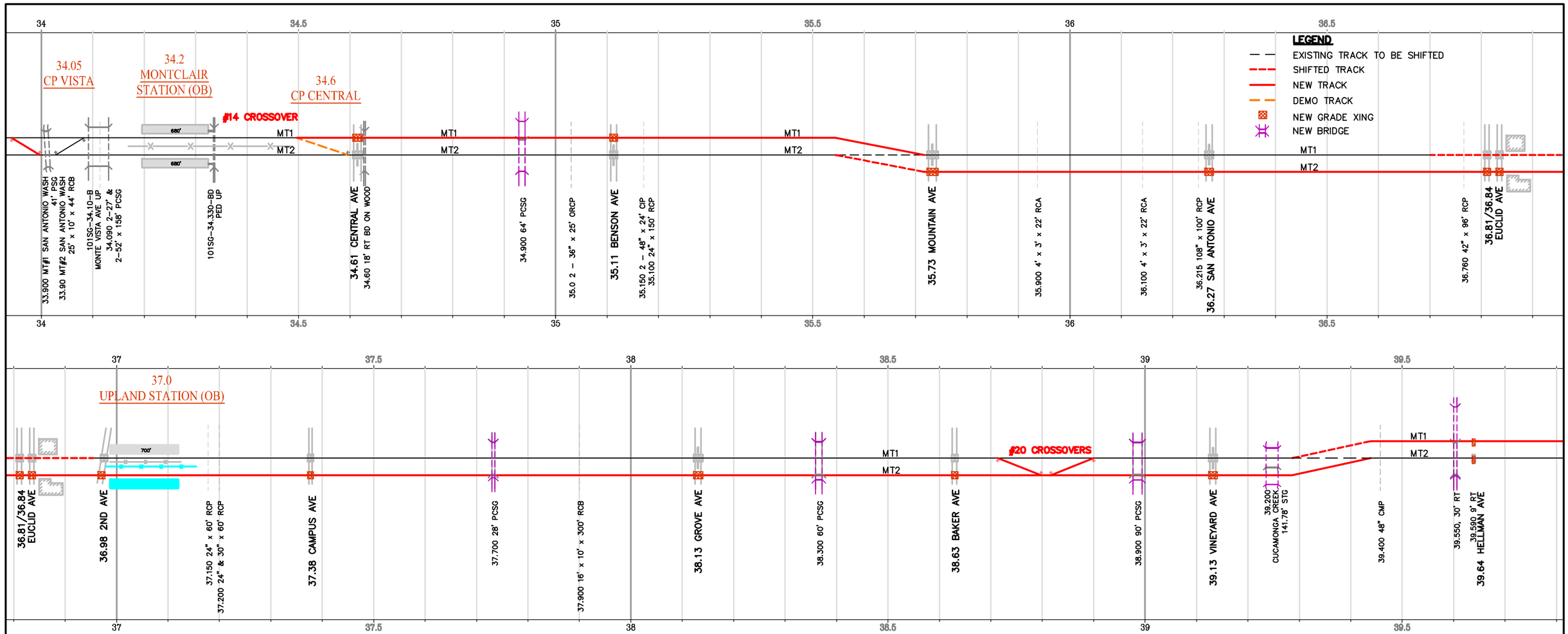
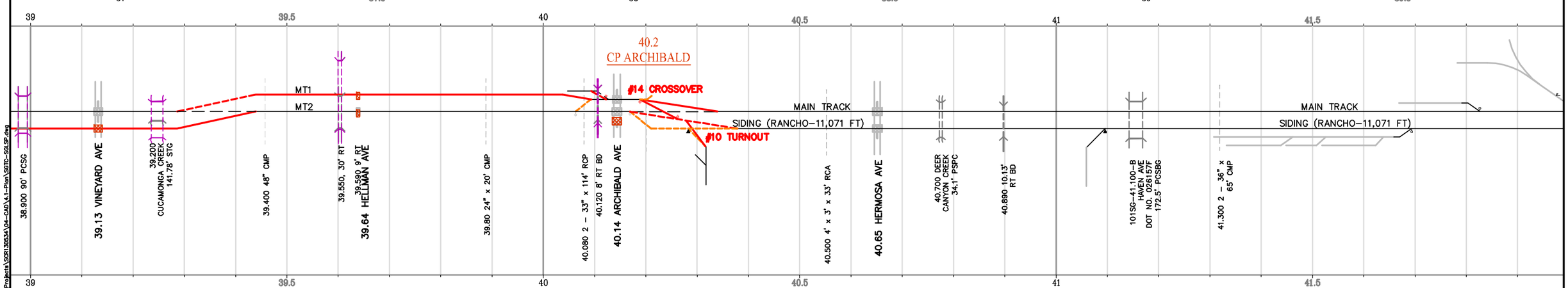
SEGMENT 1 – MP 26.5 LONE HILL AVE TO MP 30.4 CP WHITE
TYPICAL SECTIONS
SHEET 2 OF 2

CONTRACT NO. 130534
DRAWING NO. T152
REVISION
SHEET NO. 9
SCALE AS NOTED





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METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 2 – MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD
TRACK SCHEMATICS

CONTRACT NO. 130534
DRAWING NO. TC201
REVISION
SHEET NO. 10
SCALE 1" = 1000'

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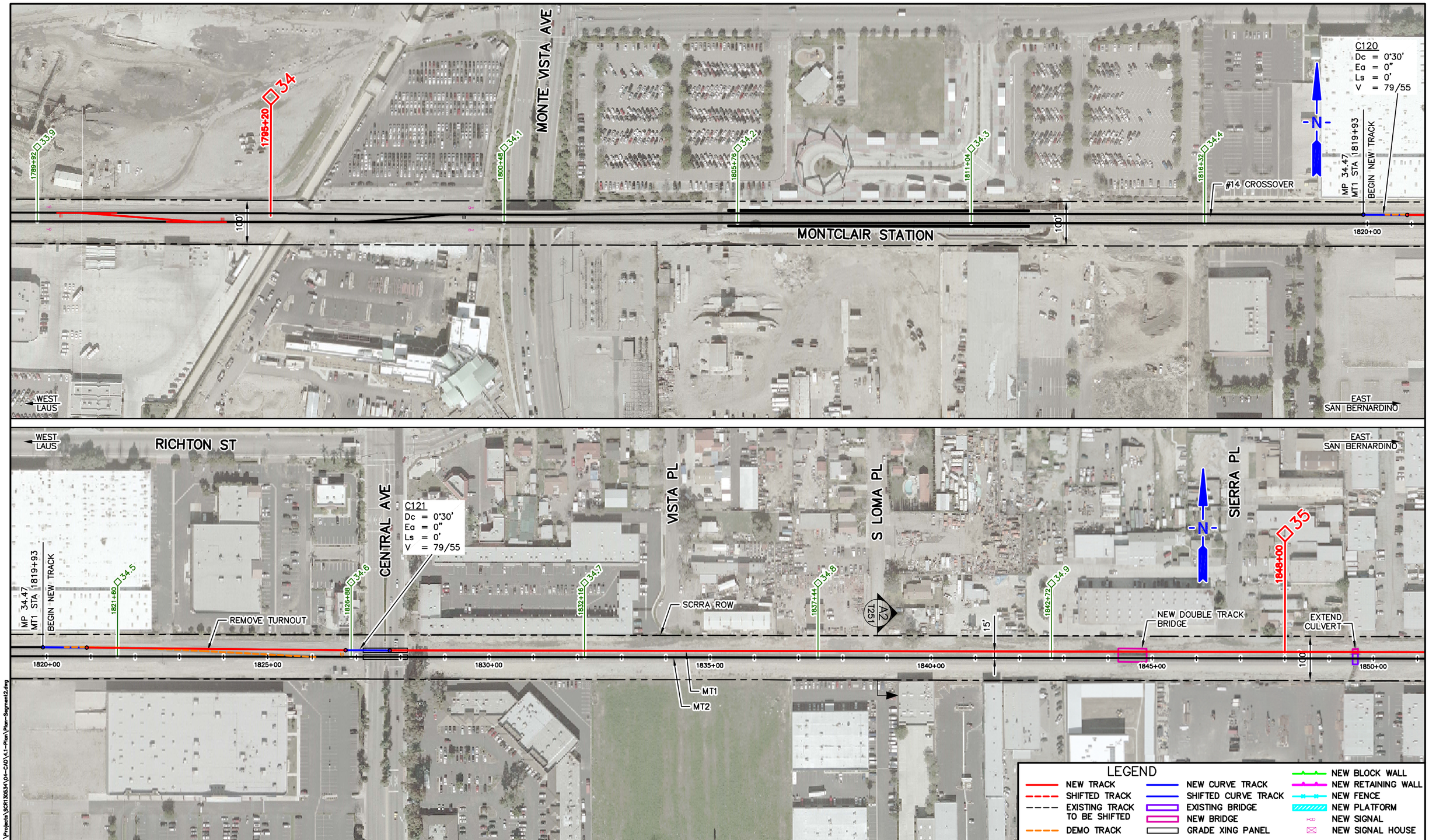

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APPROVED: _____

METROLINK COMMUTER RAIL SYSTEM

SAN BERNARDINO LINE STRATEGIC PLAN

SEGMENT 2 – MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD
PROPOSED TRACK LAYOUT
SHEET 1 OF 6

CONTRACT NO. 130534
DRAWING NO. T201
REVISION
SHEET NO. 11
SCALE 1" = 200'

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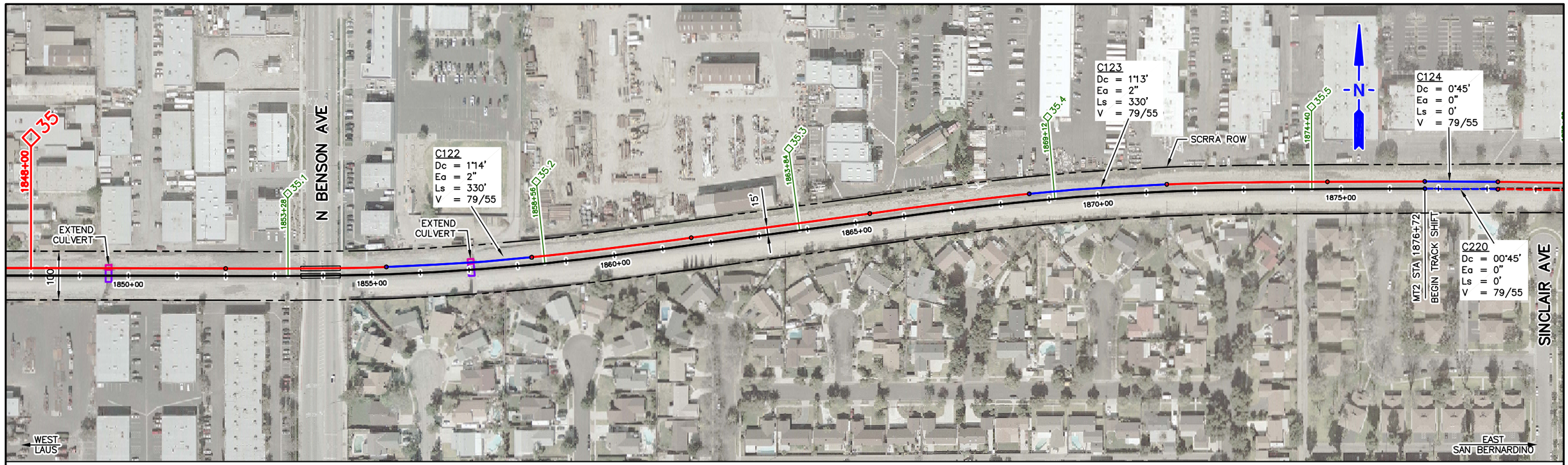

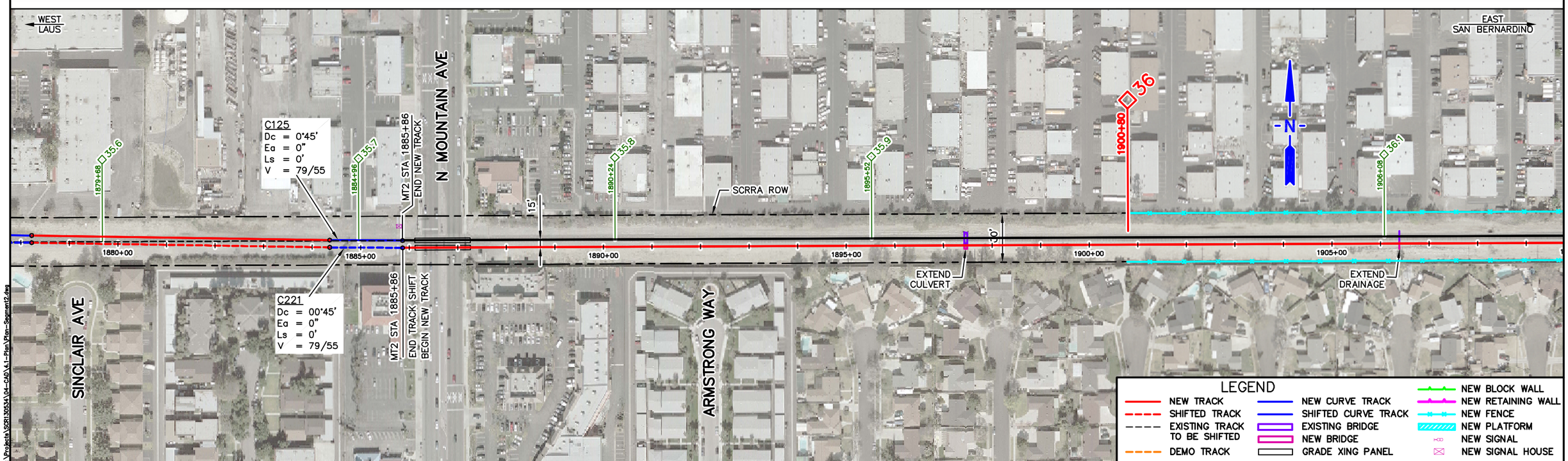

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SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 2 – MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD
PROPOSED TRACK LAYOUT
SHEET 2 OF 6

CONTRACT NO. 130534
DRAWING NO. T202
REVISION
SHEET NO. 12
SCALE 1" = 200'

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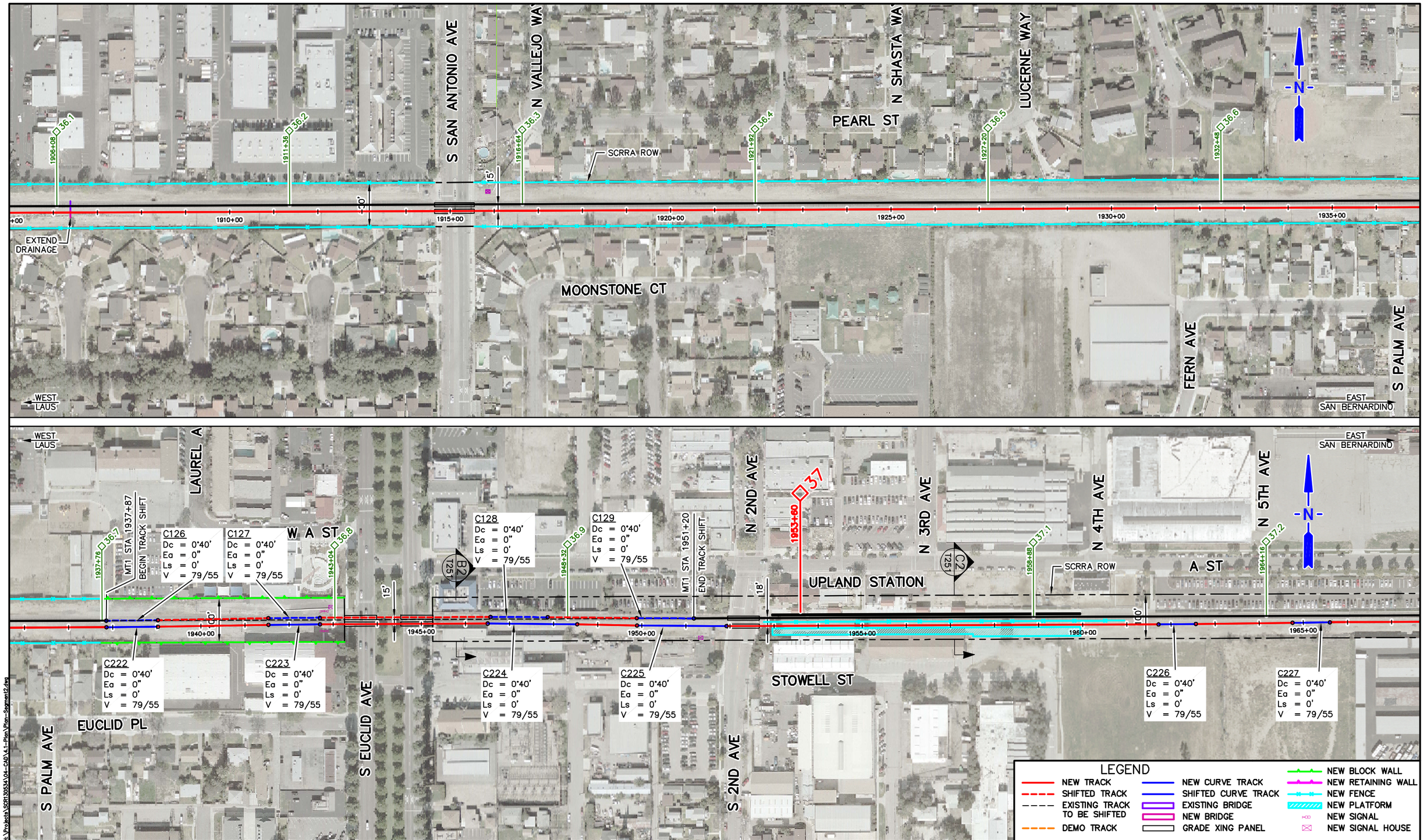

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SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 2 – MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD
PROPOSED TRACK LAYOUT
SHEET 3 OF 6

CONTRACT NO. 130534
DRAWING NO. T203
REVISION
SHEET NO. 13
SCALE 1" = 200'

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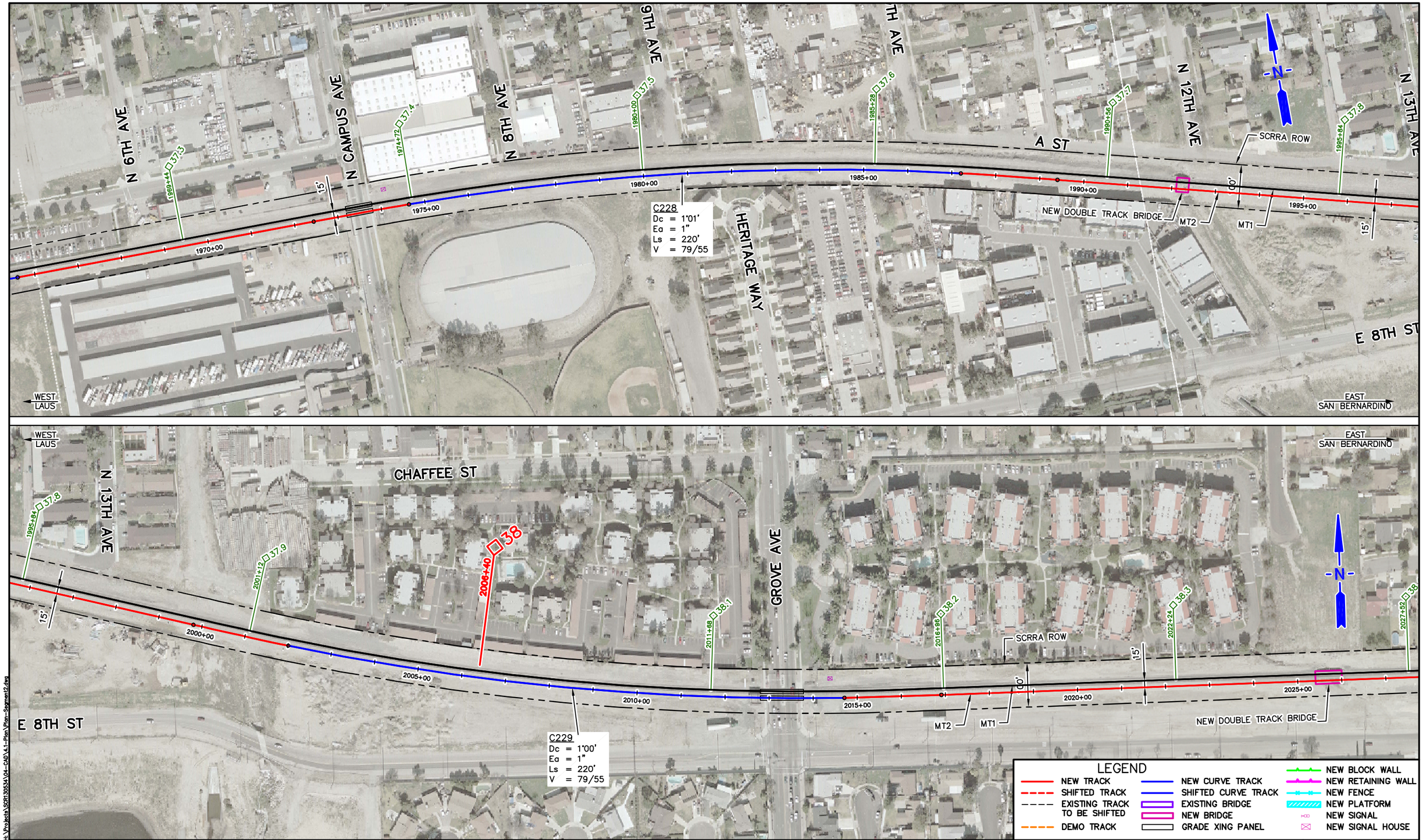

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METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 2 – MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD
PROPOSED TRACK LAYOUT
SHEET 4 OF 6

CONTRACT NO. 130534
DRAWING NO. T204
REVISION
SHEET NO. 14
SCALE 1" = 200'

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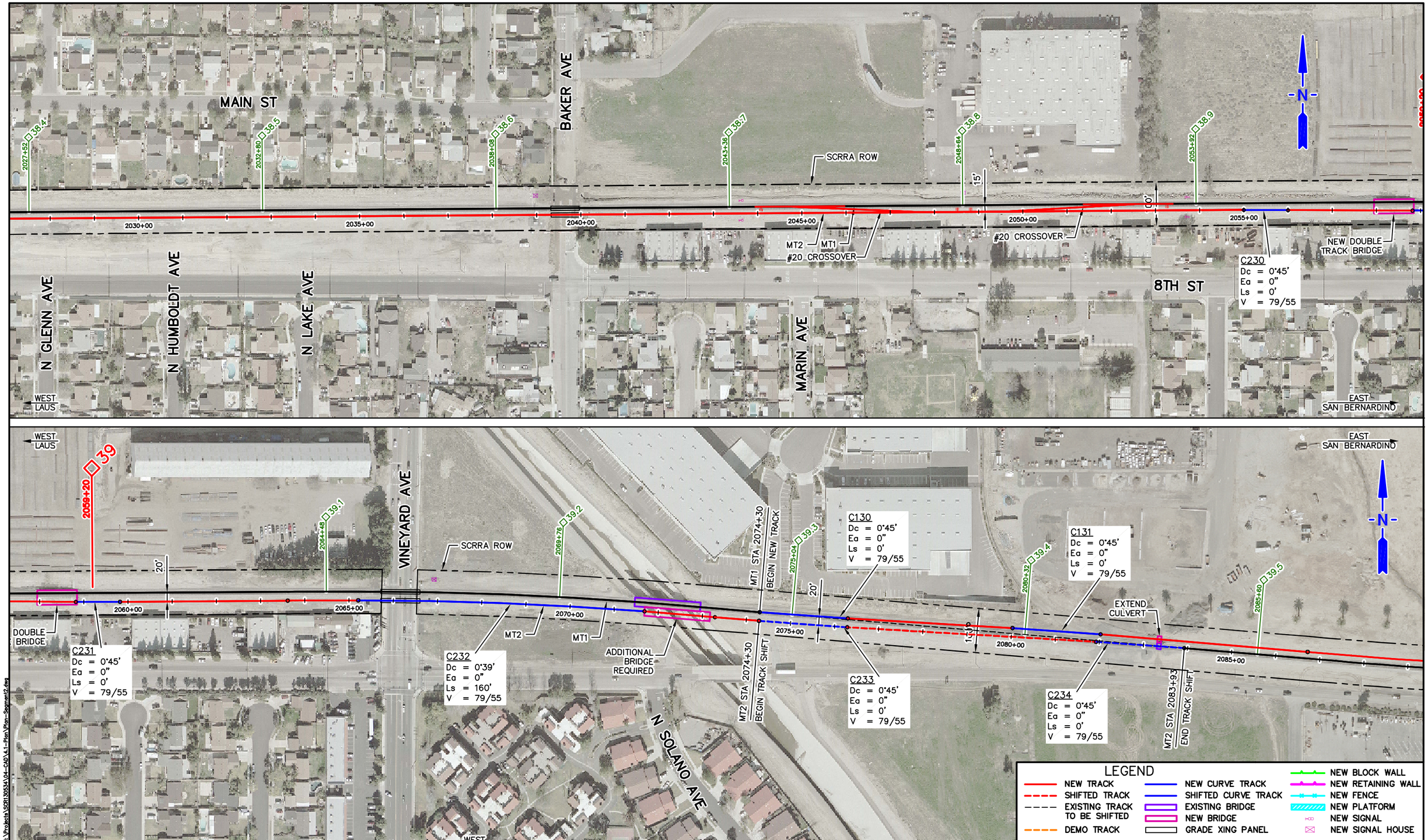

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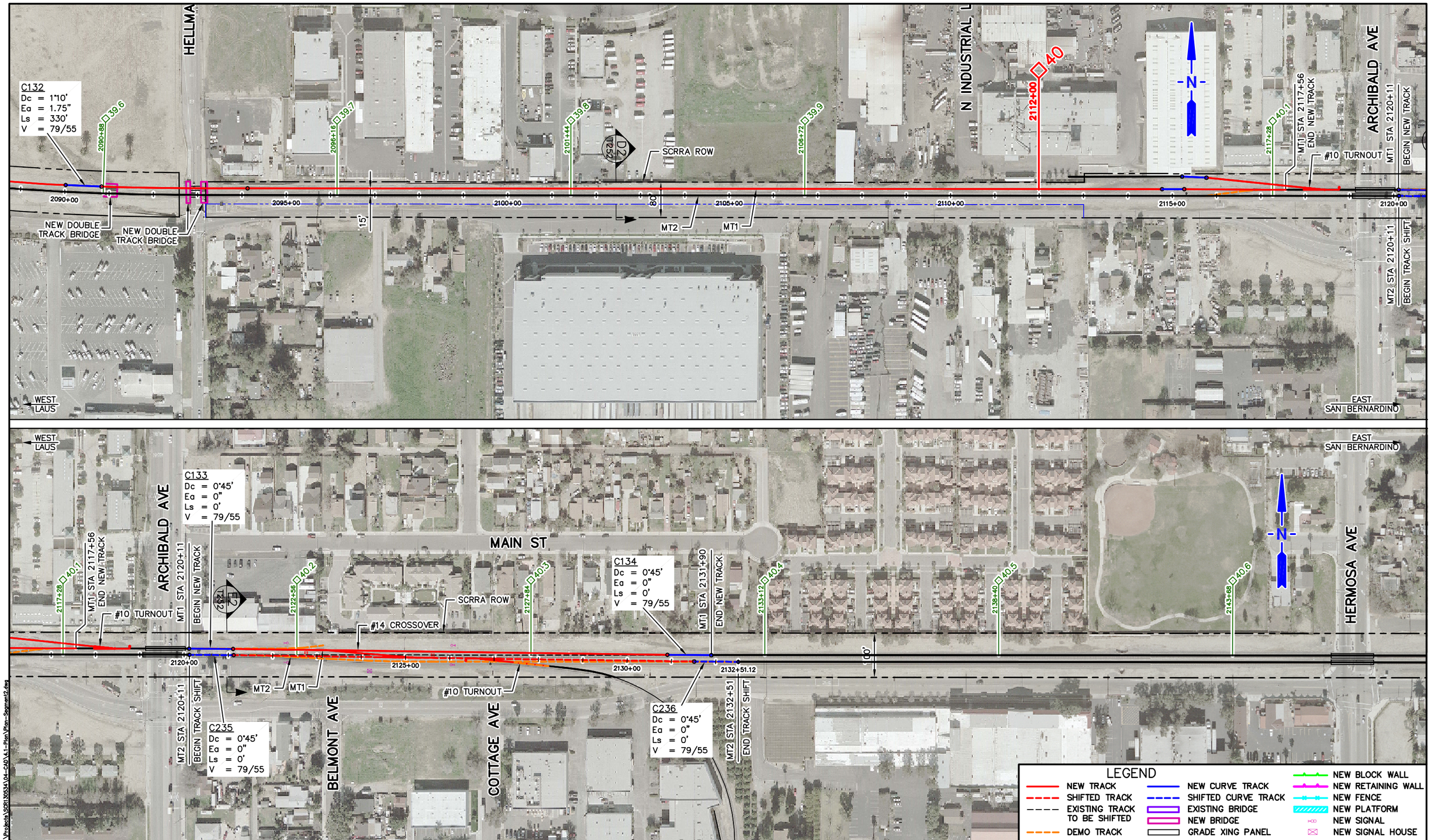
SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 2 – MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD
PROPOSED TRACK LAYOUT
SHEET 5 OF 6

CONTRACT NO. 130534
DRAWING NO. T205
REVISION
SHEET NO. 15
SCALE 1" = 200'

bhp Jan 28, 2014 – 3:22pm H:\Projects\SCR130534\04-CAD\A.1-Plan\Plan-Segment2.dwg



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SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 2 – MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD
PROPOSED TRACK LAYOUT
SHEET 6 OF 6

CONTRACT NO. 130534
DRAWING NO. T206
REVISION
SHEET NO. 16
SCALE 1" = 200'

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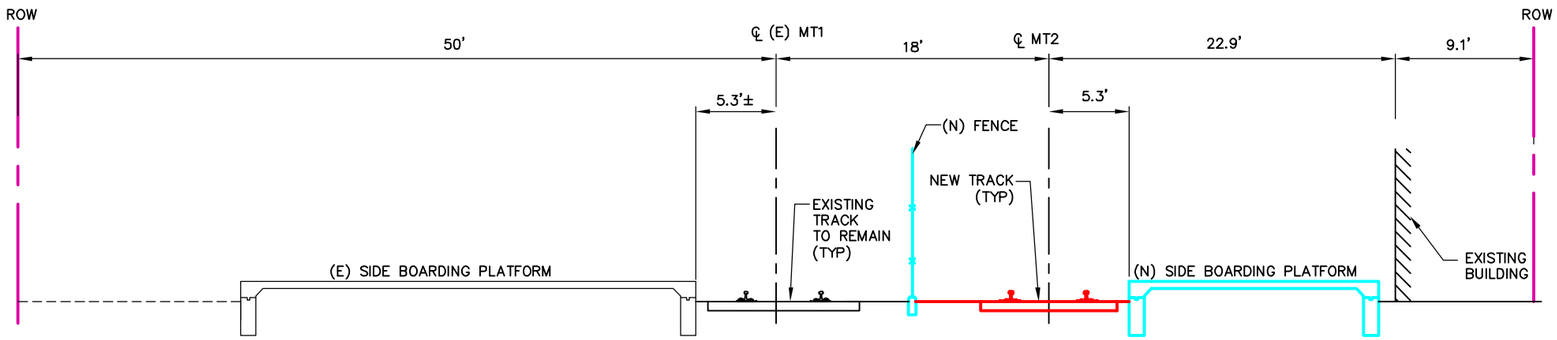
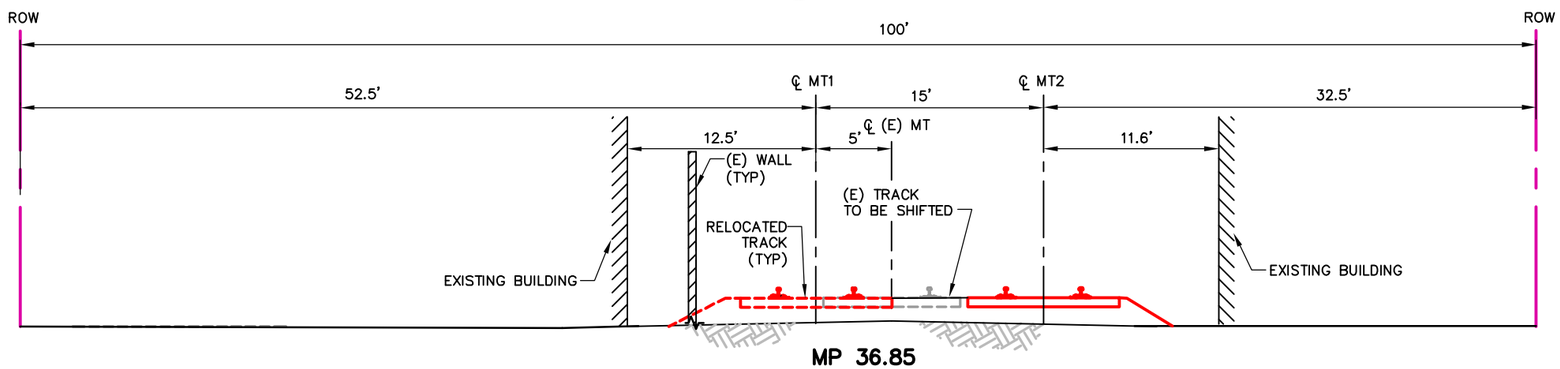


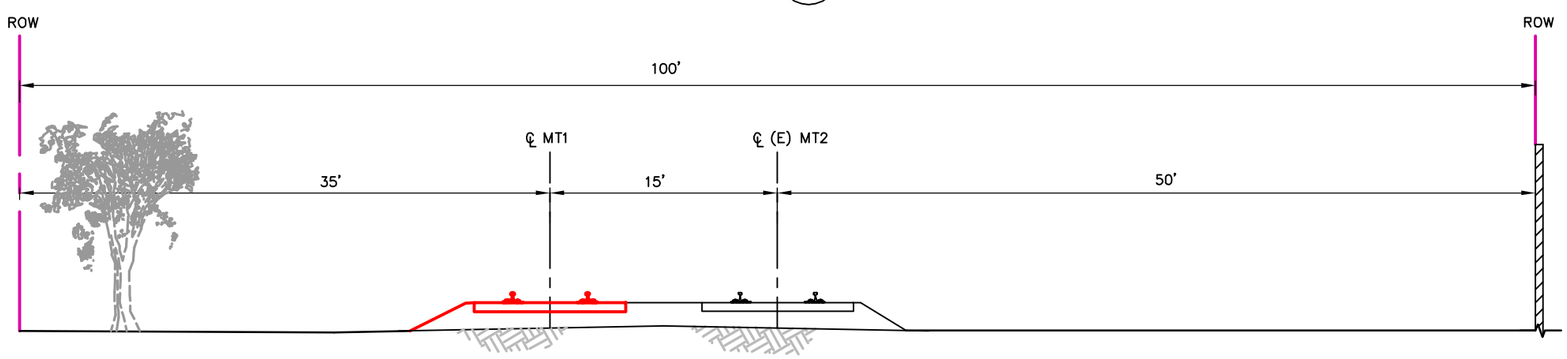
UPLAND STATION
MP 37.07

C2 / T203 SECTION
1" = 10'



MP 36.85

B2 / T203 SECTION
1" = 10'



S LOMA PL
MP 34.83

A2 / T201 SECTION
1" = 10'

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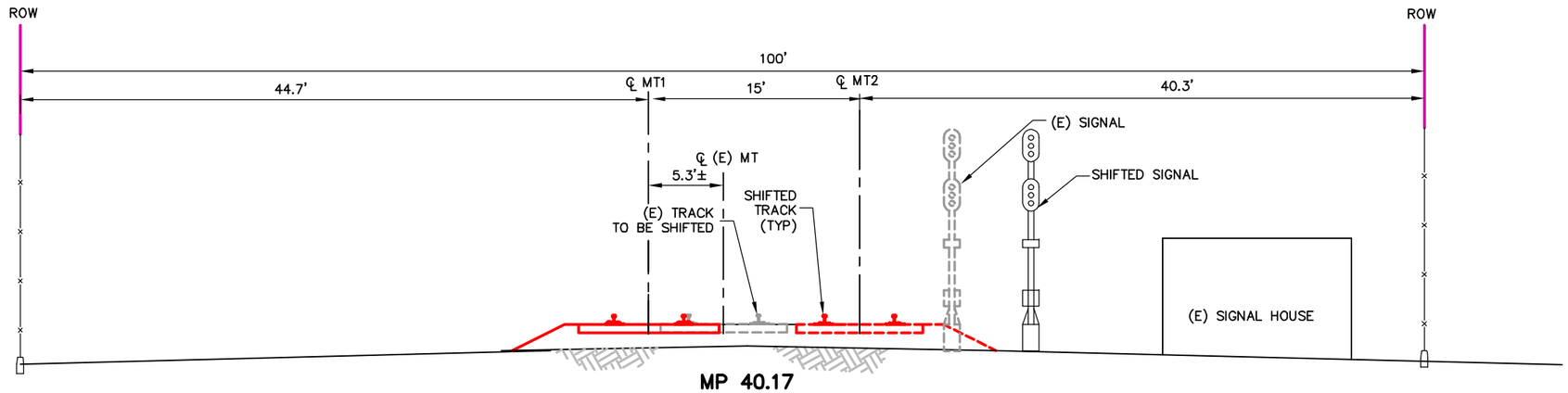
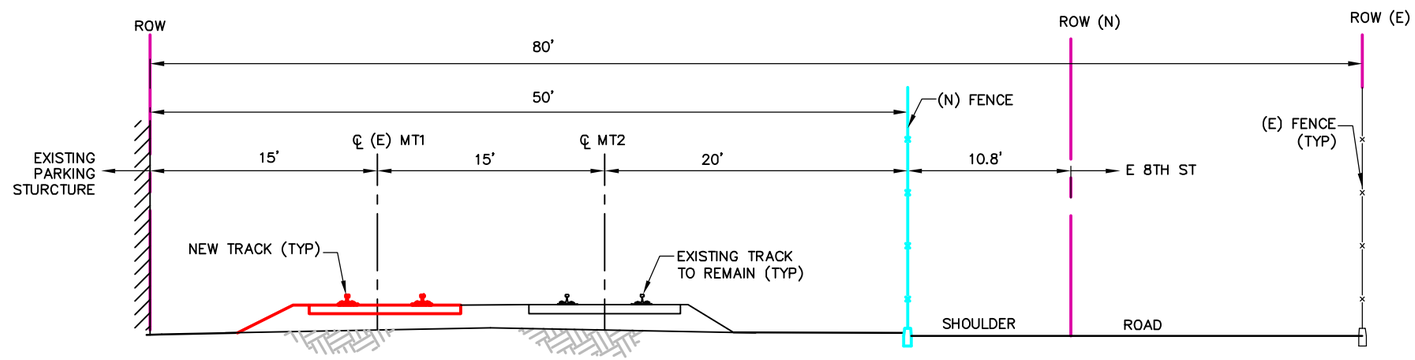
SAN GABRIEL LINE STRAGTEGIC PLAN
SEGMENT 2 – MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD
TYPICAL SECTIONS
SHEET 1 OF 2

CONTRACT NO. 130534
DRAWING NO. T251
REVISION
SHEET NO. 17
SCALE AS NOTED



MP 40.17

E2 / T206 SECTION
1" = 10'



MP 39.82

D2 / T206 SECTION
1" = 10'

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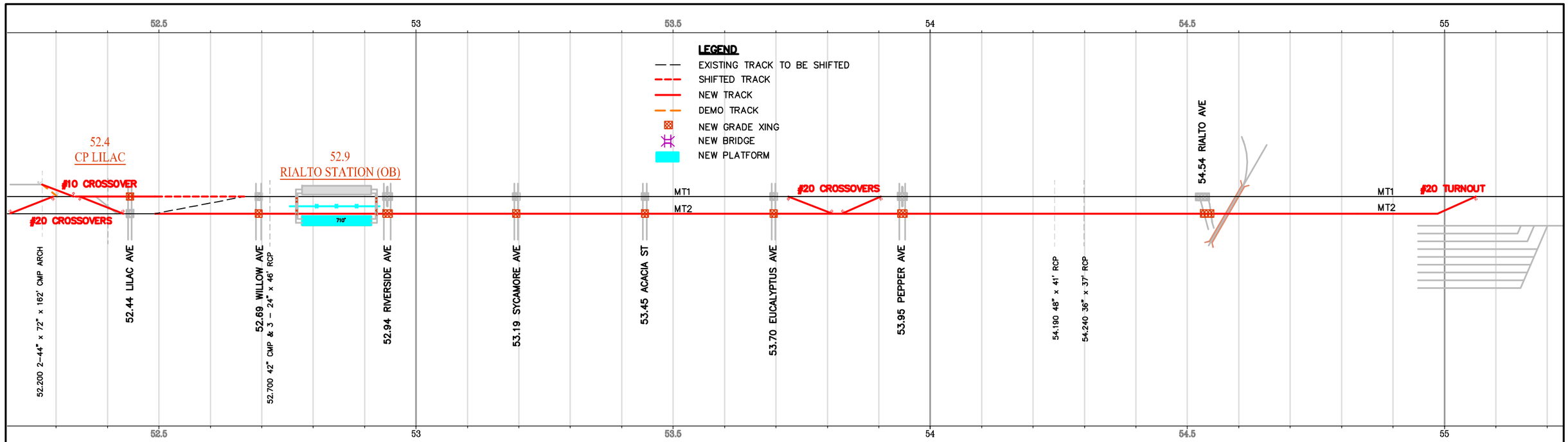
SAN GABRIEL LINE STRAGTEGIC PLAN
SEGMENT 2 – MP 34.6 CP CENTRAL TO MP 40.2 CP ARCHIBALD
TYPICAL SECTIONS
SHEET 2 OF 2

CONTRACT NO. 130534
DRAWING NO. T252
REVISION
SHEET NO. 18
SCALE AS NOTED



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METROLINK COMMUTER RAIL SYSTEM

SAN BERNARDINO LINE STRATEGIC PLAN

SEGMENT 3 – MP 52.4 CP LILAC TO MP 55.1 CP RANCHO
TRACK SCHEMATICS

CONTRACT NO. 130534
DRAWING NO. TC301
REVISION
SHEET NO. 19
SCALE 1" = 1000'

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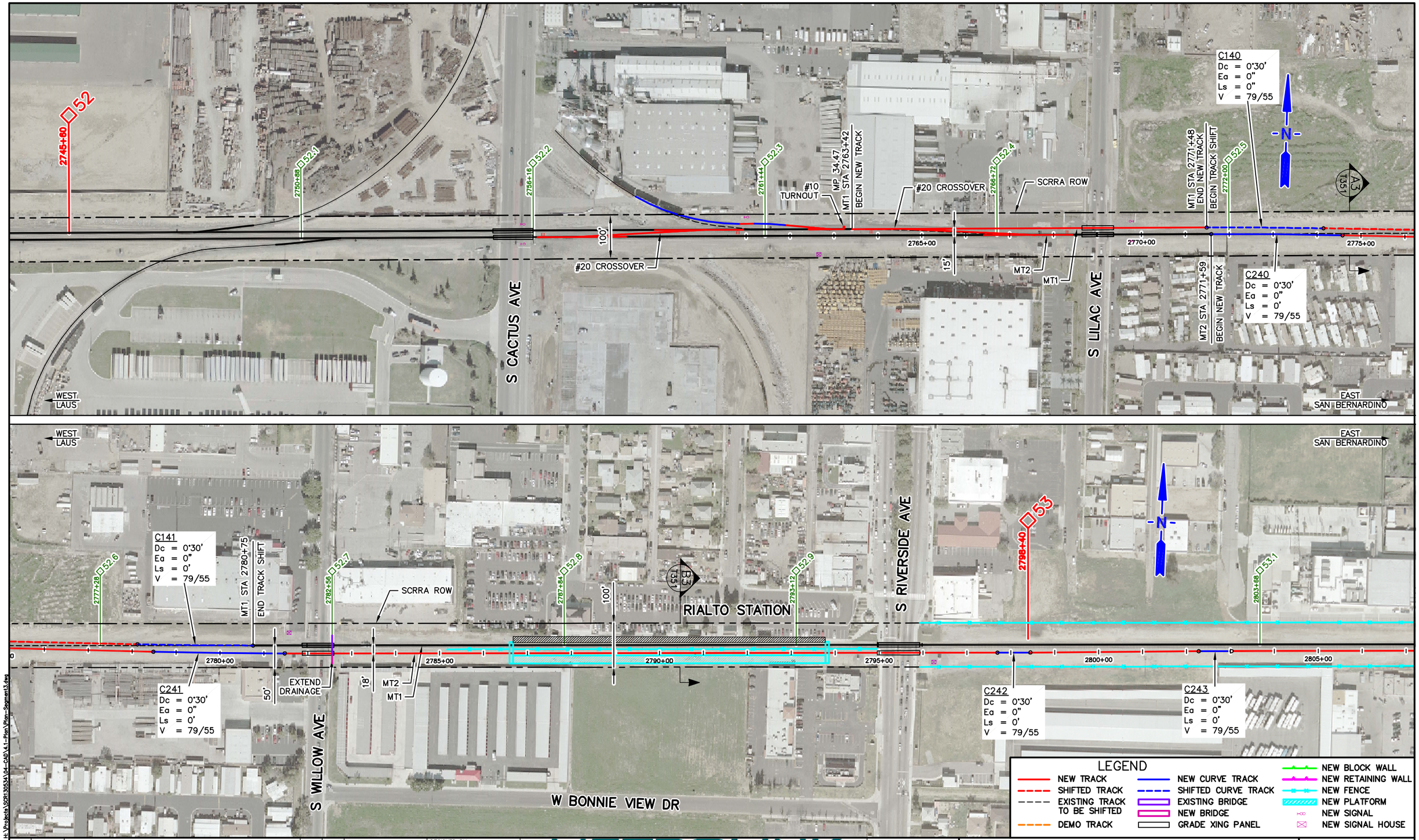

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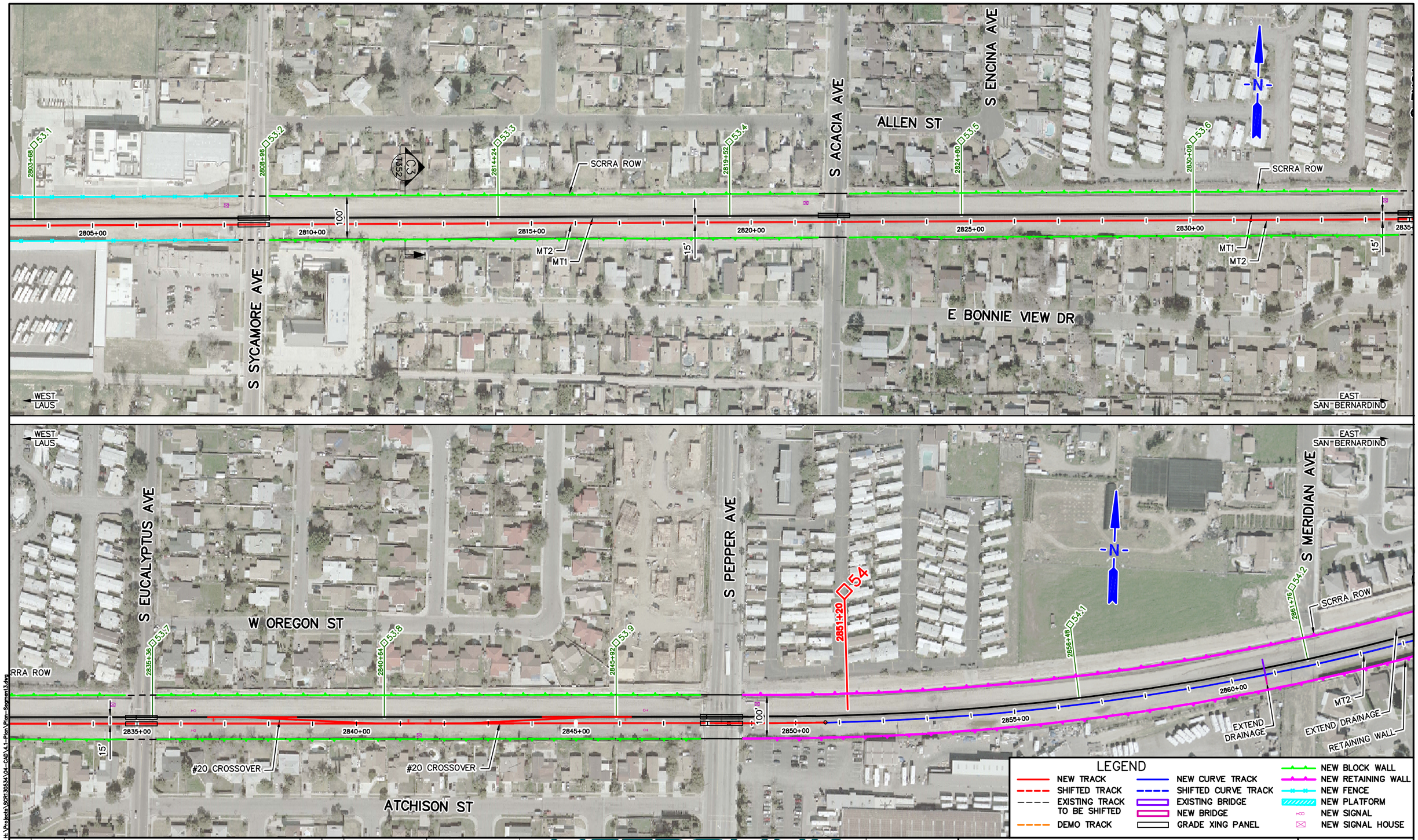
SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 3 – MP 52.4 CP LILAC TO MP 55.1 CP RANCHO
PROPOSED TRACK LAYOUT
SHEET 1 OF 3

CONTRACT NO. 130534
DRAWING NO. T301
REVISION
SHEET NO. 20
SCALE 1" = 200'



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PROJECT MANAGER

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SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 3 – MP 52.4 CP LILAC TO MP 55.1 CP RANCHO
PROPOSED TRACK LAYOUT
SHEET 2 OF 3

CONTRACT NO. 130534
DRAWING NO. T302
REVISION
SHEET NO. 21
SCALE 1" = 200'

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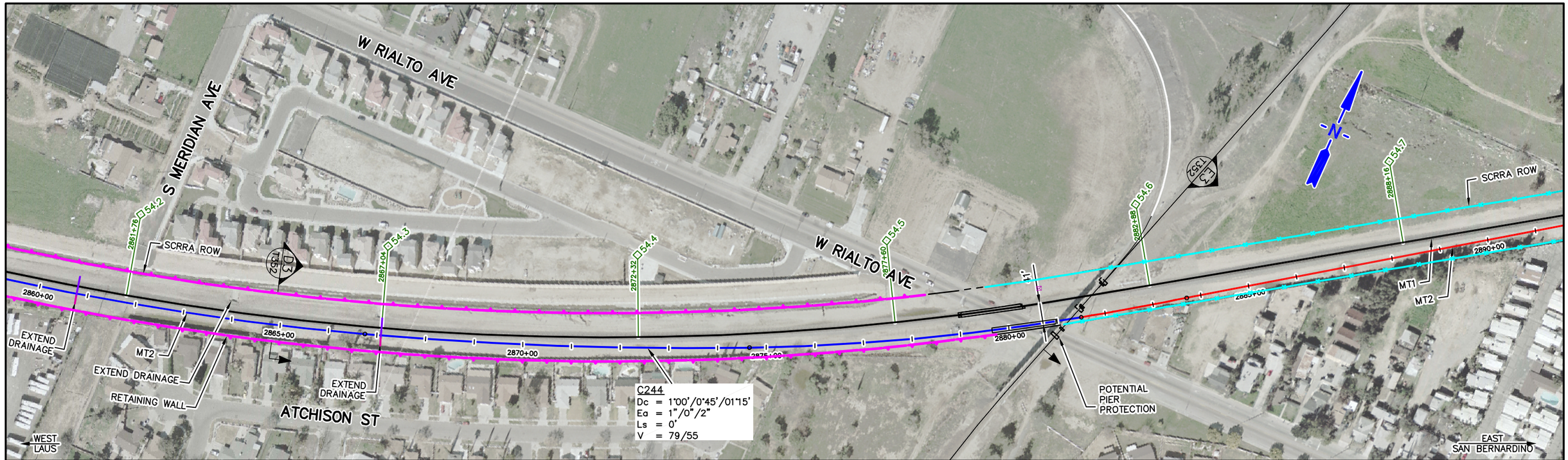

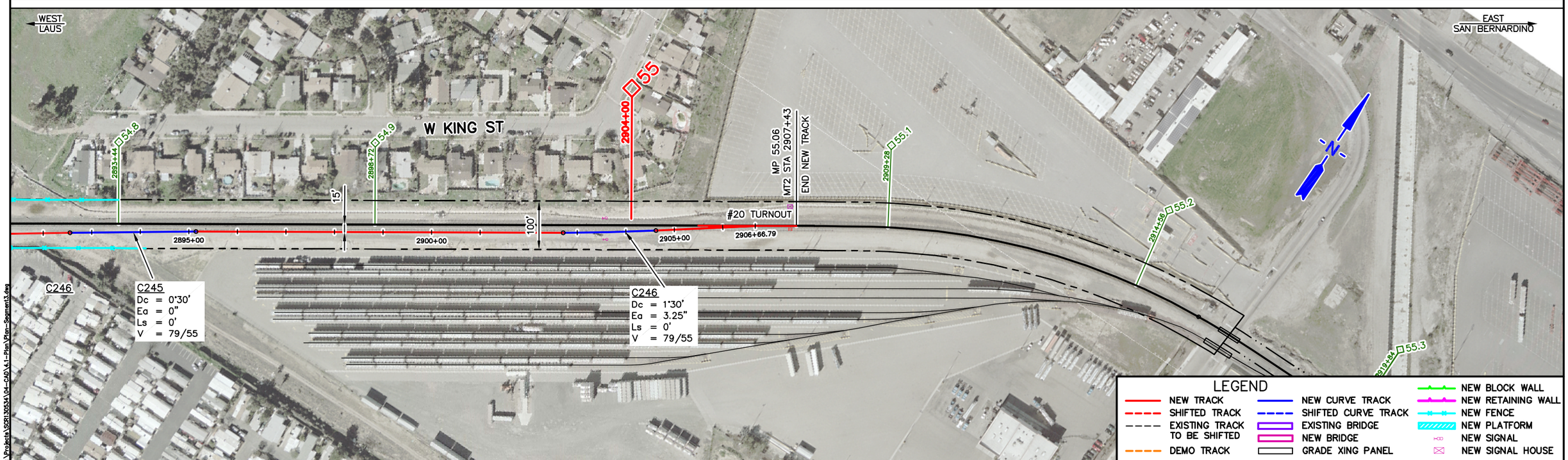

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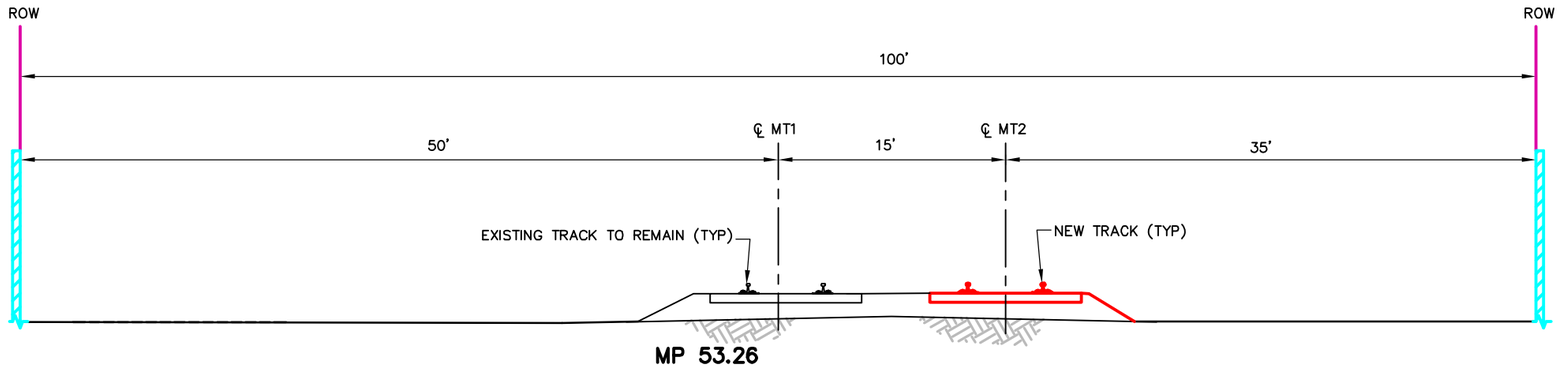
METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 3 – MP 52.4 CP LILAC TO MP 55.1 CP RANCHO
PROPOSED TRACK LAYOUT
SHEET 3 OF 3

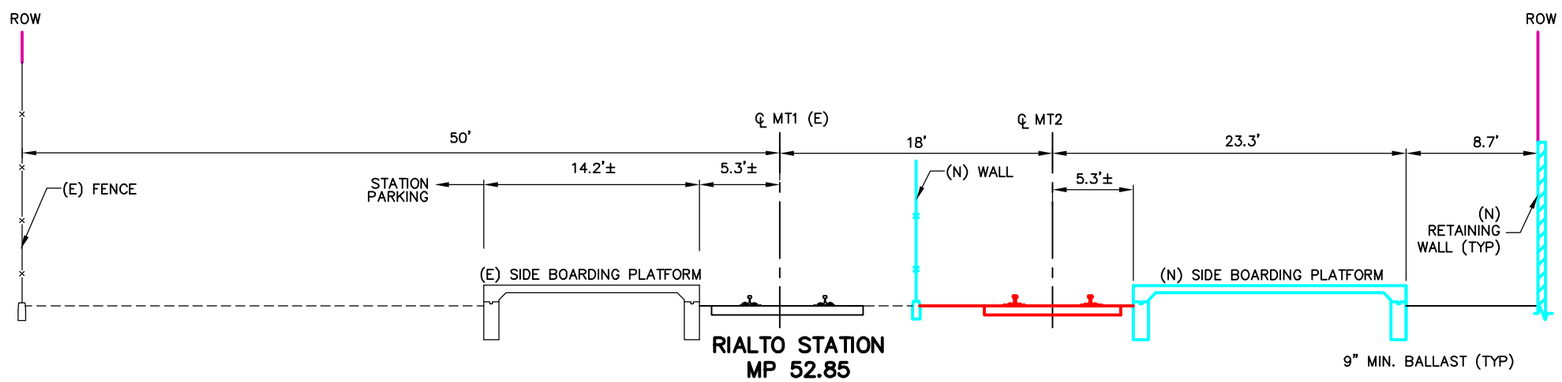
CONTRACT NO. 130534
DRAWING NO. T303
REVISION
SHEET NO. 22
SCALE 1" = 200'

Jan 28, 2014 – 3:32pm H:\Projects\SCRI\30534\04-CAD\41-Plan\Plan-Segment3.dwg



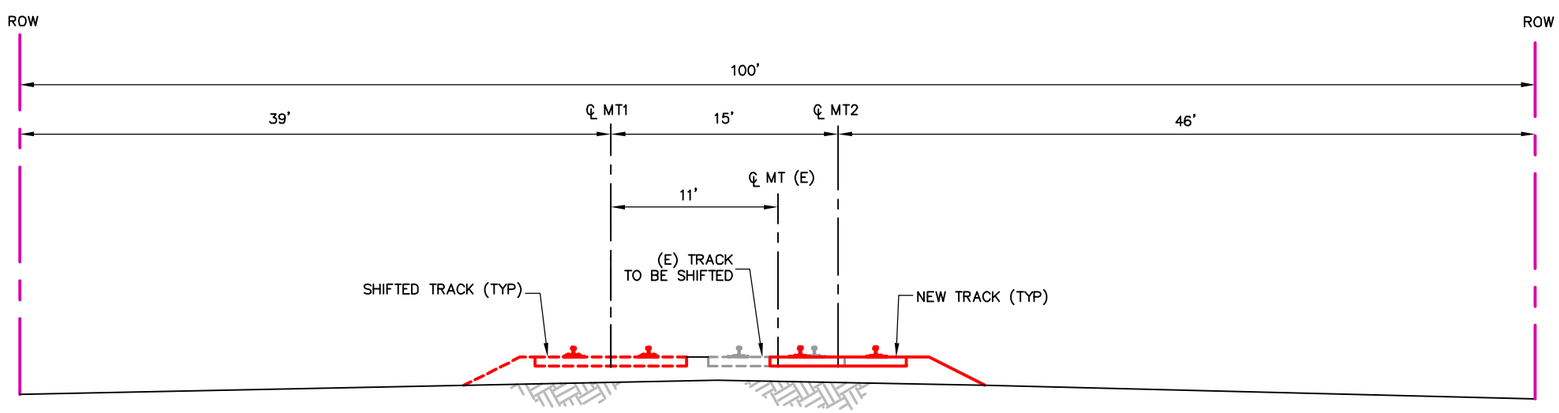
MP 53.26

C3 / T302 SECTION 1" = 10'



RIALTO STATION
MP 52.85

B3 / T301 SECTION 1" = 10'



MP 52.55

A3 / T301 SECTION 1" = 10'

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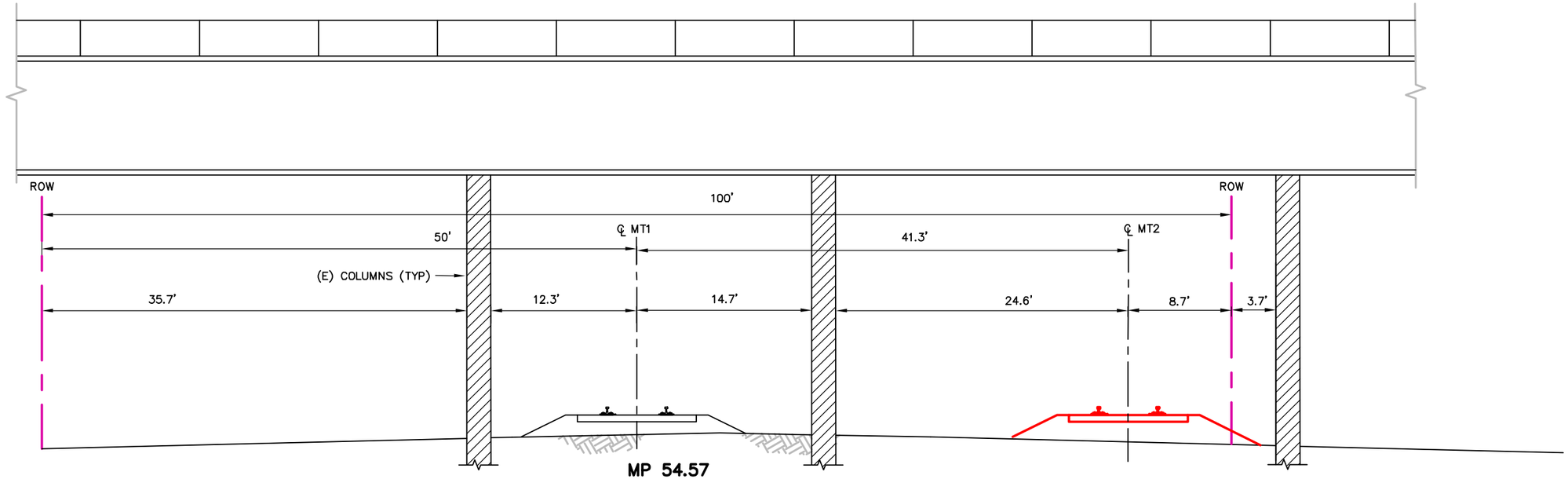
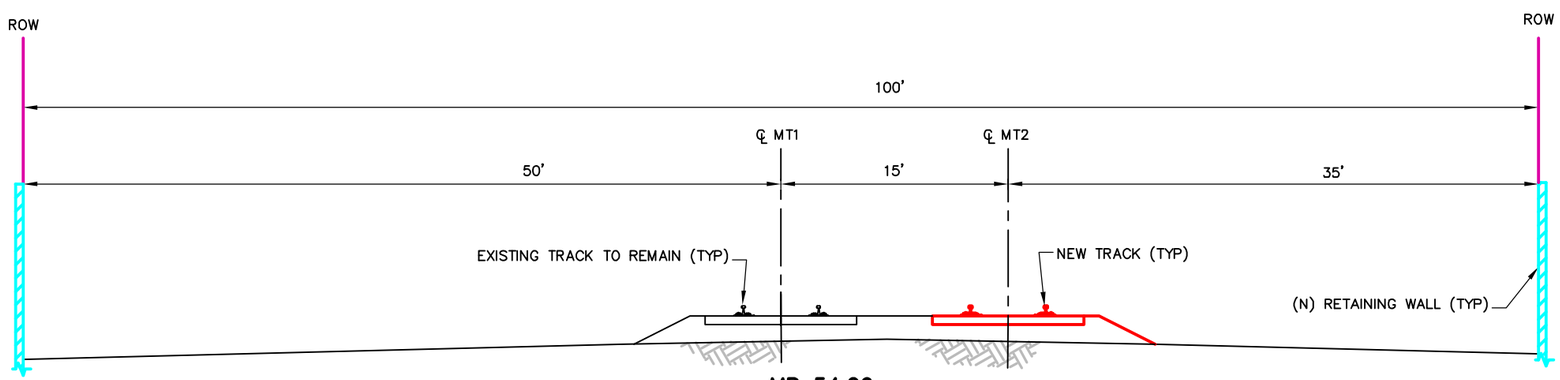
SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 3 – MP 52.4 CP LILAC TO MP 55.1 CP RANCHO
TYPICAL SECTIONS
SHEET 1 OF 2

CONTRACT NO. 130534
DRAWING NO. T351
REVISION
SHEET NO. 23
SCALE AS NOTED



MP 54.57

E3 / T303 SECTION
1" = 10'



MP 54.26

D3 / T303 SECTION
1" = 10'

NOTES:

1. POTENTIAL PIER PROTECTION WALL AT MP 54.57

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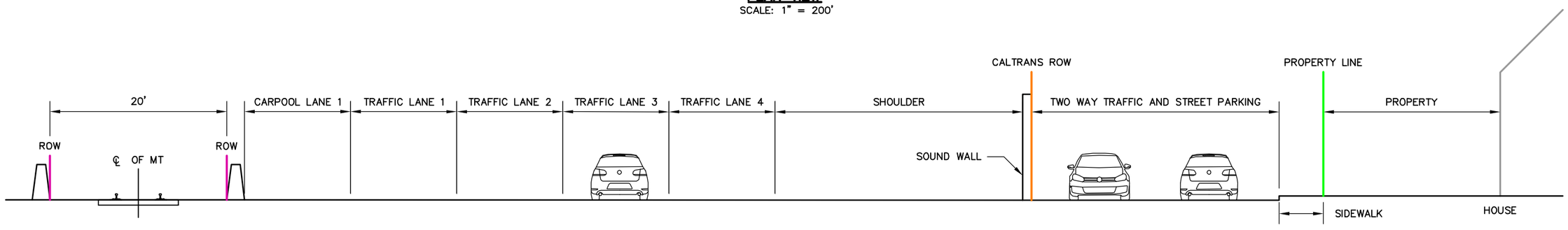
METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
SEGMENT 3 – MP 52.4 CP LILAC TO MP 55.1 CP RANCHO
TYPICAL SECTIONS
SHEET 2 OF 2

CONTRACT NO. 130534
DRAWING NO. T352
REVISION
SHEET NO. 24
SCALE AS NOTED

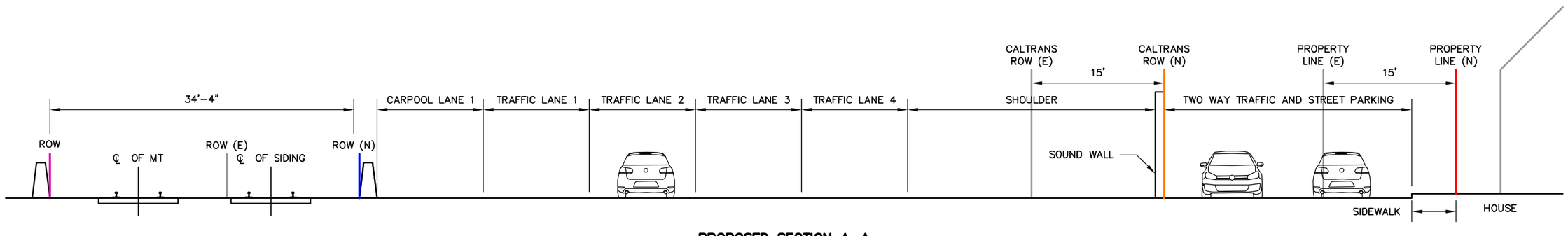
APPENDIX C2

I-10 Corridor Plans

PLAN VIEW
SCALE: 1" = 200'



EXISTING SECTION A–A
W. RAMONA RD – MP 5.6



PROPOSED SECTION A–A
W. RAMONA RD – MP 5.6

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BELMONT, CA 94002
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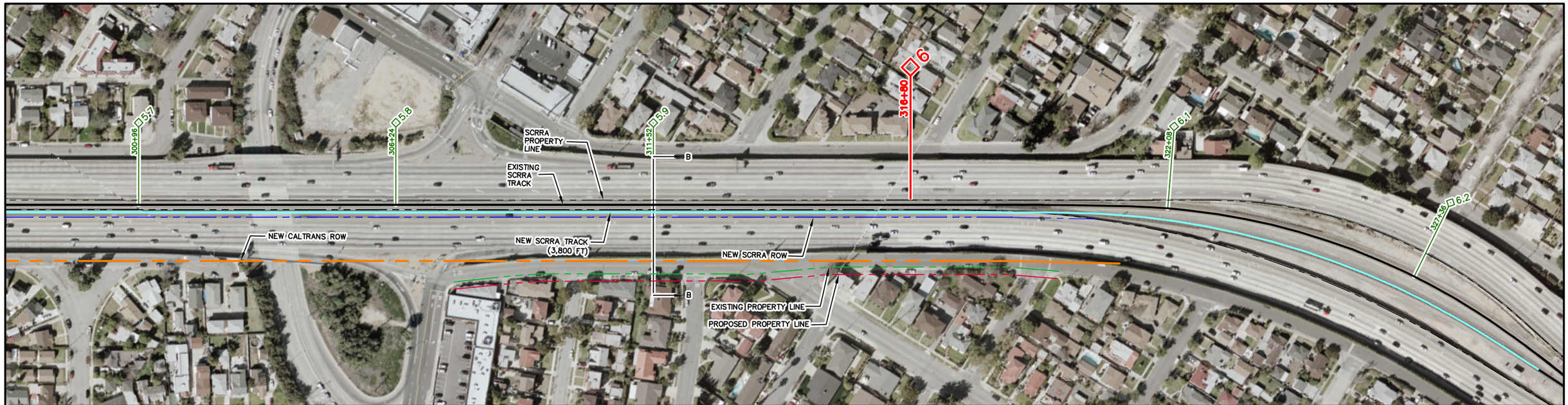
APPROVED: _____

METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
I–10 SEGMENT – MP 5.44 TO MP 6.08
PROPOSED TRACK LAYOUT

CONTRACT NO. 130534
DRAWING NO. SBSP–1
REVISION
SHEET NO. 1
SCALE AS NOTED



PLAN VIEW
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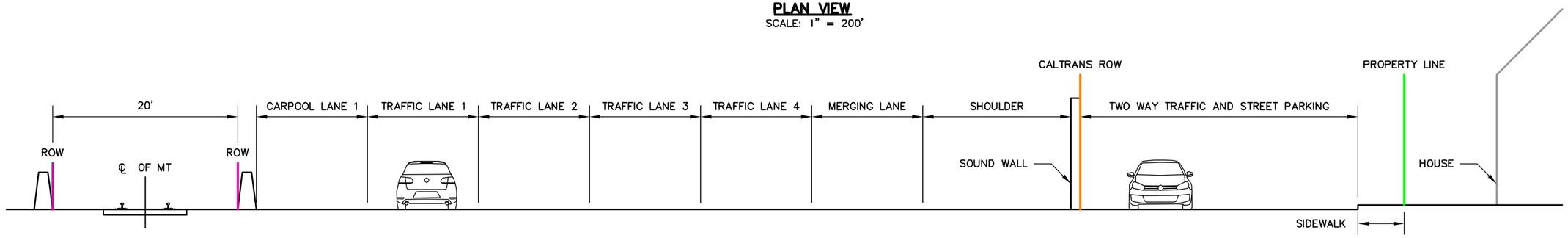
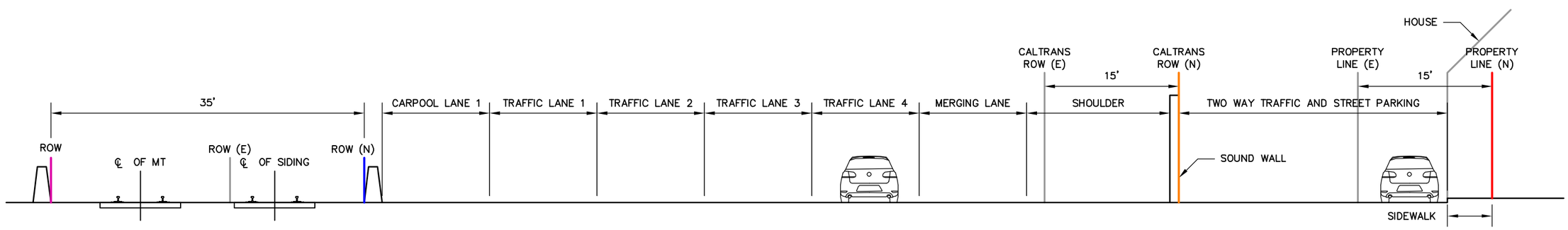


EXISTING SECTION B–B
W. RAMONA RD – MP 5.9



PROPOSED SECTION B–B
W. RAMONA RD – MP 5.9

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DATE

METROLINK

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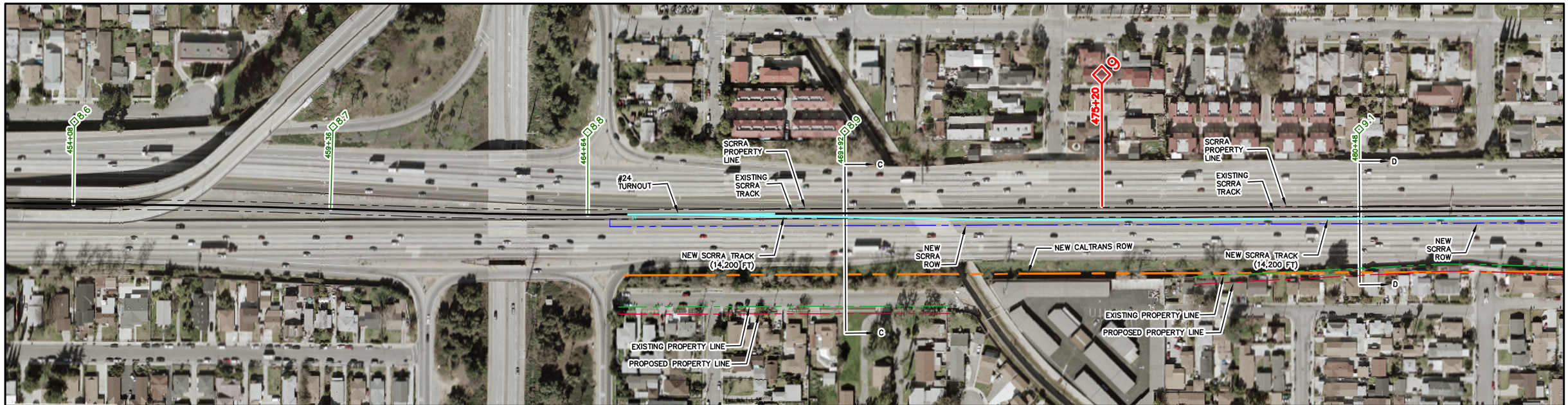
1075 OLD COUNTY ROAD
BELMONT, CA 94002
WWW.RSERAIL.COM

SUBMITTED: _____ PROJECT MANAGER

APPROVED: _____

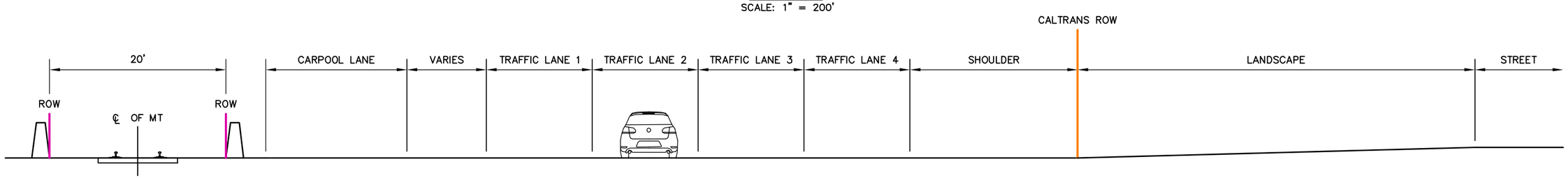
METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
I–10 SEGMENT – MP 5.44 TO MP 6.08
PROPOSED TRACK LAYOUT

CONTRACT NO. 130534
DRAWING NO. SBSP–2
REVISION
SHEET NO. 2
SCALE AS NOTED



PLAN VIEW

SCALE: 1" = 200'



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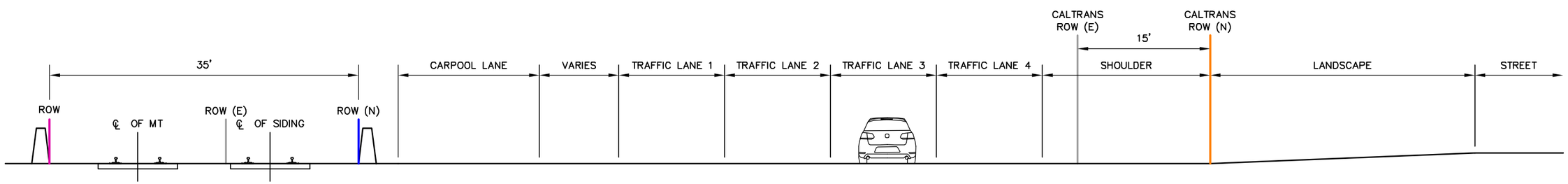
ARTSON ST – MP 8.9



PROPOSED SECTION C–C

ARTSON ST – MP 8.9

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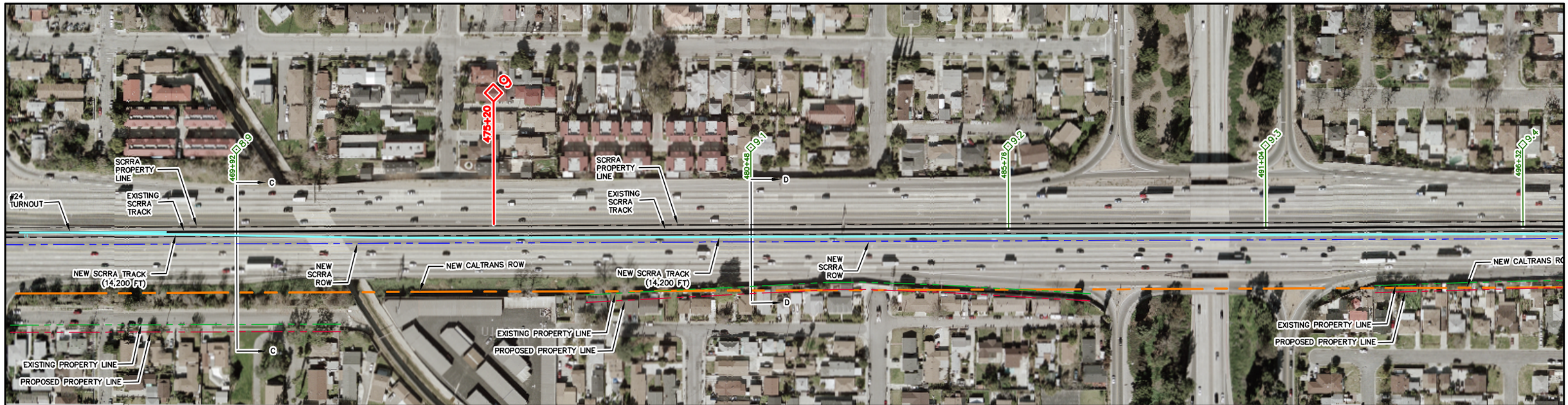
METROLINK COMMUTER RAIL SYSTEM

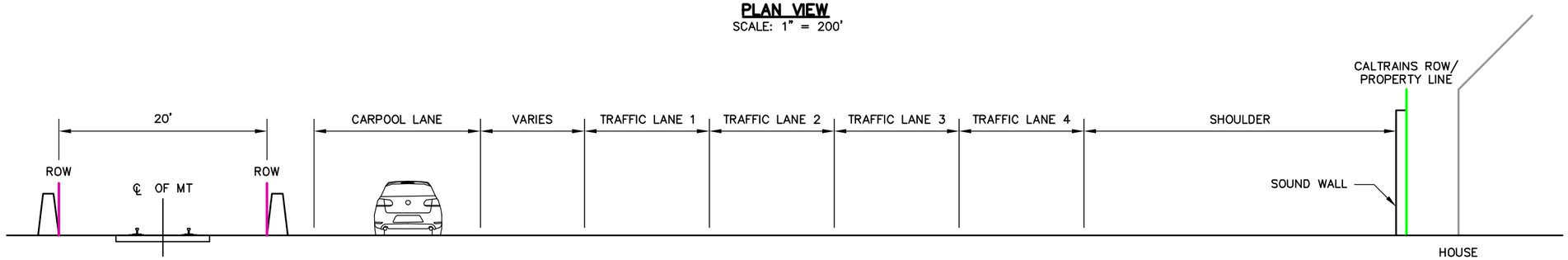
SAN BERNARDINO LINE STRATEGIC PLAN

I–10 SEGMENT – MP 8.82 TO MP 11.25
PROPOSED TRACK LAYOUT

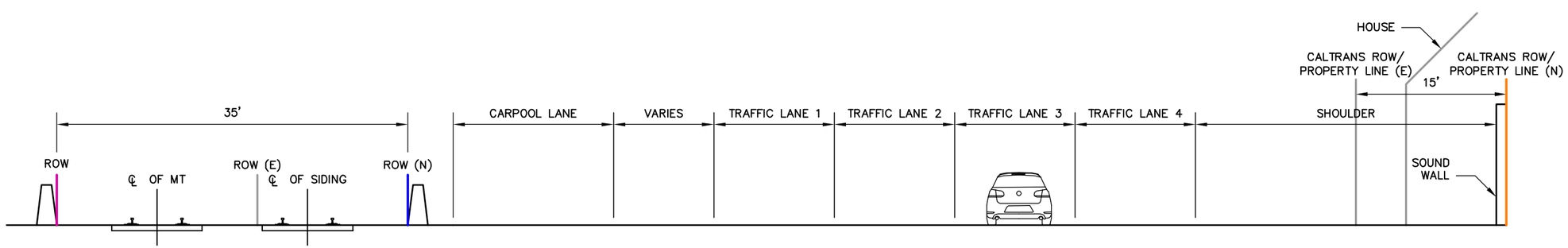
CONTRACT NO. 130534
DRAWING NO. SBSP–3
REVISION
SHEET NO. 3
SCALE AS NOTED



PLAN VIEW
SCALE: 1" = 200'



EXISTING SECTION D–D
ARTSON ST – MP 9.1



PROPOSED SECTION D–D
ARTSON ST – MP 9.1

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METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
I–10 SEGMENT – MP 8.82 TO MP 11.25
PROPOSED TRACK LAYOUT

CONTRACT NO. 130534
DRAWING NO. SBSP–4
REVISION
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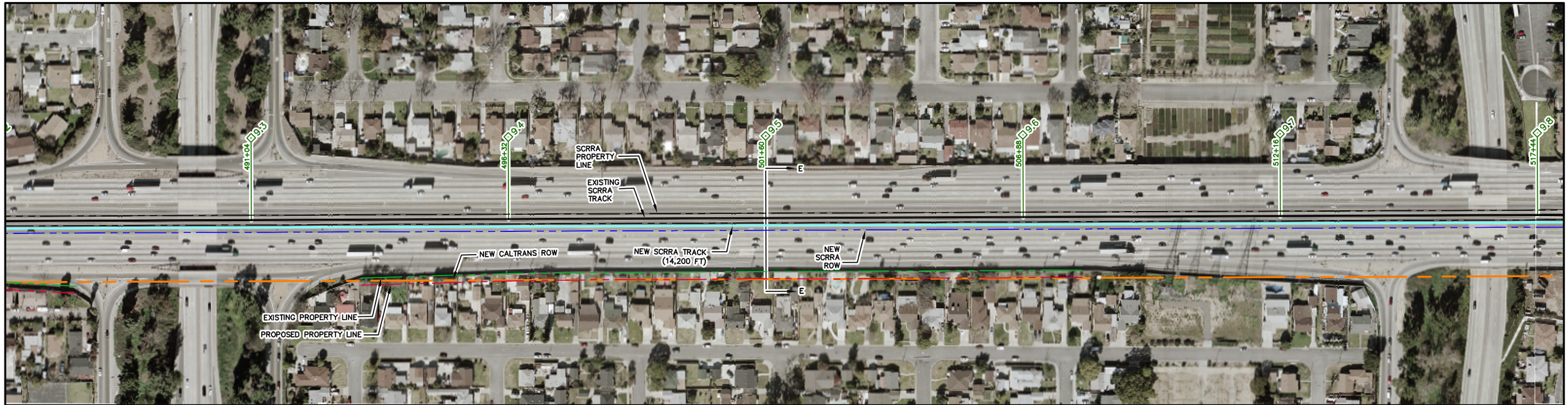
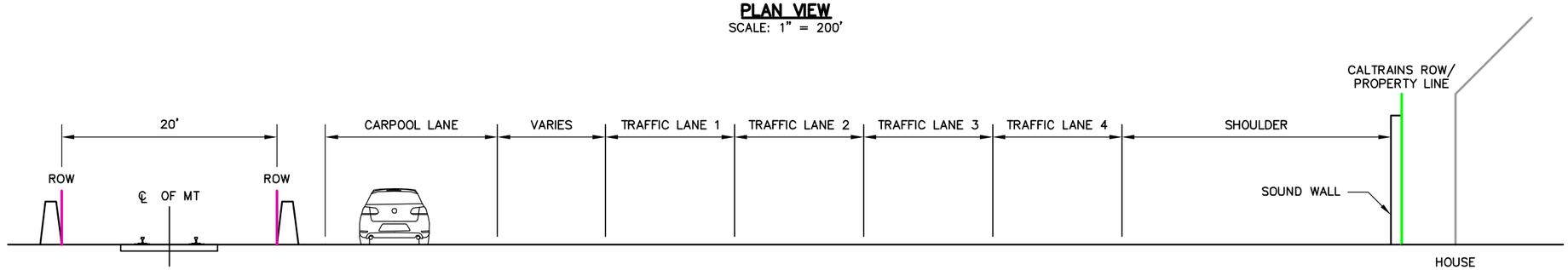


PLAN VIEW
SCALE: 1" = 200'



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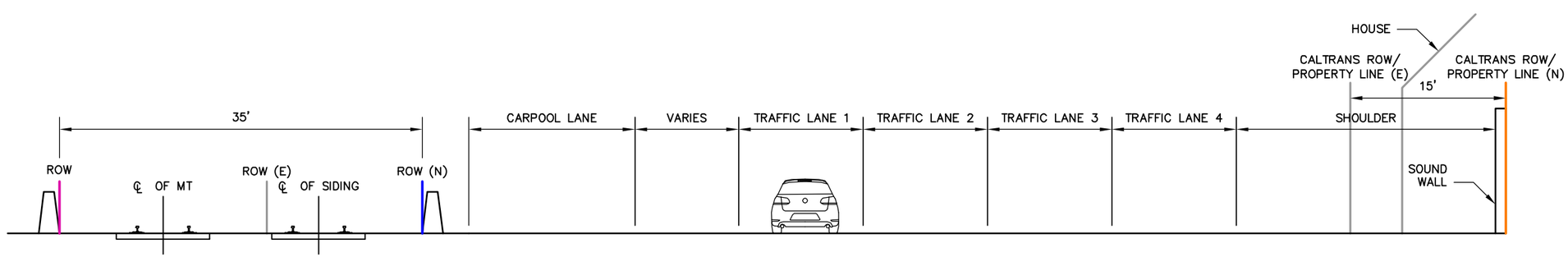
ARTSON ST – MP 9.6



PROPOSED SECTION E–E
ARTSON ST – MP 9.6

REV.	DATE		BY	SUB.	APP.

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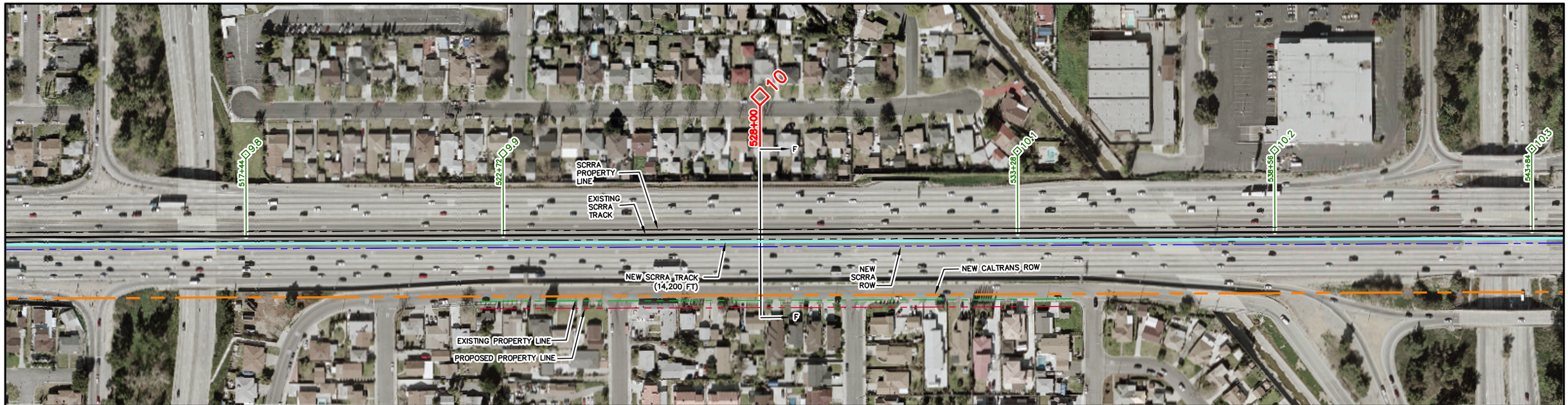
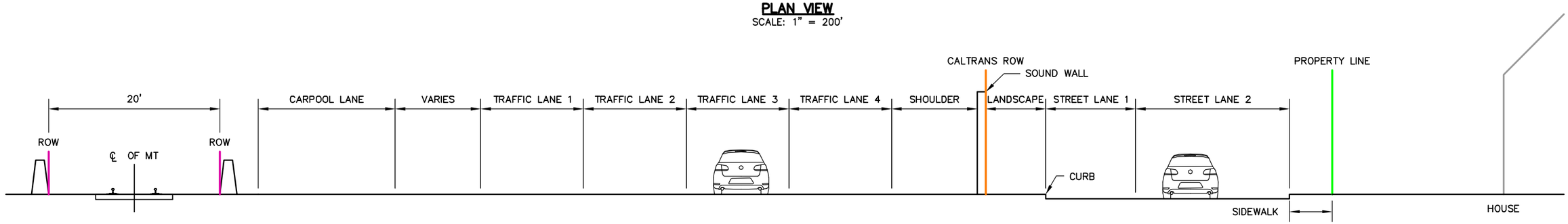
METROLINK COMMUTER RAIL SYSTEM
SAN BERNARDINO LINE STRATEGIC PLAN
I–10 SEGMENT – MP 8.82 TO MP 11.25
PROPOSED TRACK LAYOUT

CONTRACT NO. 130534
DRAWING NO. SBSP–5
REVISION
SHEET NO. 5
SCALE AS NOTED



PLAN VIEW

SCALE: 1" = 200'



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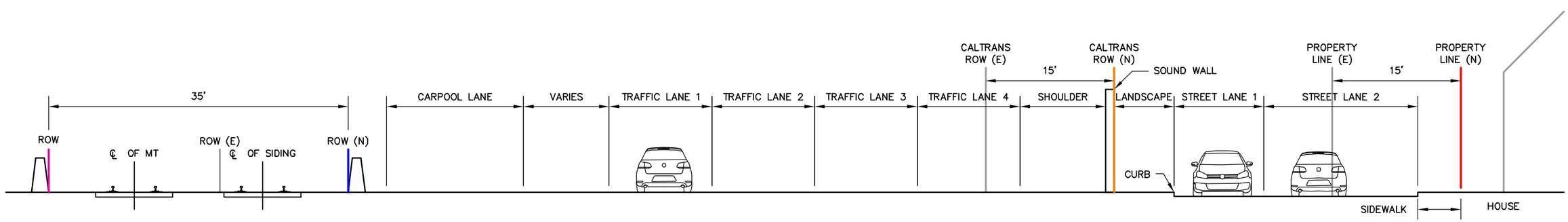
RAMONA BLVD – MP 10.0



PROPOSED SECTION F–F

RAMONA BLVD – MP 10.0

REV.	DATE		BY	SUB.	APP.

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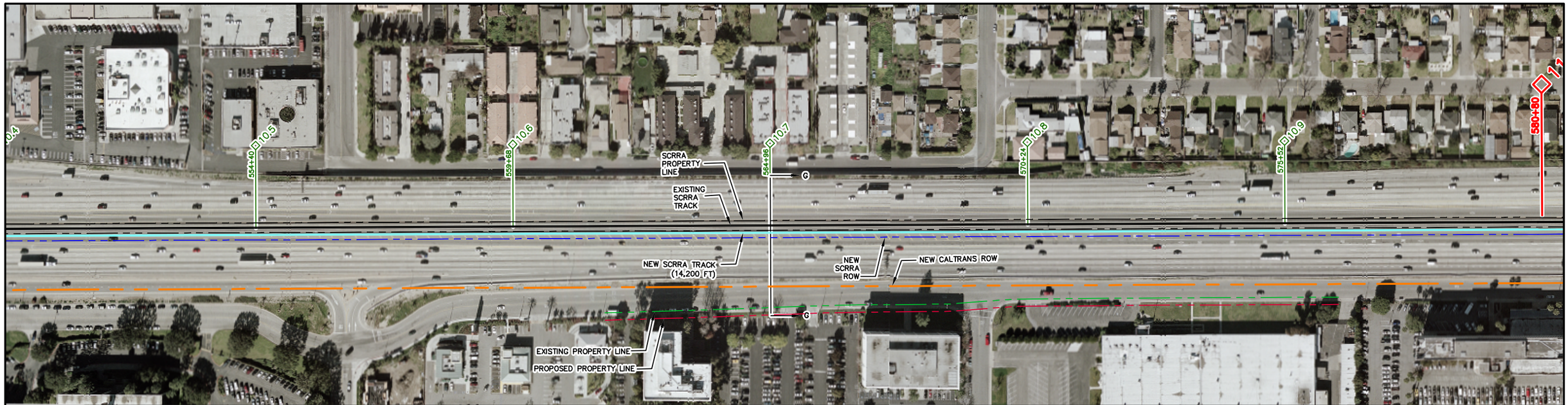
METROLINK COMMUTER RAIL SYSTEM

SAN BERNARDINO LINE STRATEGIC PLAN

I–10 SEGMENT – MP 8.82 TO MP 11.25
PROPOSED TRACK LAYOUT

CONTRACT NO. 130534
DRAWING NO. SBSP–6
REVISION
SHEET NO. 6
SCALE AS NOTED



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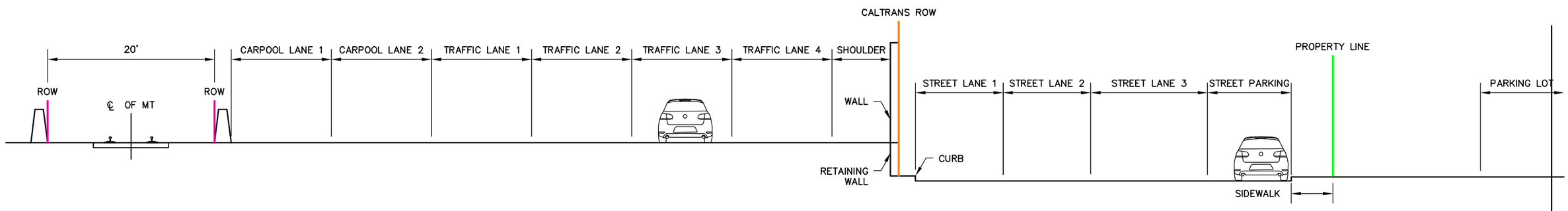

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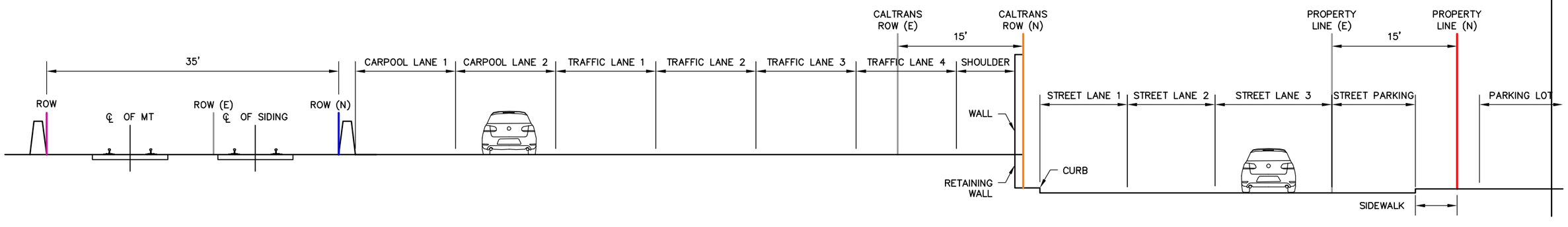
FLAIR DR – MP 10.7



PROPOSED SECTION G–G

FLAIR DR – MP 10.7

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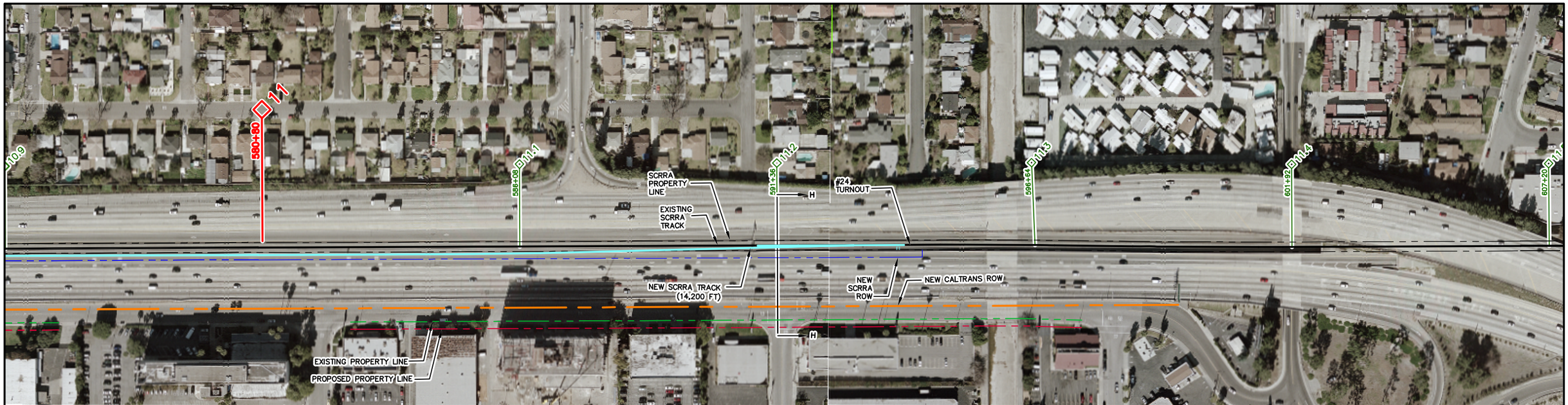
METROLINK COMMUTER RAIL SYSTEM

SAN BERNARDINO LINE STRATEGIC PLAN

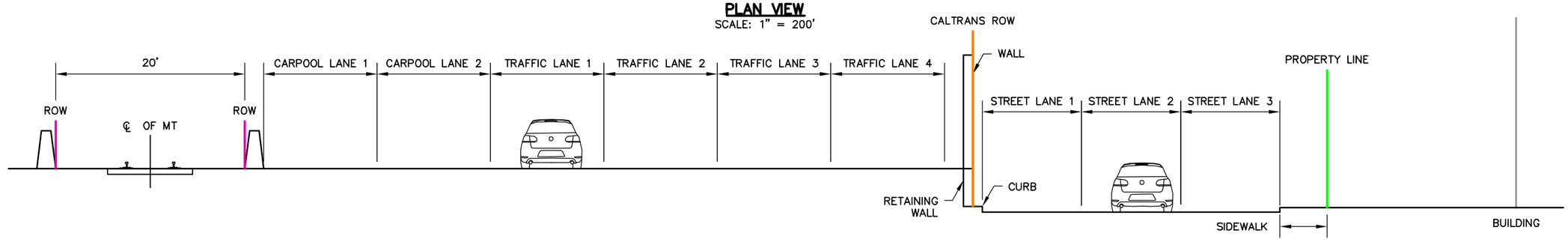
I–10 SEGMENT – MP 8.82 TO MP 11.25
PROPOSED TRACK LAYOUT

CONTRACT NO. 130534
DRAWING NO. SBSP–7
REVISION
SHEET NO. 7
SCALE AS NOTED



PLAN VIEW

SCALE: 1" = 200'



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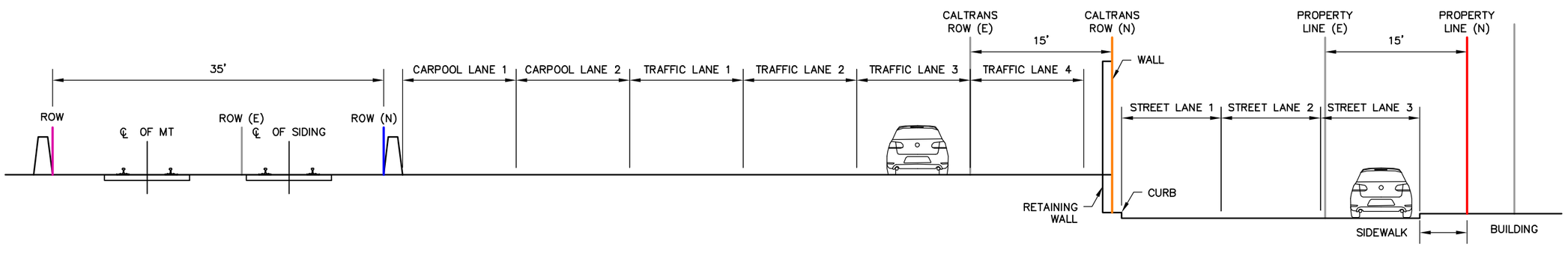
FLAIR DR – MP 11.2



PROPOSED SECTION H–H

FLAIR DR – MP 11.2

REV.	DATE		BY	SUB.	APP.

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METROLINK COMMUTER RAIL SYSTEM

SAN BERNARDINO LINE STRATEGIC PLAN

I–10 SEGMENT – MP 8.82 TO MP 11.25
PROPOSED TRACK LAYOUT

CONTRACT NO. 130534
DRAWING NO. SBSP–8
REVISION
SHEET NO. 8
SCALE AS NOTED

APPENDIX D

Grade Crossings

APPENDIX D1

Decision Chart and Pedestrian Safety Enhancement Summary

METROLINK - SAN BERNARINO LINE DECISION CHART AND PEDESTRIAN SAFETY ENHANCEMENT SUMMARY
LONE HILL AVENUE TO CP WHITE

LONE HILL AVE TO CP WHITE: PEDESTRIAN - RAIL GRADE CROSSING DESIGN CONSIDERATION TABLE

No.	Street Crossing	Type	Decision Point 1: Existing Pedestrian Activity, Sidewalks Leading to the Railroad Right of Way	Decision Point 2: Crossing Considered for Quiet Zone	Decision Point 3: Vehicle/Pedestrian Crossing with Adjacent Passenger Station (Including Light Rail)	* Decision Point 4: School Zone, Hospital Zone, Adjacent ADA Facility (within 10 min walk) or Significant Pedestrian Activity Levels Occur *	School, Hospital, ADA Facility, or Significant Pedestrian Generator Within 10 Minutes	Decision Point 5: 3 or More Main or Controlled Siding Tracks	Decision Point 6: Two Main Tracks	Decision Point 7: Visibility Restricted on Approach	Decision Point 8A: Constrained Right of Way	Decision Point 8B: Note 2 Unable to Fit Pedestrian Gate(s)	** Pedestrian Improvement Recommendation Summary **
1	Cataract Ave	Industrial	Yes	No	No	No (Pedestrian study needed to verify that ped activity due to the proximity of Pioneer Park is low as perceived).		No	Yes	No			**Pedestrian Channelization** and **Passive Warning Devices**
2	S. San Dimas Ave	Resid/Ind	Yes	No	No	Yes (Proceed to Decision Point 8A)	Raging Waters is a 9 minute walk to south of the crossing and is a significant local attraction.				No		**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
3	Walnut Ave	Resid/Ind	Yes	No	No	No		No	Yes	Yes (Proceed to Decision Point 8B)		Yes	**Pedestrian Channelization, Passive Warning Devices,** and **Swing Gates**
4	San Dimas Canyon Rd	Resid/Ind	Yes	No	No	Yes (Proceed to Decision Point 8A)	Holy Name of Mary Church and School is a 6 minute walk from the crossing.				No		**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
5	Ganey Ceramics (Private)	Industrial	No (Proceed to Pedestrian Improvement Summary)										No Additional Pedestrian Improvements
6	Wheeler Ave	Industrial	Yes	No	No	Yes (Proceed to Decision Point 8A)	University of La Verne is an 8 minute walk from the crossing. Kuns park is also adjacent to the crossing.				No		**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
7	Fairplex Drive	Resid/Ind	Yes	No	No	Yes (Proceed to Decision Point 8A)	University of La Verne is an 8 minute walk from the crossing. Auto Club Raceway is also adjacent to the crossing.				No		**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
8	Arrow Hwy	Industrial	Yes	No	No	Yes (Proceed to Decision Point 8A)	University of La Verne is an 9 minute walk from the crossing.				No		**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
9	Paper Pak (Private)	Industrial	No (Proceed to Pedestrian Improvement Summary)										No Additional Pedestrian Improvements
10	N. White Ave	Resid/Ind	Yes	No	No	Yes (Proceed to Decision Point 8A)	University of La Verne is a 7 minute walk from the crossing.				No		**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)

NOTES:
*** Further investigation (pedestrian study) to determine the volume of pedestrian use (on and off-peak hours), types of pedestrians, and pedestrian behavior must be completed for all roadway-grade crossings identified as part of a proposed double track corridor to verify that pedestrian activity is "substantial".**
**** Proposed pedestrian safety recommendations are an initial attempt at determining the safety needs of the roadway-rail grade crossings for capital cost estimation purposes and are subject to change pending inspection by a Safety Review Team to be designated at a future date by METRO, SANBAG, and SCRRA project managers and a formal CPUC diagnostic review of each roadway-rail grade crossing.**

METROLINK - SAN BERNARINO LINE DECISION CHART AND PEDESTRIAN SAFETY ENHANCEMENT SUMMARY
LONE HILL AVENUE TO CP WHITE

LONE HILL AVE TO CP WHITE: SAFETY ENHANCEMENTS SUMMARY

No.	Street Crossing	Type	New Vehicle Gates	Protect Existing Vehicle Gate in Place	Relocate Vehicle Gates	Exit Gates	New Median/Median Extensions	Pedestrian Channelization	Passive Warning Devices	Swing Gates	Pedestrian Gates	Pedestrian Gate Justification	Pedestrian Improvement Recommendation Summary
1	Cataract Ave	Industrial	No	Yes	No	No	Yes	Yes	Yes	No	No		**Pedestrian Channelization** and **Passive Warning Devices**
2	S. San Dimas Ave	Resid/Ind	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Raging Waters is a 9 minute walk to south of the crossing and is a significant local attraction.	**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
3	Walnut Ave	Resid/Ind	No	No	Yes	Yes	Yes	Yes	Yes	No	No		**Pedestrian Channelization, Passive Warning Devices,** and **Swing Gates**
4	San Dimas Canyon Rd	Resid/Ind	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Holy Name of Mary Church and School is a 6 minute walk from the crossing.	**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
5	Ganey Ceramics (Private)	Industrial	No	Yes	Yes	No	No	No	Yes	No	No		No Additional Pedestrian Improvements
6	Wheeler Ave	Industrial	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	University of La Verne is an 8 minute walk from the crossing. Kuns park is also adjacent to the crossing.	**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
7	Fairplex Drive	Resid/Ind	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	University of La Verne is an 8 minute walk from the crossing. Auto Club Raceway is also adjacent to the crossing.	**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
8	Arrow Hwy	Industrial	Yes (No. 8A Cantilever)	Yes	Yes	No	No	Yes	Yes	Yes	Yes	University of La Verne is an 9 minute walk from the crossing.	**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
9	Paper Pak (Private)	Industrial	No	Yes	Yes	No	No	No	Yes	No	No		No Additional Pedestrian Improvements
10	N. White Ave	Resid/Ind	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	University of La Verne is a 7 minute walk from the crossing.	**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)

NOTES:
*** Further investigation (pedestrian study) to determine the volume of pedestrian use (on and off-peak hours), types of pedestrians, and pedestrian behavior must be completed for all roadway-grade crossings identified as part of a proposed double track corridor to verify that pedestrian activity is "substantial".**
**** Proposed pedestrian safety recommendations are an initial attempt at determining the safety needs of the roadway-rail grade crossings for capital cost estimation purposes and are subject to change pending inspection by a Safety Review Team to be designated at a future date by METRO, SANBAG, and SCRRA project managers and a formal CPUC diagnostic review of each roadway-rail grade crossing.**

METROLINK - SAN BERNARINO LINE DECISION CHART AND PEDESTRIAN SAFETY ENHANCEMENT SUMMARY
CP LILAC TO CP RANCHO

CP LILAC TO CP RANCHO: PEDESTRIAN - RAIL GRADE CROSSING DESIGN CONSIDERATION TABLE

No.	Street Crossing	Type	Decision Point 1: Existing Pedestrian Activity, Sidewalks Leading to the Railroad Right of Way	Decision Point 2: Crossing Considered for Quiet Zone	Decision Point 3: Vehicle/Pedestrian Crossing with Adjacent Passenger Station (Including Light Rail)	* Decision Point 4: School Zone, Hospital Zone, Adjacent ADA Facility (within 10 min walk) or Significant Pedestrian Activity Levels Occur *	School, Hospital, ADA Facility, or Significant Pedestrian Generator Within 10 Minutes	Decision Point 5: 3 or More Main or Controlled Siding Tracks	Decision Point 6: Two Main Tracks	Decision Point 7: Visibility Restricted on Approach	Decision Point 8A: Constrained Right of Way	Decision Point 8B: Note 2 Unable to Fit Pedestrian Gate(s)	** Pedestrian Improvement Recommendation Summary **
1	S. Lilac Ave	Resid/Ind	Yes	No	No	Yes (Proceed to Decision Point 8A)	Yes, Curtis Elementary School is a 4 minute walk from the crossing.				No		**Full Ped Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates) **on east side only. Ped Crossing closed on west side - no sidewalk.**
2	S. Willow Ave	Resid/Ind	Yes	No	No	Yes (Proceed to Decision Point 8A)	Yes, Curtis Elementary School is a 4 minute walk from the crossing.				No		**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
3	S. Riverside Ave	Commercial	Yes	No	Yes (Proceed to Decision Point 8A)		Yes, The crossing is located adjacent to the Rialto Train Station and Boyd Elementary School is an 8 minute walk from the crossing.				No		**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
4	S. Sycamore Ave	Resid/Ind	Yes	No	No	Yes (Proceed to Decision Point 8A)	Yes, Boyd Elementary School is a 5 minute walk from the crossing.				No		**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
5	S. Acacia Ave	Residential	Yes	No	No	Yes (Proceed to Decision Point 8A)	Yes, Boyd Elementary School is a 9 minute walk from the crossing.				No		**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
6	S. Eucalyptus Ave	Residential	Yes	No	No	Yes (Proceed to Decision Point 8A)	Yes, Casey Elementary School is a 9 minute walk from the crossing. Rialto High School is a 6 minute walk from the crossing.				No		**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
7	S. Pepper Ave	Resid/Ind	Yes	No	No	Yes (Proceed to Decision Point 8A)	Yes, Kelly Elementary School is a 6 minute walk from the crossing. Rialto High School is a 7 minute walk from the crossing.				No		**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
8	W. Rialto Ave	Vacant	No (Proceed to Pedestrian Improvement Summary)										No Additional Pedestrian Improvements

NOTES:
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**** Proposed pedestrian safety recommendations are an initial attempt at determining the safety needs of the roadway-rail grade crossings for capital cost estimation purposes and are subject to change pending inspection by a Safety Review Team to be designated at a future date by METRO, SANBAG, and SCRRA project managers and a formal CPUC diagnostic review of each roadway-rail grade crossing.**

METROLINK - SAN BERNARINO LINE DECISION CHART AND PEDESTRIAN SAFETY ENHANCEMENT SUMMARY
CP LILAC TO CP RANCHO

CP LILAC TO CP RANCHO: SAFETY ENHANCEMENTS SUMMARY

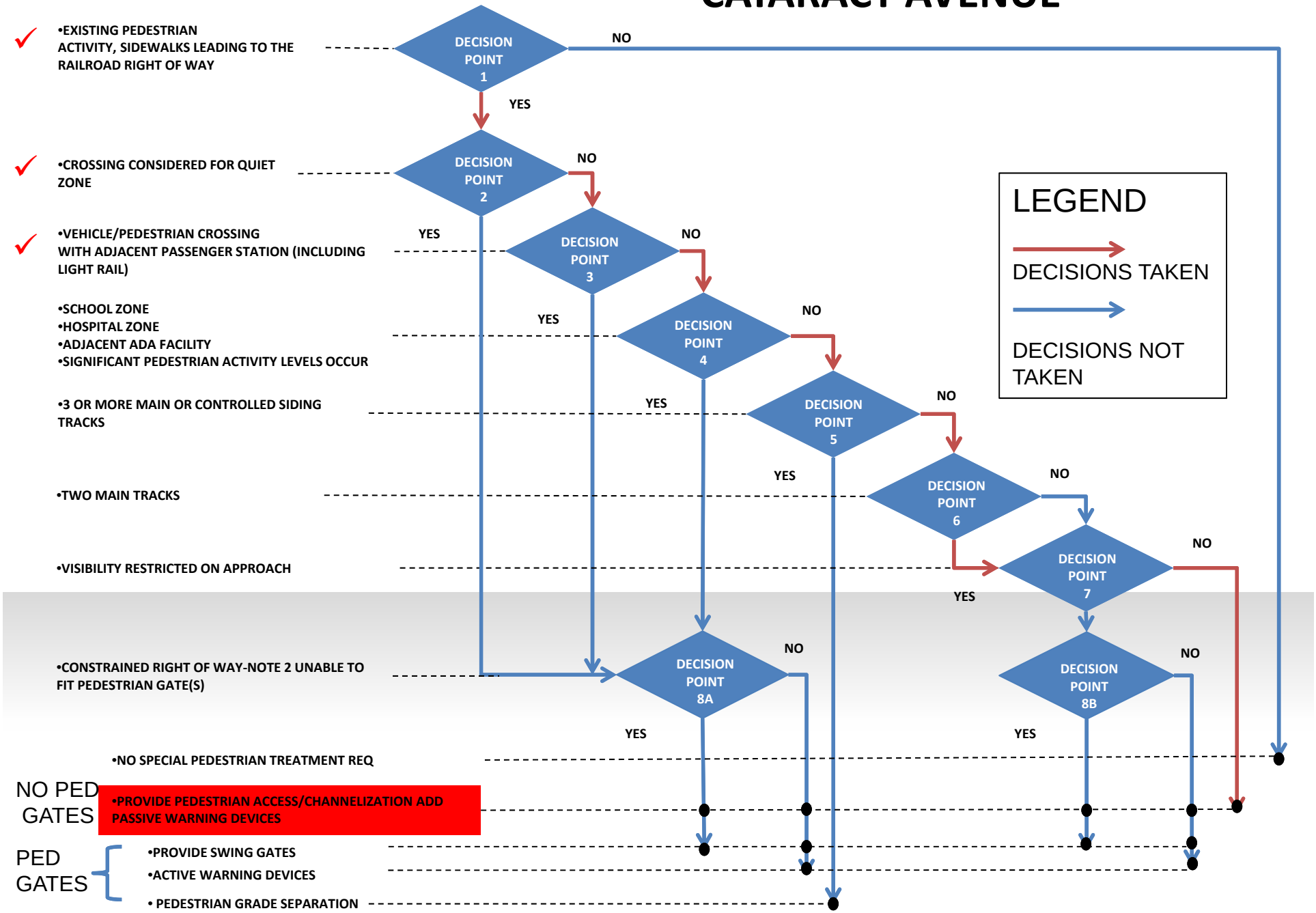
No.	Street Crossing	Type	New Vehicle Gates	Protect Existing Vehicle Gate in Place	Relocate Vehicle Gates	Exit Gates	New Median/Median Extensions	Pedestrian Channelization	Passive Warning Devices	Swing Gates	Pedestrian Gates	* Pedestrian Gate Justification *	** Pedestrian Improvement Recommendation Summary **
1	S. Lilac Ave	Resid/Ind	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Curtis Elementary School is a 4 minute walk from the crossing.	**Full Ped Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates) **on east side only. Ped Crossing closed on west side - no sidewalk.**
2	S. Willow Ave	Resid/Ind	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Curtis Elementary School is a 4 minute walk from the crossing.	**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
3	S. Riverside Ave	Commercial	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	The crossing is located adjacent to the Rialto Train Station and Boyd Elementary School is an 8 minute walk from the crossing.	**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
4	S. Sycamore Ave	Resid/Ind	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Boyd Elementary School is a 5 minute walk from the crossing.	**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
5	S. Acacia Ave	Residential	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Boyd Elementary School is a 9 minute walk from the crossing.	**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
6	S. Eucalyptus Ave	Residential	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Casey Elementary School is a 9 minute walk from the crossing. Rialto High School is a 6 minute walk from the crossing.	**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
7	S. Pepper Ave	Resid/Ind	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Kelly Elementary School is a 6 minute walk from the crossing. Rialto High School is a 7 minute walk from the crossing.	**Full Pedestrian Treatments** (Ped Channelization, Passive Warning Devices, Swing Gates, and Ped Gates)
8	W. Rialto Ave	Vacant	No	Yes	Yes	No	Yes	No	No	No	No		No Additional Pedestrian Improvements

NOTES:
*** Further investigation (pedestrian study) to determine the volume of pedestrian use (on and off-peak hours), types of pedestrians, and pedestrian behavior must be completed for all roadway-grade crossings identified as part of a proposed double track corridor to verify that pedestrian activity is "substantial".**
**** Proposed pedestrian safety recommendations are an initial attempt at determining the safety needs of the roadway-rail grade crossings for capital cost estimation purposes and are subject to change pending inspection by a Safety Review Team to be designated at a future date by METRO, SANBAG, and SCRRA project managers and a formal CPUC diagnostic review of each roadway-rail grade crossing.**

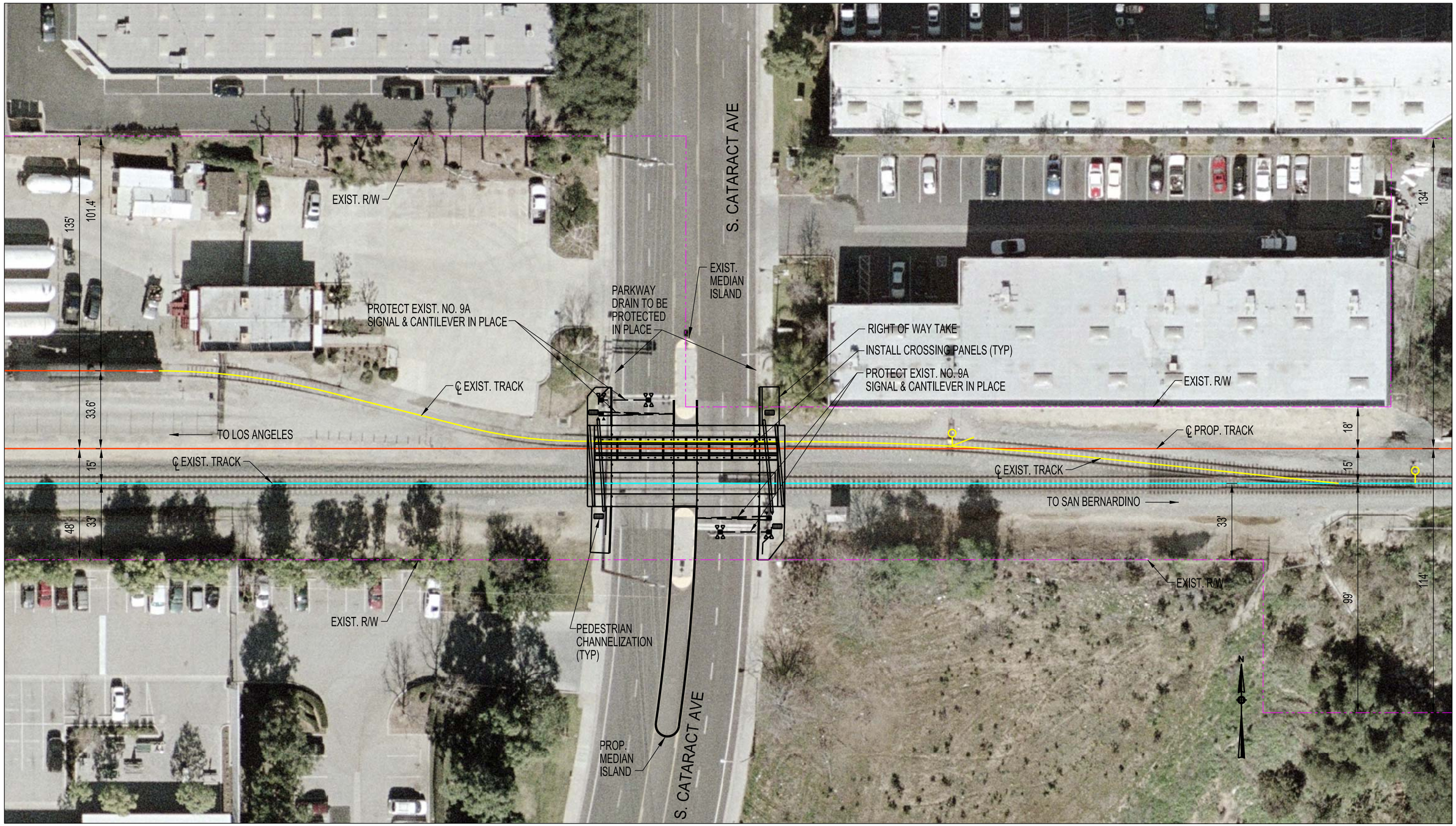
APPENDIX D2

Grade Crossing Layouts

CATARACT AVENUE



D2-1



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20 0 20 40
1"=20' HORIZONTAL

REV.	DATE		BY	SUB.	APP.

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DRAWN BY D. PARDEZ
CHECKED BY D. PELEN
APPROVED BY J. WHEELER
DATE

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HDR Engineering, Inc.
3230 El Camino Real
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Irvine, Ca 92602

SUBMITTED: _____ PROJECT MANAGER

V&A INC.
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LOS ANGELES, CA 90013
213.972.9700

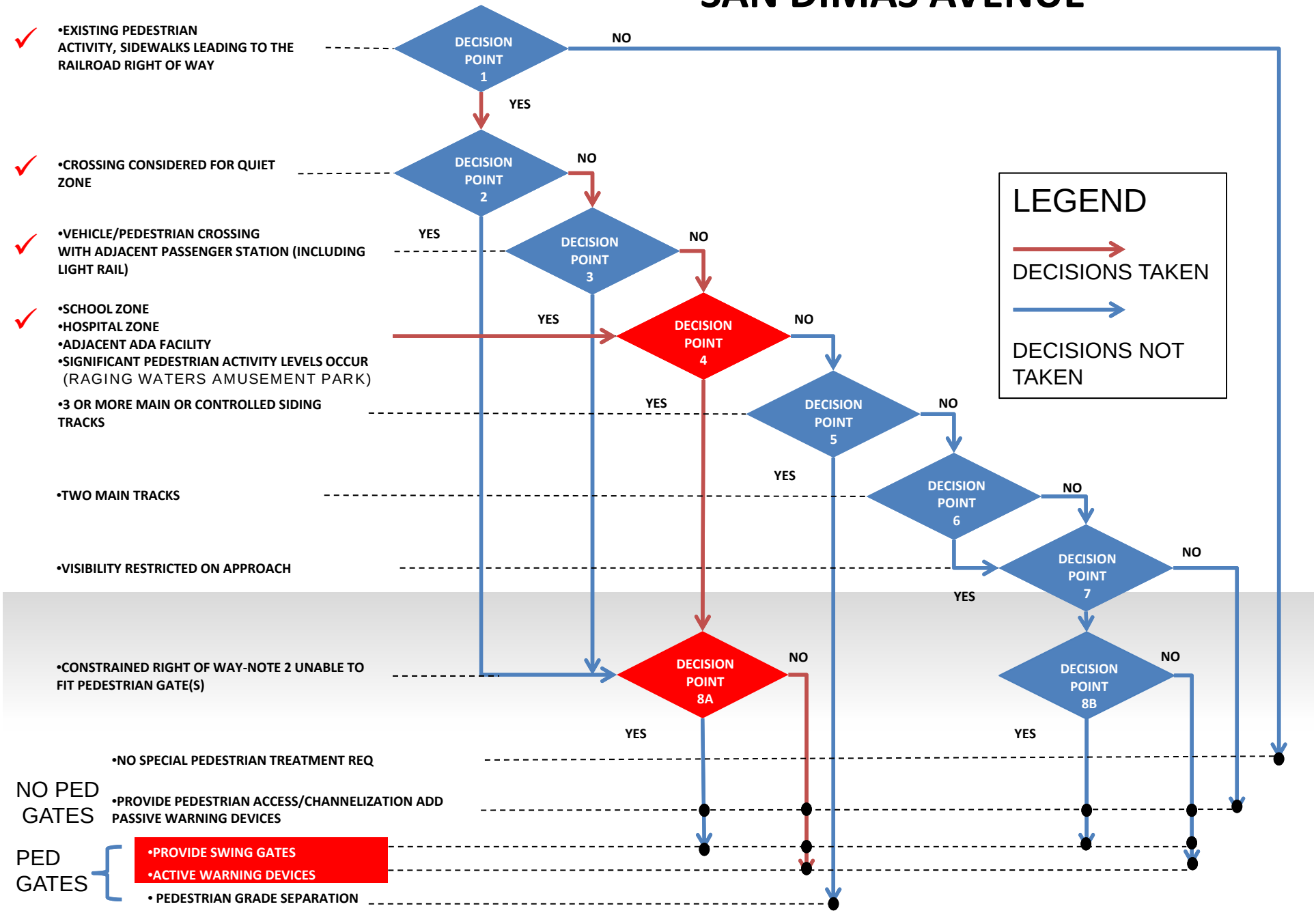
Metro
APPROVED: _____

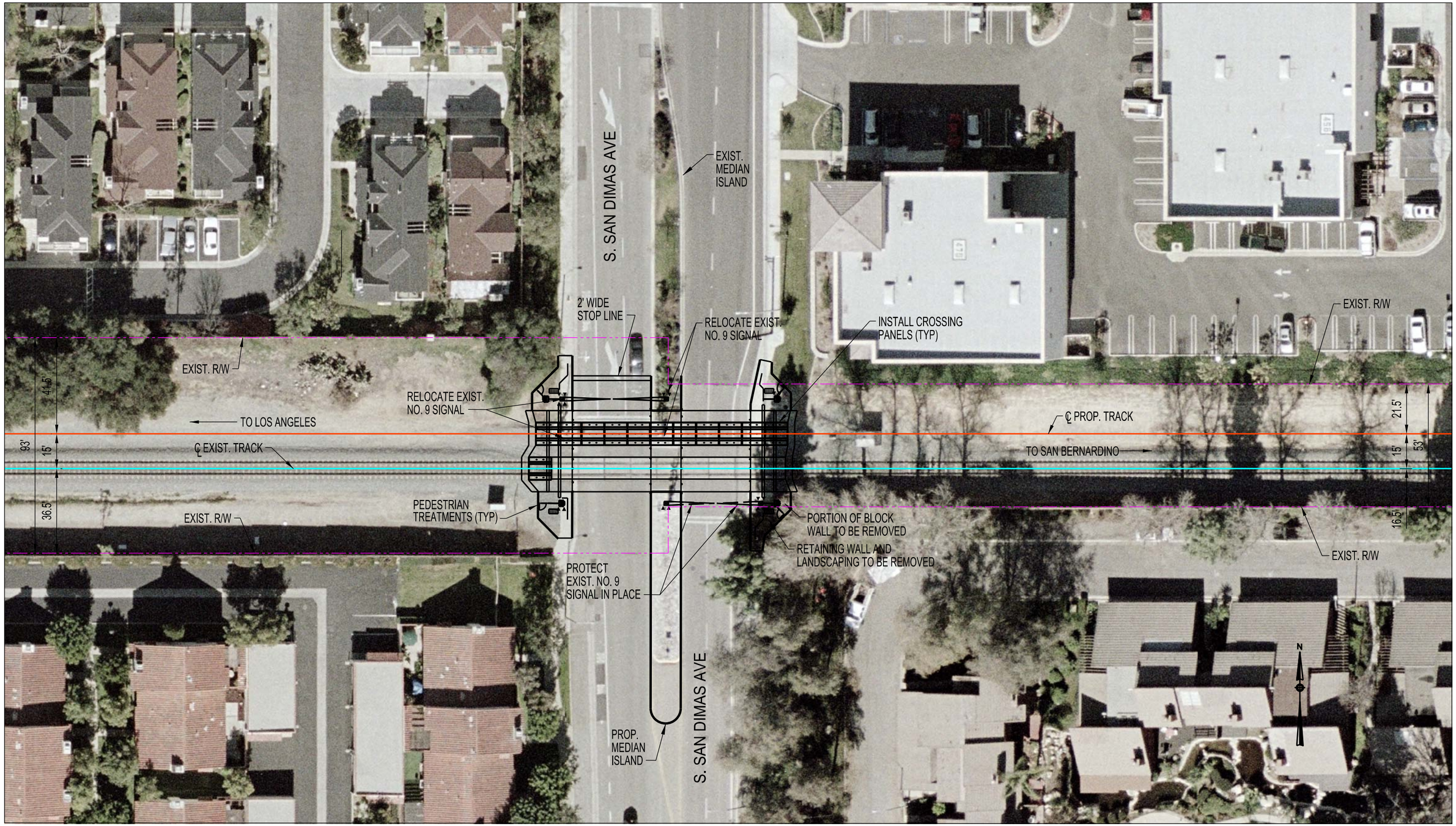
SAN BERNARDINO LINE INFRASTRUCTURE
IMPROVEMENT STRATEGIC PLAN
S.CATARACT AVE (DOT) 747320R (CPUC) 101SG-27.54
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-2
SCALE

$TIMES
$USERS
$DATES
$PLOTS
$PENTBLS
$PLTDRVLS

SAN DIMAS AVENUE





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530 S. HEWITT ST. SUITE 121
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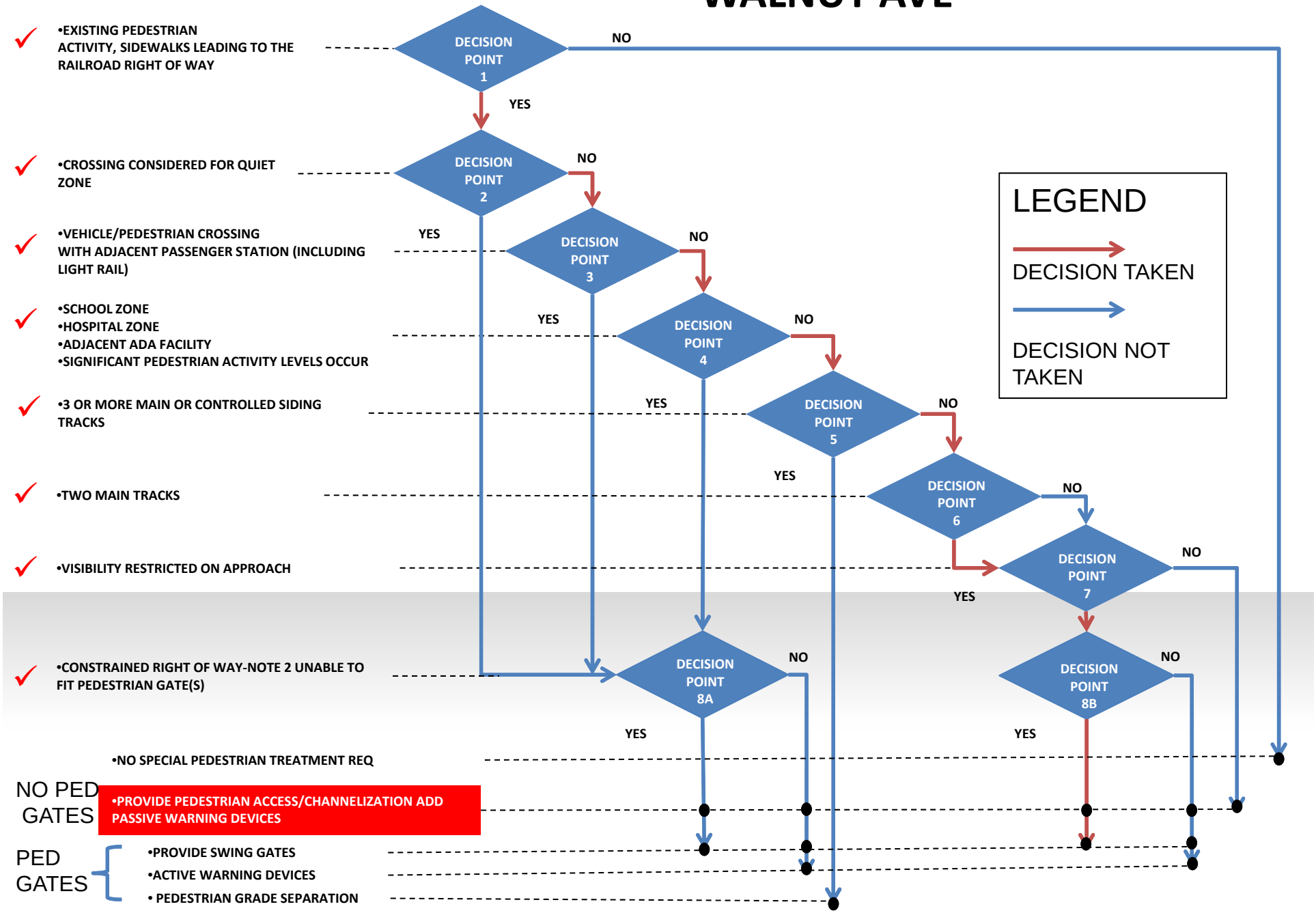
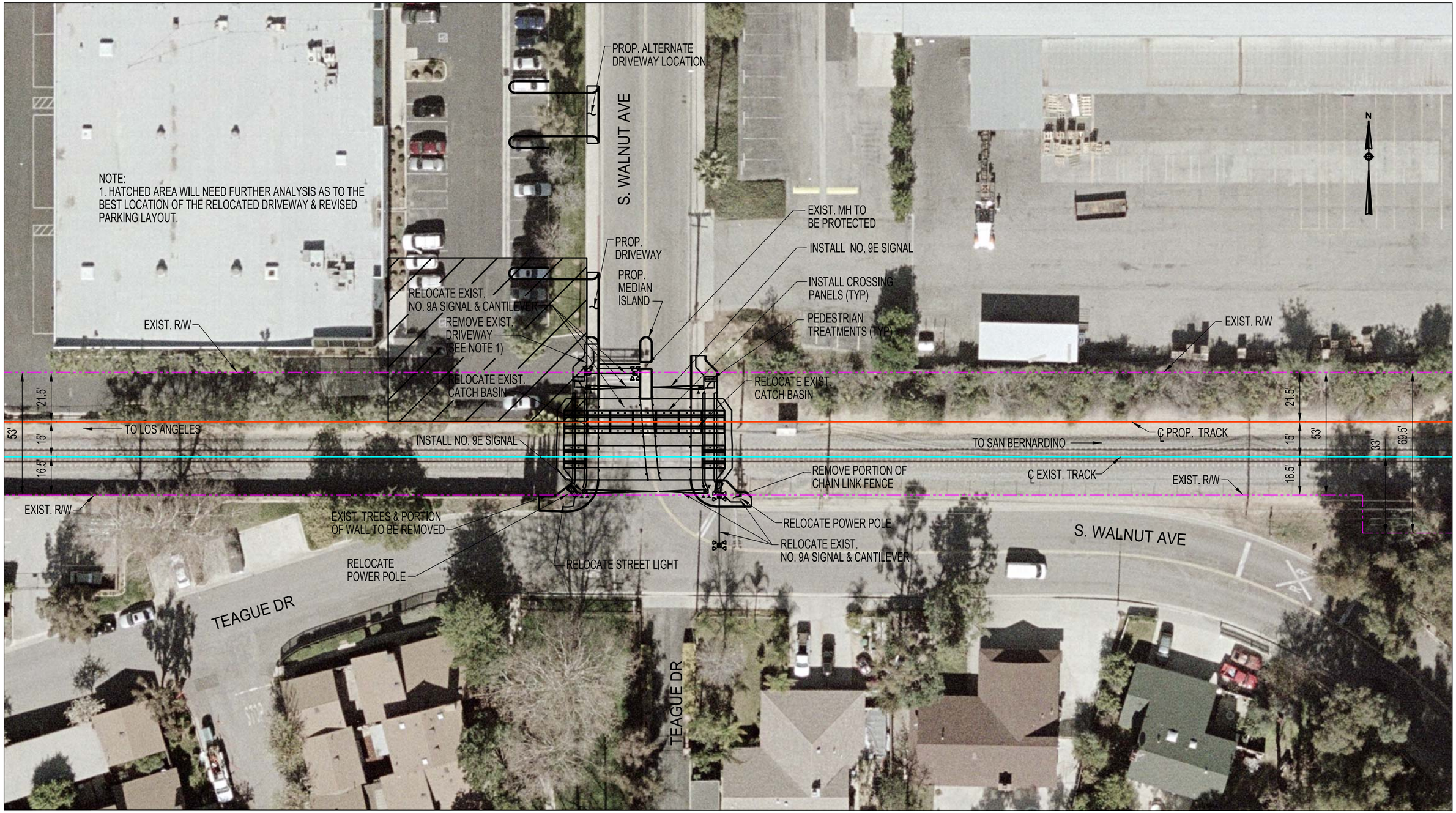
SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
S. SAN DIMAS AVE (DOT) 747321X (CPUC) 101SG-27.79
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-4
SCALE

$DATE$
$PLOTS
$PENTBLS
$PLTDRVLS
$USER$
$TIME$

WALNUT AVE


•EXISTING PEDESTRIAN ACTIVITY, SIDEWALKS LEADING TO THE RAILROAD RIGHT OF WAY
DECISION POINT 1
NO
YES
•CROSSING CONSIDERED FOR QUIET ZONE
DECISION POINT 2
NO
YES
•VEHICLE/PEDESTRIAN CROSSING WITH ADJACENT PASSENGER STATION (INCLUDING LIGHT RAIL)
DECISION POINT 3
NO
YES
•SCHOOL ZONE
•HOSPITAL ZONE
•ADJACENT ADA FACILITY
•SIGNIFICANT PEDESTRIAN ACTIVITY LEVELS OCCUR
DECISION POINT 4
NO
YES
•3 OR MORE MAIN OR CONTROLLED SIDING TRACKS
DECISION POINT 5
NO
YES
•TWO MAIN TRACKS
DECISION POINT 6
NO
YES
•VISIBILITY RESTRICTED ON APPROACH
DECISION POINT 7
NO
YES
•CONSTRAINED RIGHT OF WAY-NOTE 2 UNABLE TO FIT PEDESTRIAN GATE(S)
DECISION POINT 8A
NO
YES
DECISION POINT 8B
NO
YES
LEGEND
DECISION TAKEN
DECISION NOT TAKEN
•NO SPECIAL PEDESTRIAN TREATMENT REQ
NO PED GATES
•PROVIDE PEDESTRIAN ACCESS/CHANNELIZATION ADD PASSIVE WARNING DEVICES
PED GATES
•PROVIDE SWING GATES
•ACTIVE WARNING DEVICES
• PEDESTRIAN GRADE SEPARATION



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20 0 20 40
1"=20' HORIZONTAL

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213.972.9700

Metro
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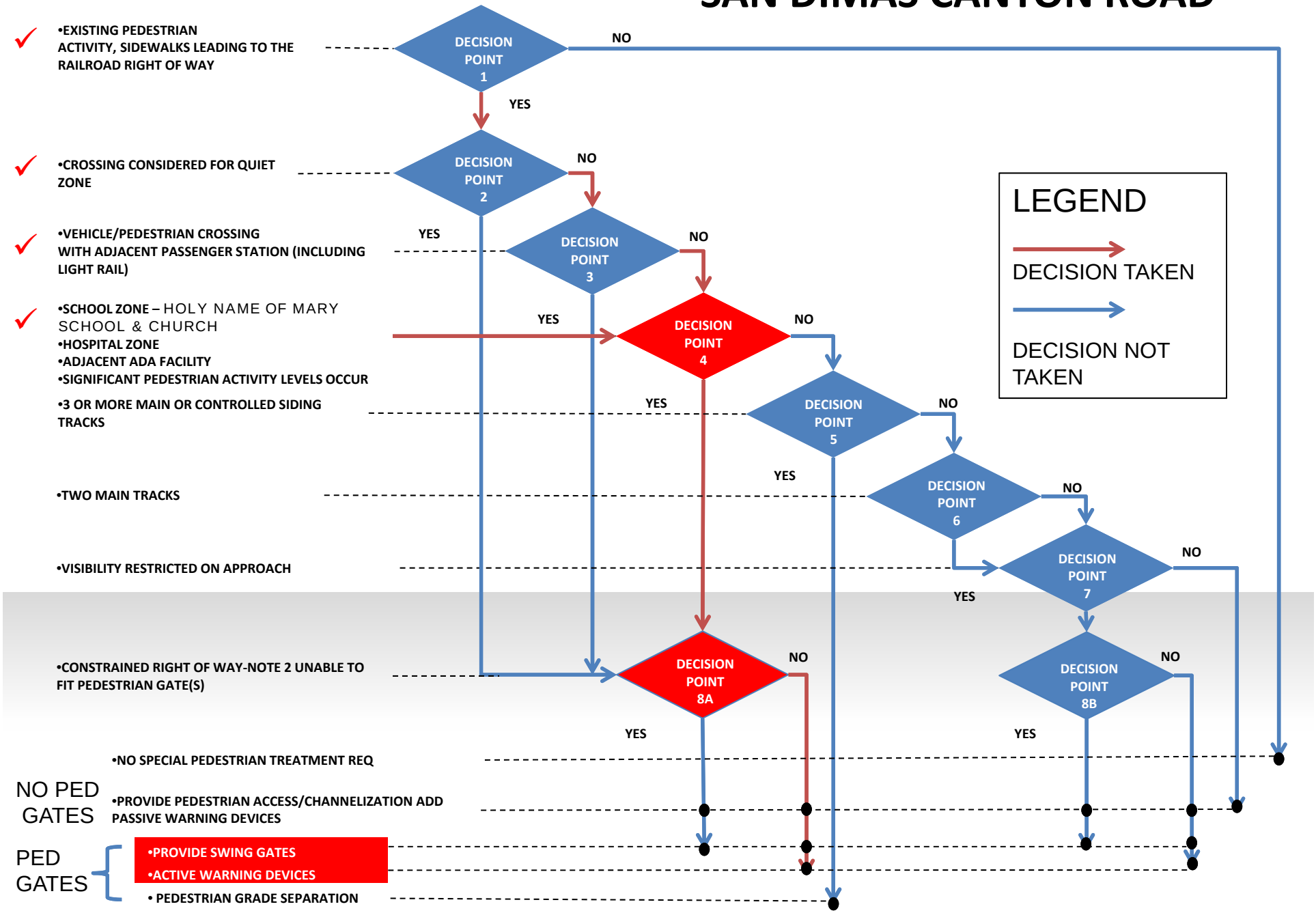
SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN

S. WALNUT AVE (DOT) 747322E (CPUC) 101SG-28.04
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-6
SCALE

$DATE$
$PLOT$
$PENTBL$
$PLTDRVL$
$USER$
$TIME$

SAN DIMAS CANYON ROAD



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20 0 20 40
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SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
S SAN DIMAS CANYON ROAD
(DOT) 914497T (CPUC) 101SG-28.55
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-8
SCALE

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$PENTABLE$
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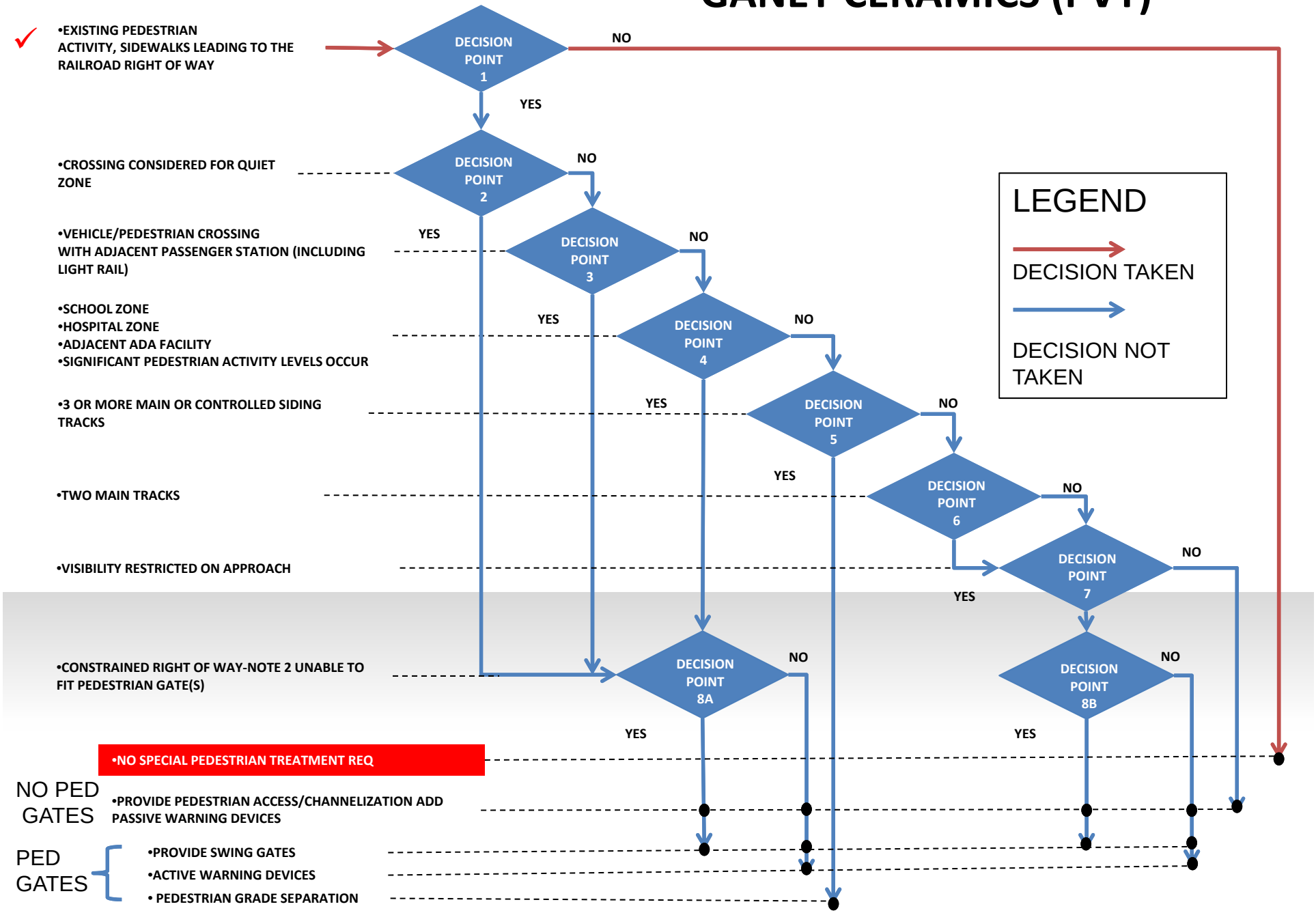
$TIME$

GANEY CERAMICS (PVT)



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LOS ANGELES, CA 90013
213.972.9700

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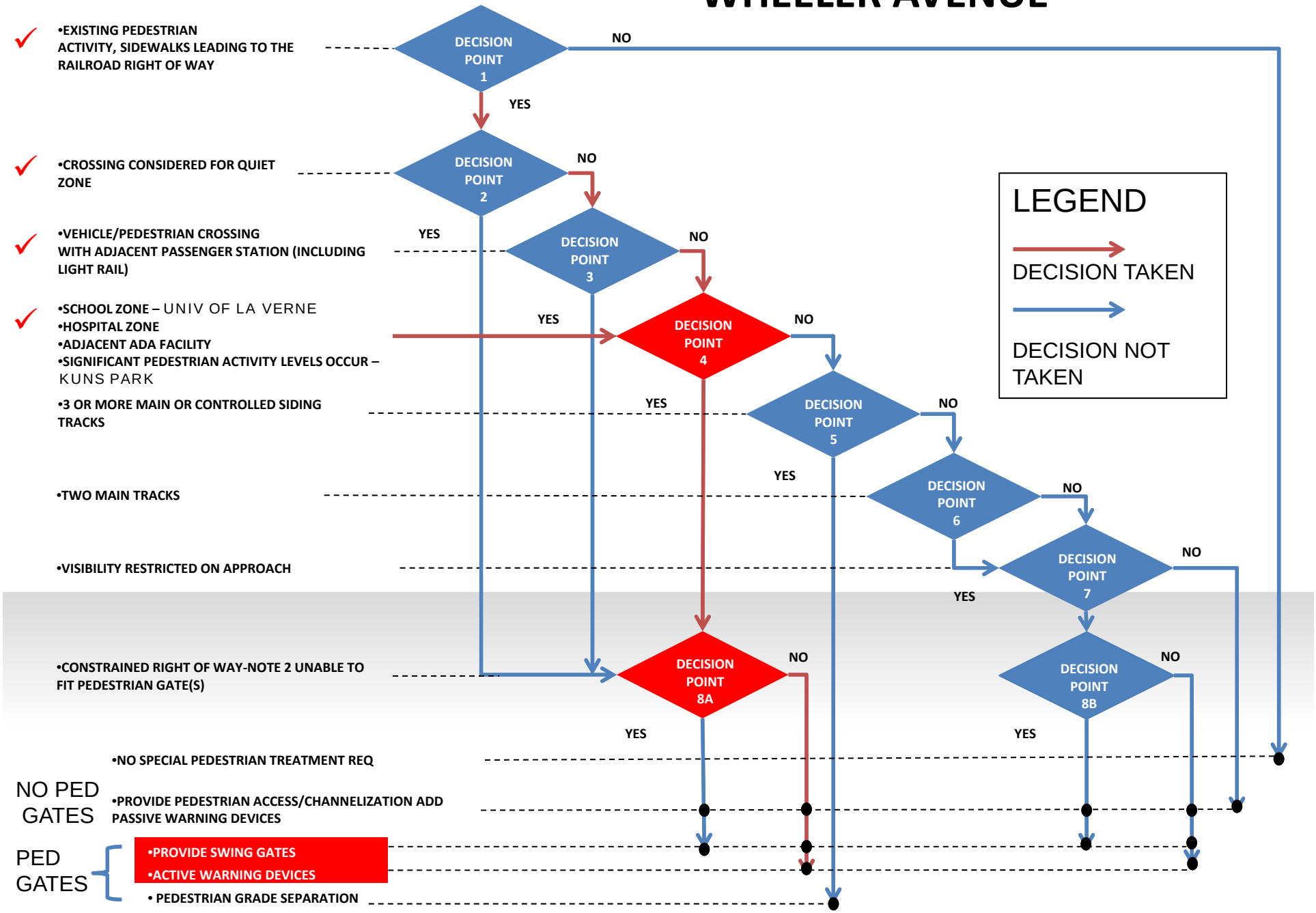
SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
GAINEY CERAMICS
(DOT) 747324T (CPUC) 101SG-28.85-X
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-10
SCALE

$DATE$
$PLOTS
$PENTBL$
$PLTDRVL$
$USER$
$TIME$

WHEELER AVENUE



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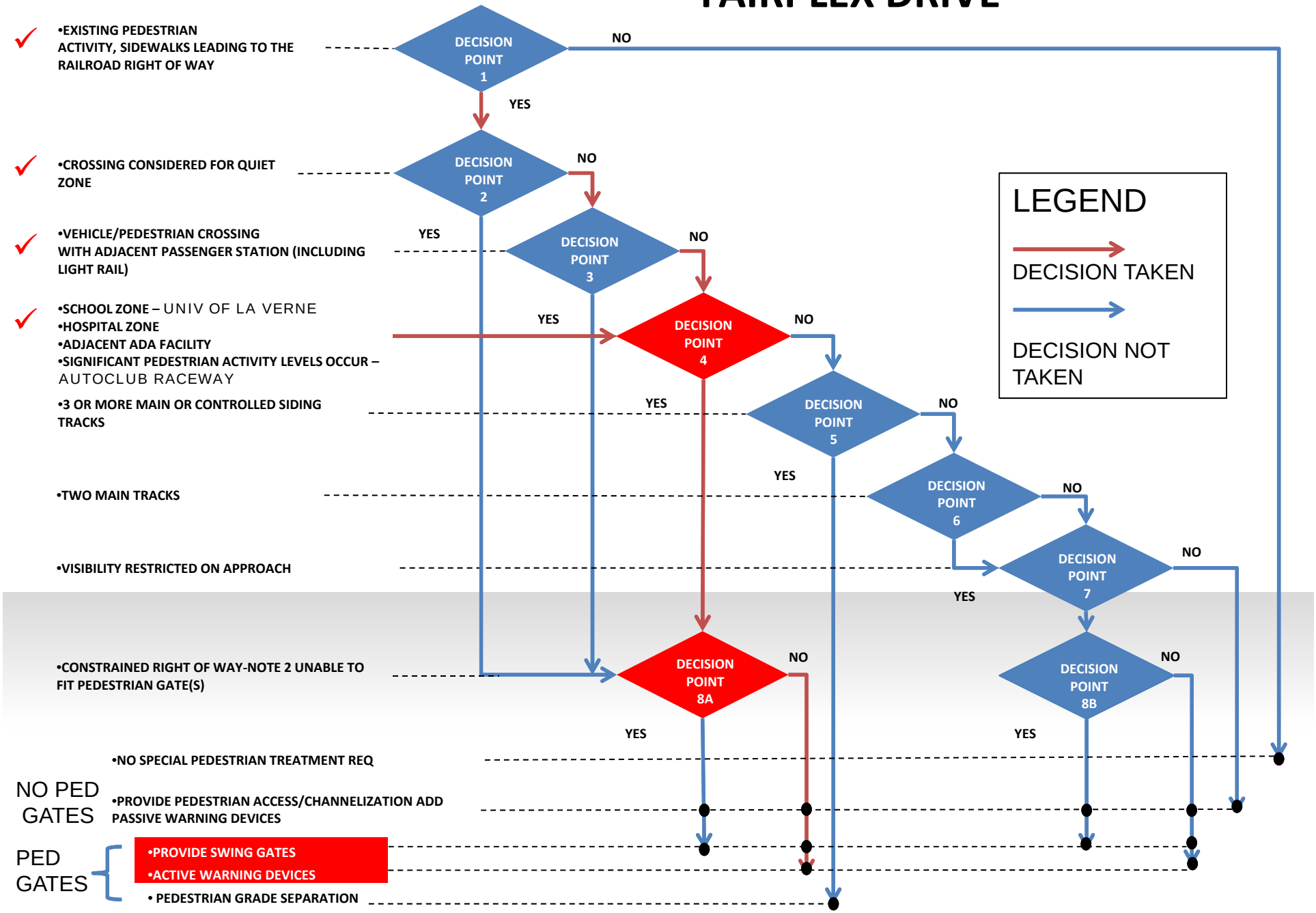
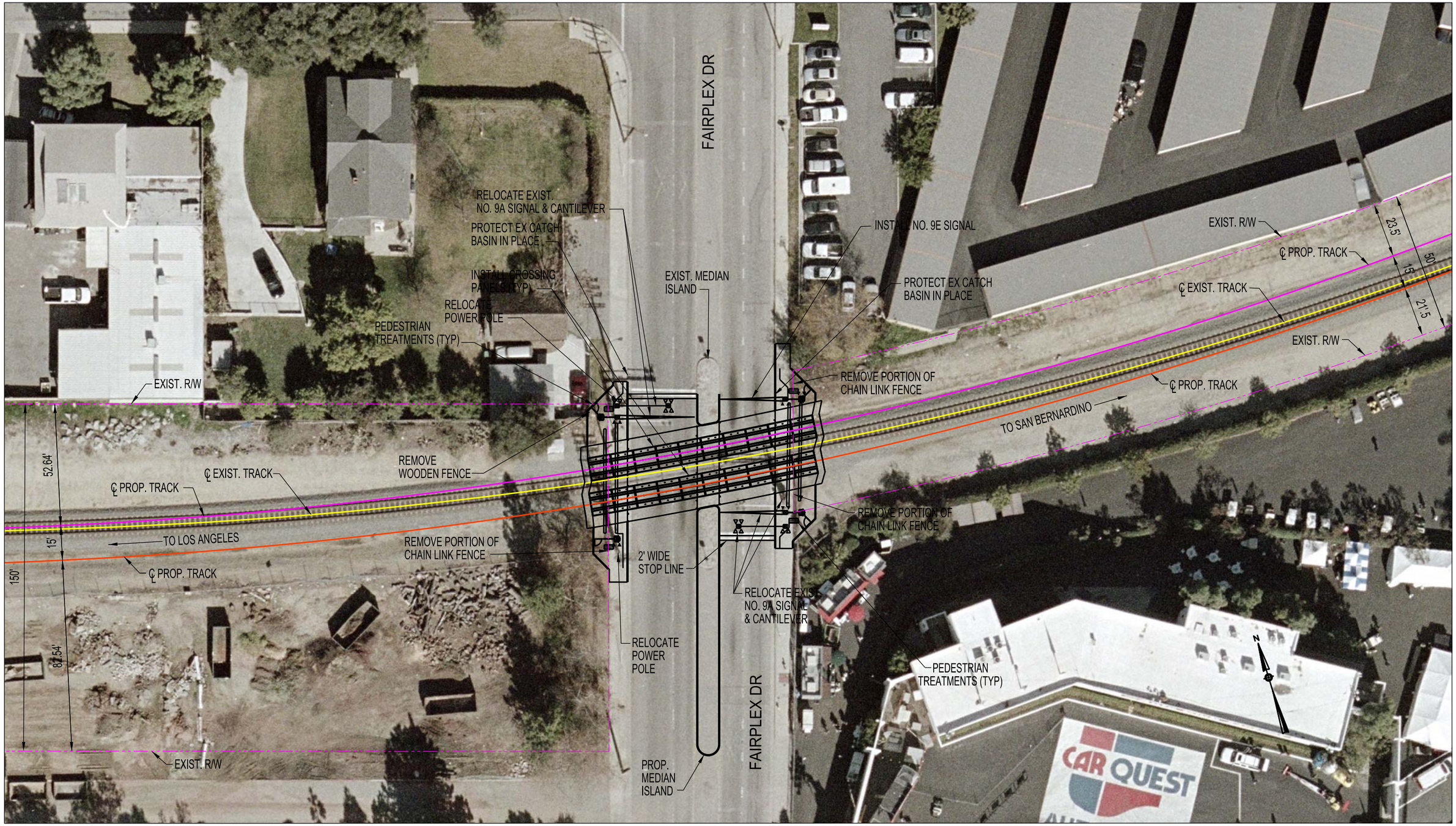
SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
WHEELER AVE (DOT) 914498A (CPUC) 101SG-29.28
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-12
SCALE

$DATES
$PLOTS
$PENTBLS
$PLTDRVLS
$TIMES
$USERS

FAIRPLEX DRIVE





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Irvine, Ca 92602

SUBMITTED: _____ PROJECT MANAGER

V&A INC.
530 S. HEWITT ST. SUITE 121
LOS ANGELES, CA 90013
213.972.9700

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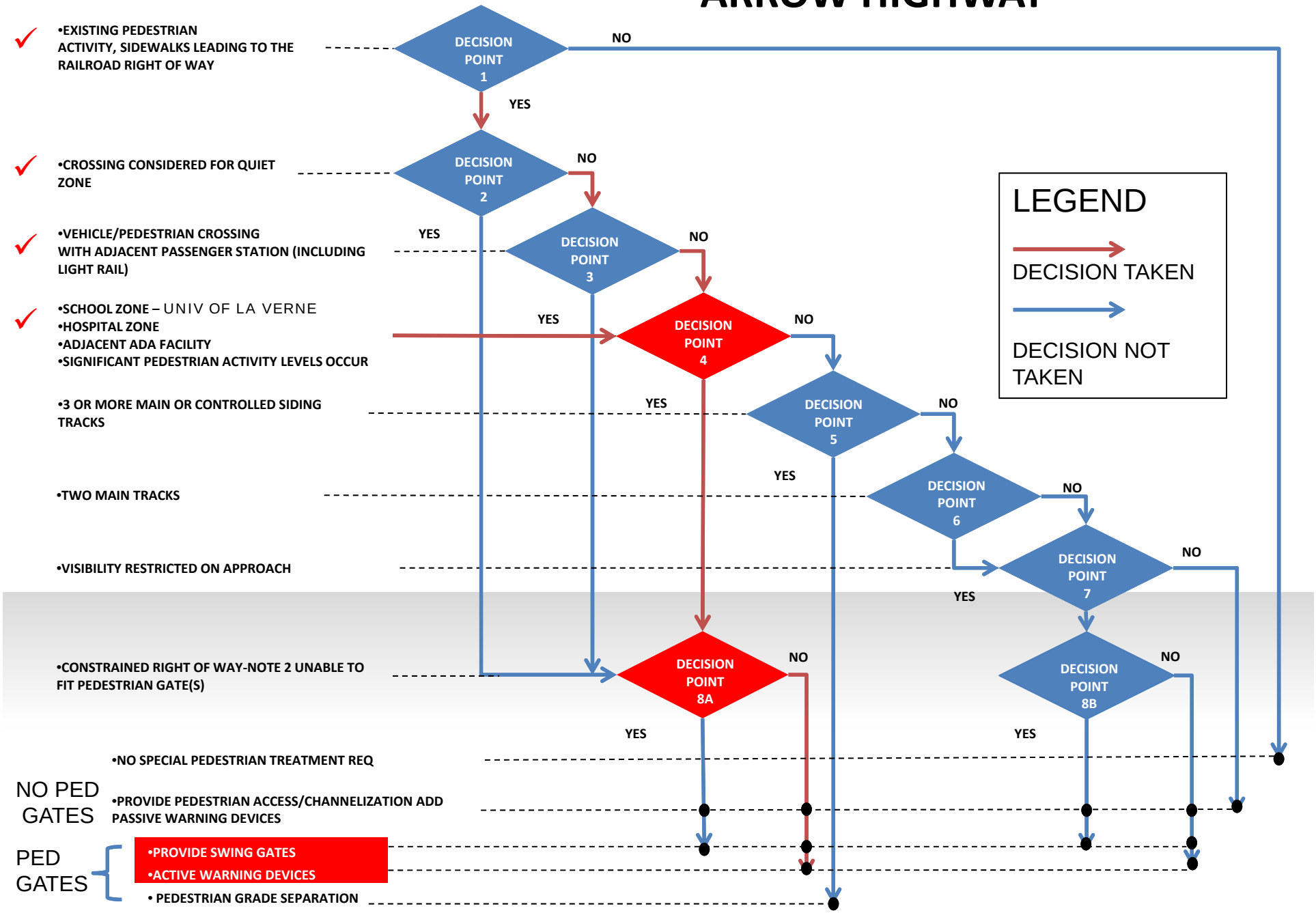
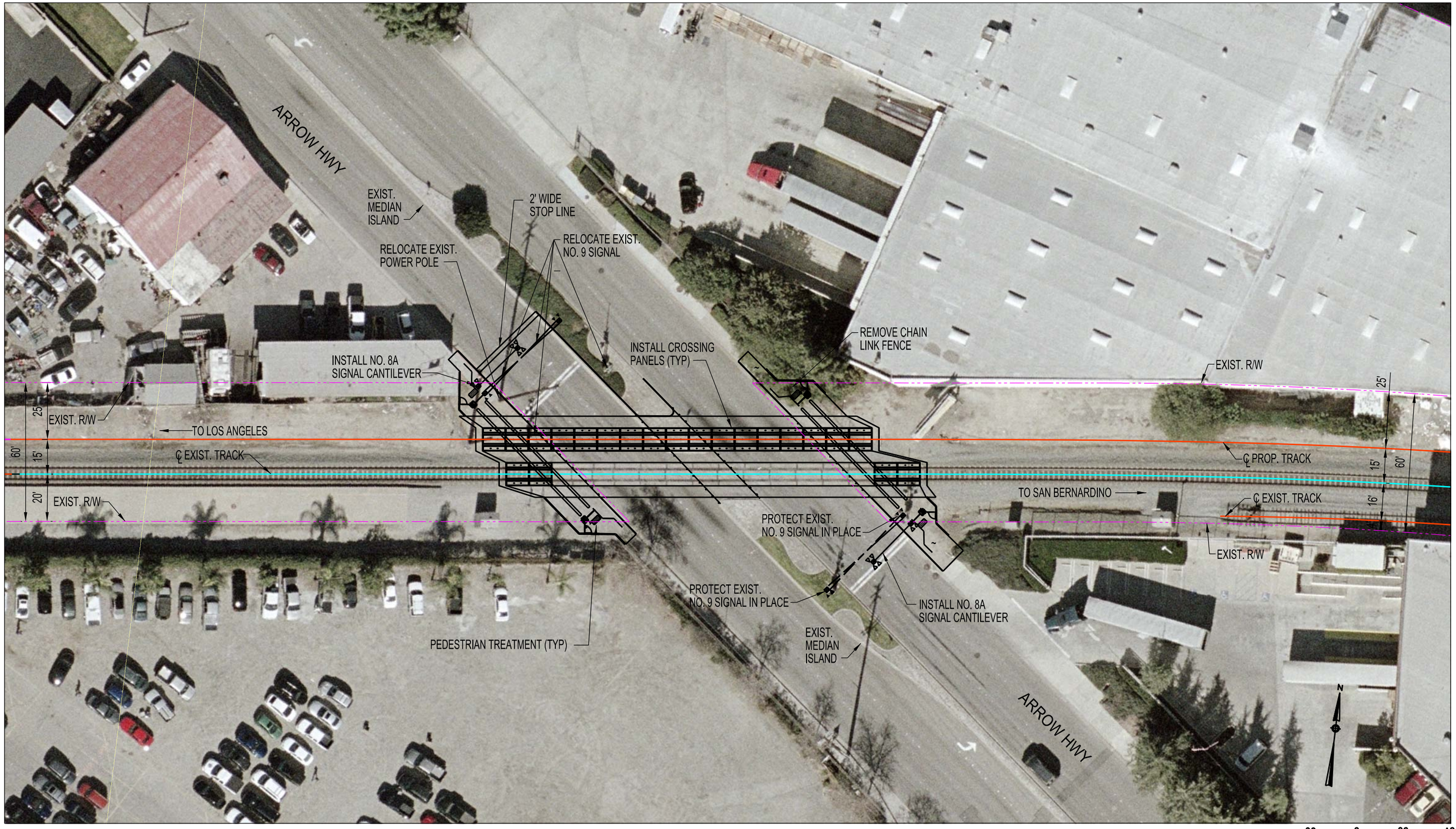
SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
FAIRPLEX DR (DOT) 747328V (CPUC) 101SG-29.97
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-14
SCALE

$DATE$
$PLOTS
$PENTBLS
$PLTDRVLS
$USERS
$TIMES

ARROW HIGHWAY





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1"=20' HORIZONTAL

REV.	DATE		BY	SUB.	APP.

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LOS ANGELES, CA 90013
213.972.9700

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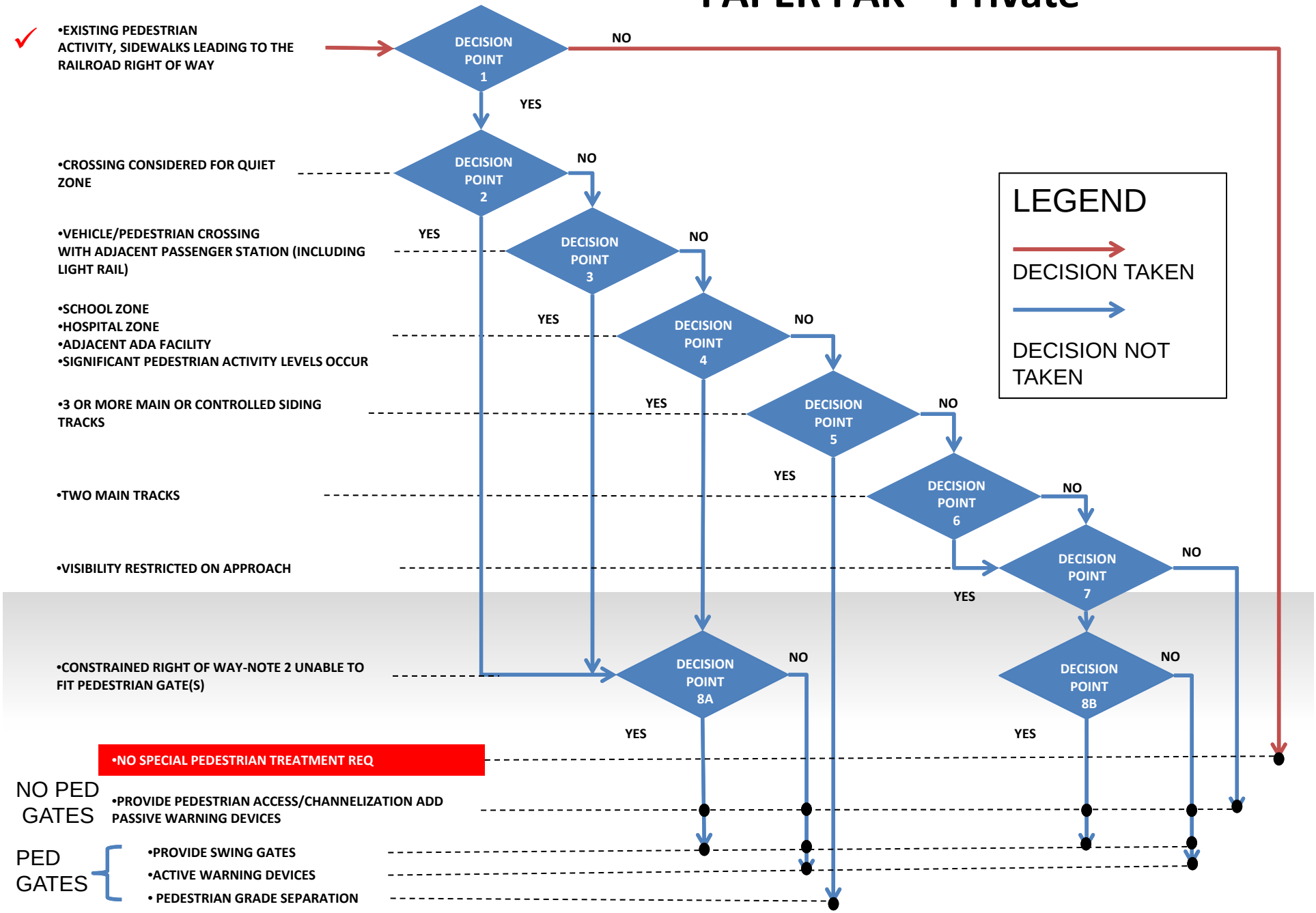
APPROVED: _____

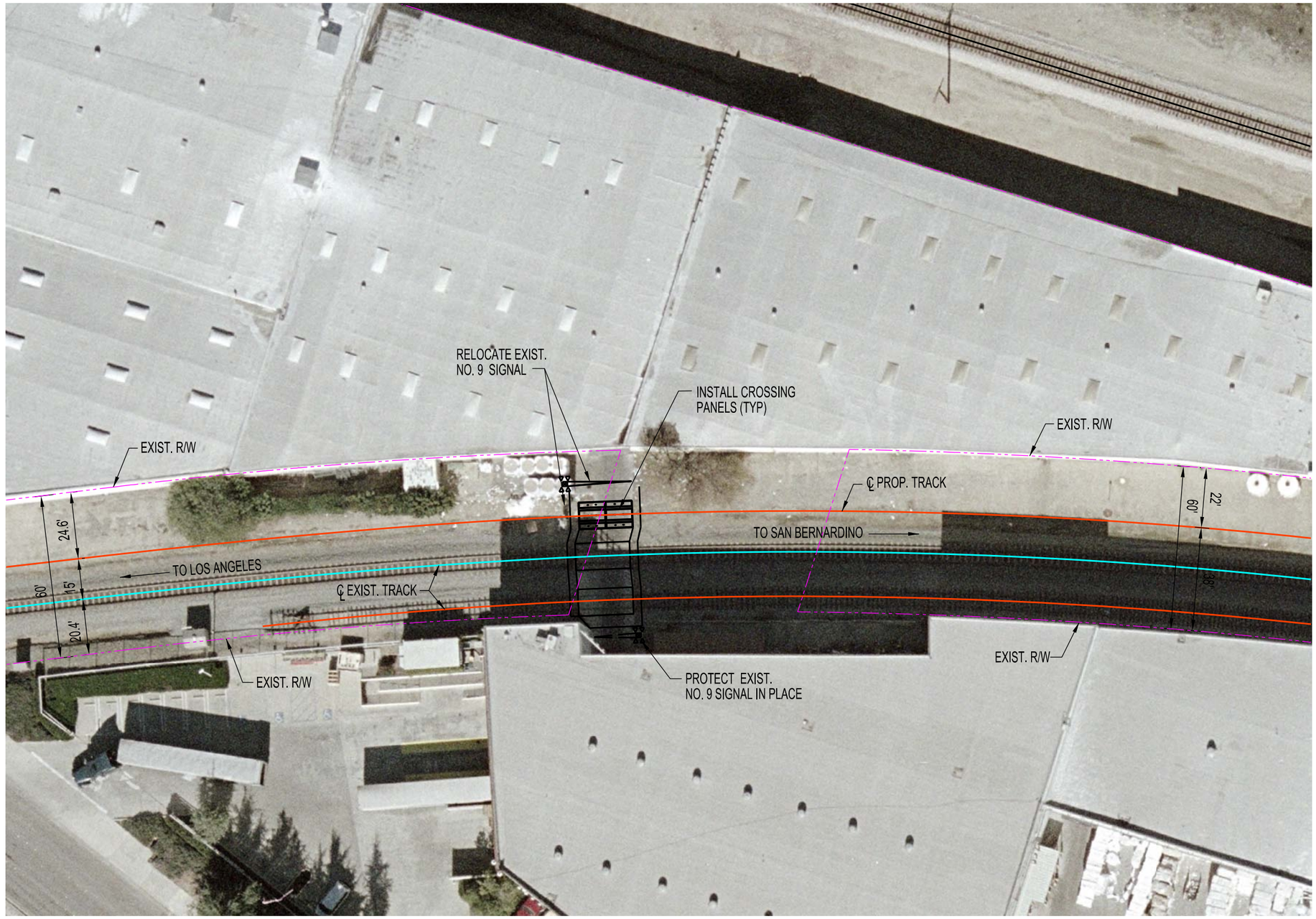
SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
ARROW HWY (DOT) 747329C (CPUC) 101SG-30.14
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION | SHEET NO. D2-16
SCALE

$DATE$
$PLOT$
$PENTBL$
PL_TORVL
$TIME$
$USER$

PAPER PAK – Private





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LOS ANGELES, CA 90013
213.972.9700

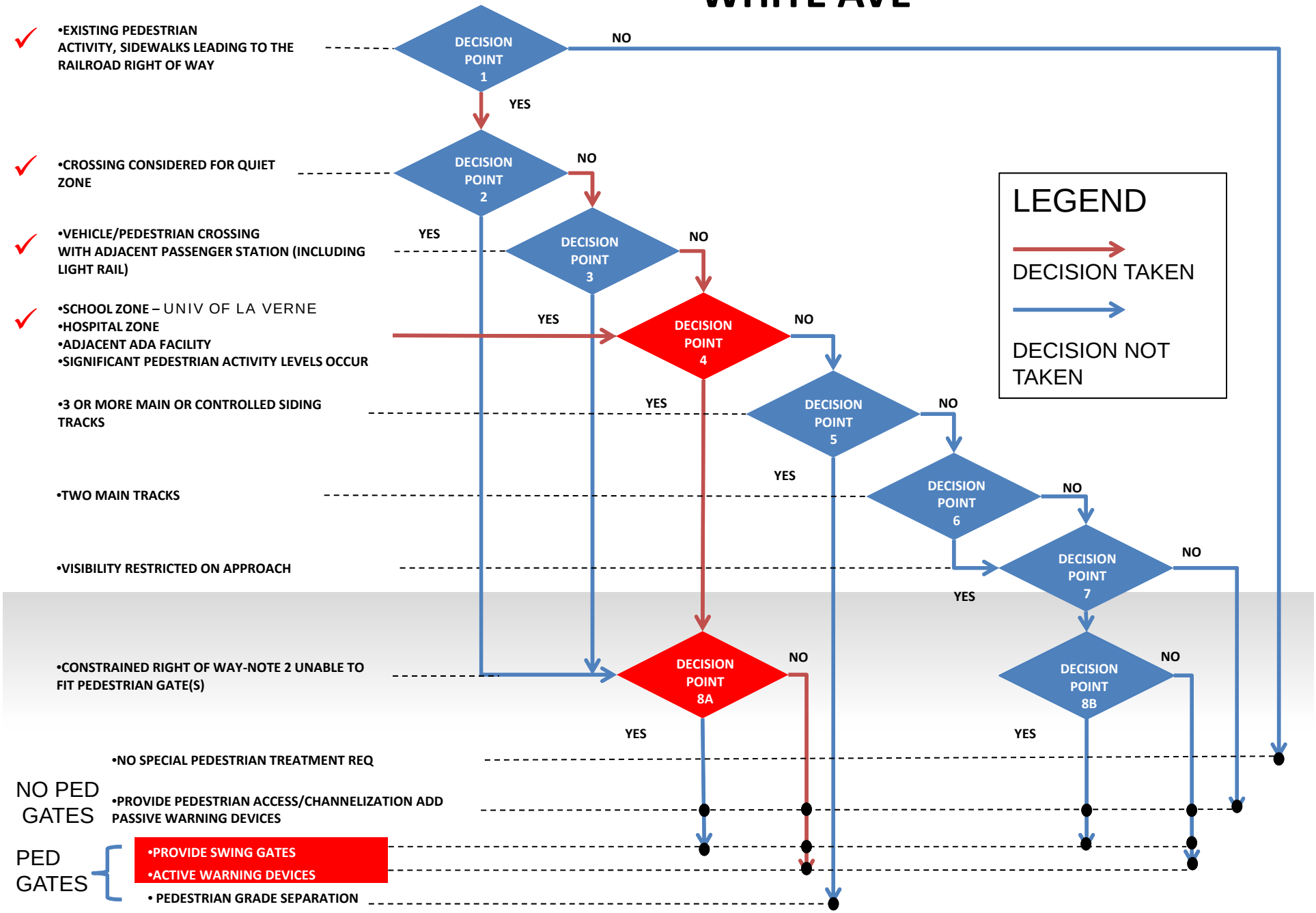
Metro
APPROVED: _____

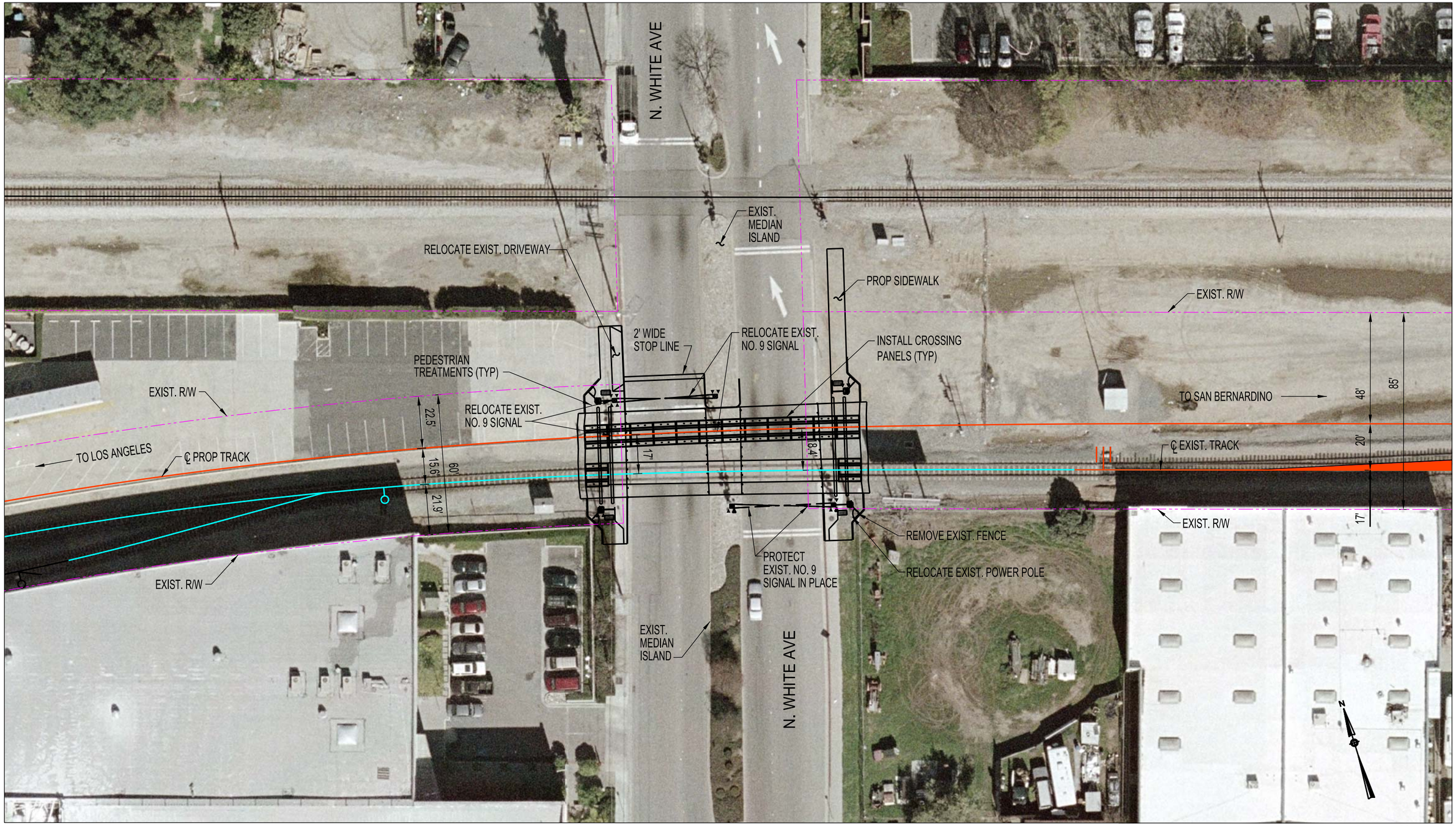
SAN BERNARDINO LINE INFRASTRUCTURE
IMPROVEMENT STRATEGIC PLAN
PAPER PAK PRIVATE CROSSING
(DOT) 91449G (CPUC) 101SG-30.21-X
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION | SHEET NO. D2-18
SCALE

$DATE$
$PLOTS$
$PENTBLL$
$PLTDRVL$
$TIMES
$USER$

WHITE AVE


•EXISTING PEDESTRIAN ACTIVITY, SIDEWALKS LEADING TO THE RAILROAD RIGHT OF WAY
DECISION POINT 1
NO
YES
•CROSSING CONSIDERED FOR QUIET ZONE
DECISION POINT 2
NO
YES
•VEHICLE/PEDESTRIAN CROSSING WITH ADJACENT PASSENGER STATION (INCLUDING LIGHT RAIL)
DECISION POINT 3
NO
YES
•SCHOOL ZONE – UNIV OF LA VERNE
•HOSPITAL ZONE
•ADJACENT ADA FACILITY
•SIGNIFICANT PEDESTRIAN ACTIVITY LEVELS OCCUR
DECISION POINT 4
NO
YES
•3 OR MORE MAIN OR CONTROLLED SIDING TRACKS
DECISION POINT 5
NO
YES
•TWO MAIN TRACKS
DECISION POINT 6
NO
YES
•VISIBILITY RESTRICTED ON APPROACH
DECISION POINT 7
NO
YES
•CONSTRAINED RIGHT OF WAY-NOTE 2 UNABLE TO FIT PEDESTRIAN GATE(S)
DECISION POINT 8A
NO
YES
DECISION POINT 8B
NO
YES
•NO SPECIAL PEDESTRIAN TREATMENT REQ
NO PED GATES
•PROVIDE PEDESTRIAN ACCESS/CHANNELIZATION ADD PASSIVE WARNING DEVICES
PED GATES
•PROVIDE SWING GATES
•ACTIVE WARNING DEVICES
• PEDESTRIAN GRADE SEPARATION
LEGEND
DECISION TAKEN
DECISION NOT TAKEN



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1"=20' HORIZONTAL

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DATE

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3230 El Camino Real
Suite 200
Irvine, Ca 92602

SUBMITTED: _____ PROJECT MANAGER

V&A INC.
530 S. HEWITT ST. SUITE 121
LOS ANGELES, CA 90013
213.972.9700

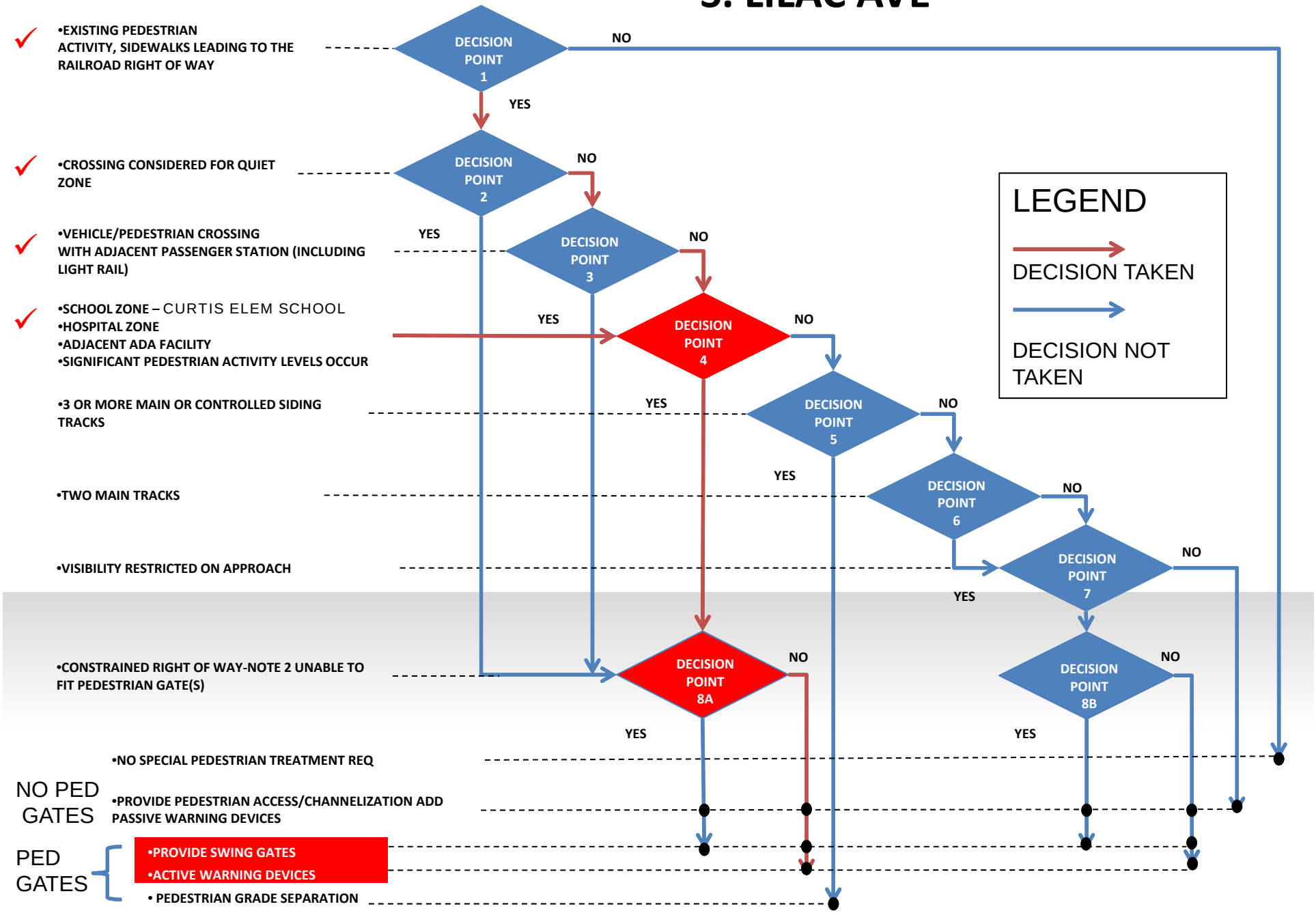
Metro
APPROVED: _____

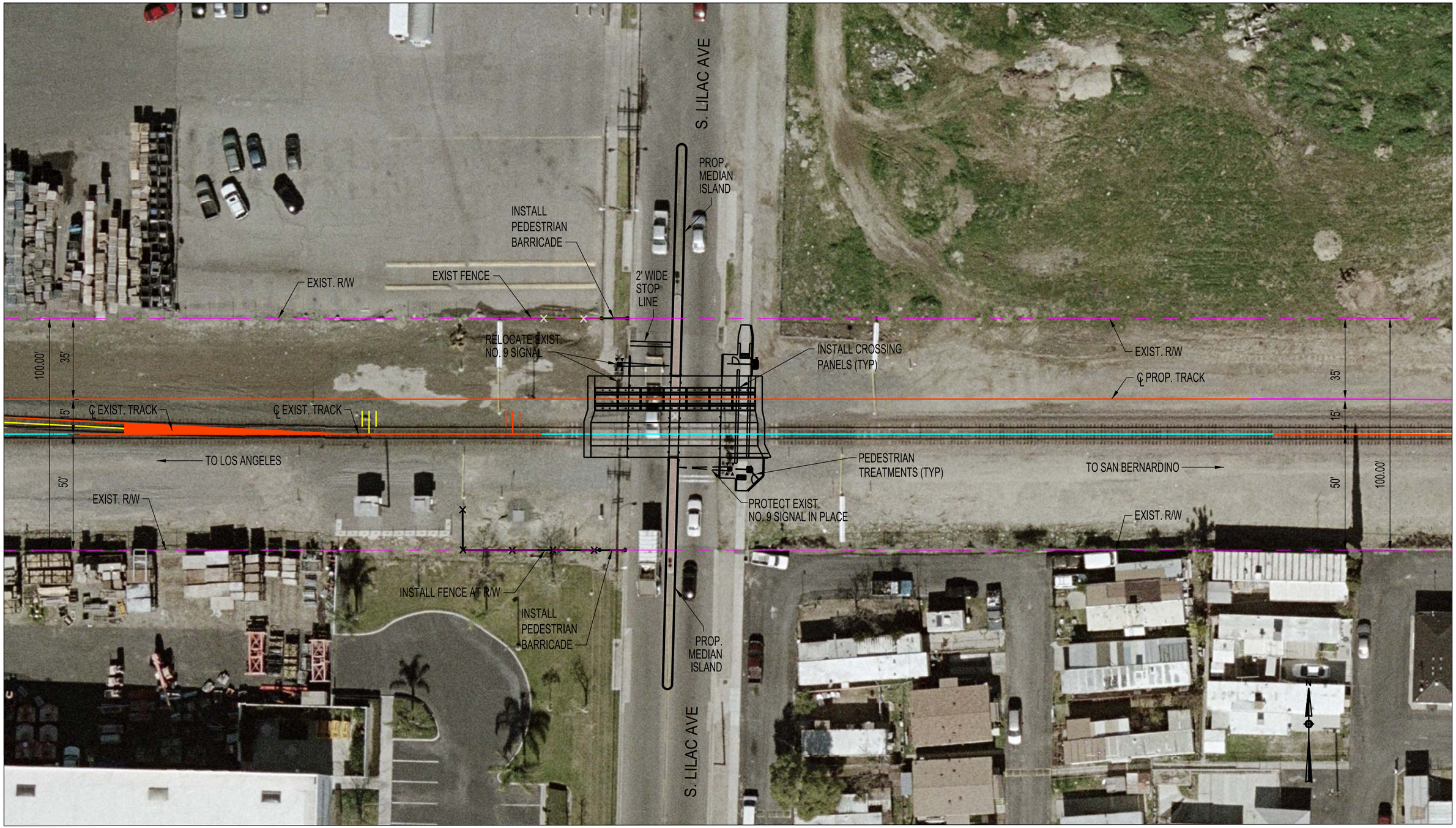
SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
N. WHITE AVE (DOT) 747330W (CPUC) 101SG-30.32
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-20
SCALE

$DATE$
$PLOT$
$PENTBL$
$PLTDRVL$
$USER$
$TIME$

S. LILAC AVE


•EXISTING PEDESTRIAN ACTIVITY, SIDEWALKS LEADING TO THE RAILROAD RIGHT OF WAY
DECISION POINT 1
NO
YES
•CROSSING CONSIDERED FOR QUIET ZONE
DECISION POINT 2
NO
YES
•VEHICLE/PEDESTRIAN CROSSING WITH ADJACENT PASSENGER STATION (INCLUDING LIGHT RAIL)
DECISION POINT 3
NO
YES
•SCHOOL ZONE – CURTIS ELEM SCHOOL
•HOSPITAL ZONE
•ADJACENT ADA FACILITY
•SIGNIFICANT PEDESTRIAN ACTIVITY LEVELS OCCUR
DECISION POINT 4
NO
YES
•3 OR MORE MAIN OR CONTROLLED SIDING TRACKS
DECISION POINT 5
NO
YES
•TWO MAIN TRACKS
DECISION POINT 6
NO
YES
•VISIBILITY RESTRICTED ON APPROACH
DECISION POINT 7
NO
YES
•CONSTRAINED RIGHT OF WAY-NOTE 2 UNABLE TO FIT PEDESTRIAN GATE(S)
DECISION POINT 8A
NO
YES
DECISION POINT 8B
NO
YES
•NO SPECIAL PEDESTRIAN TREATMENT REQ
NO PED GATES
•PROVIDE PEDESTRIAN ACCESS/CHANNELIZATION ADD PASSIVE WARNING DEVICES
PED GATES
•PROVIDE SWING GATES
•ACTIVE WARNING DEVICES
• PEDESTRIAN GRADE SEPARATION
LEGEND
DECISION TAKEN
DECISION NOT TAKEN



5% SUBMITTAL
NOT FOR CONSTRUCTION

20 0 20 40
1"=20' HORIZONTAL

REV.	DATE		BY	SUB.	APP.

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DESIGNED BY M. BARRIOS
DRAWN BY D. PARDEZ
CHECKED BY D. PELEN
APPROVED BY J. WHEELER
DATE

METROLINK®

HDR Engineering, Inc.
3230 El Camino Real
Suite 200
Irvine, Ca 92602

SUBMITTED: _____ PROJECT MANAGER

V&A INC.
530 S. HEWITT ST. SUITE 121
LOS ANGELES, CA 90013
213.972.9700

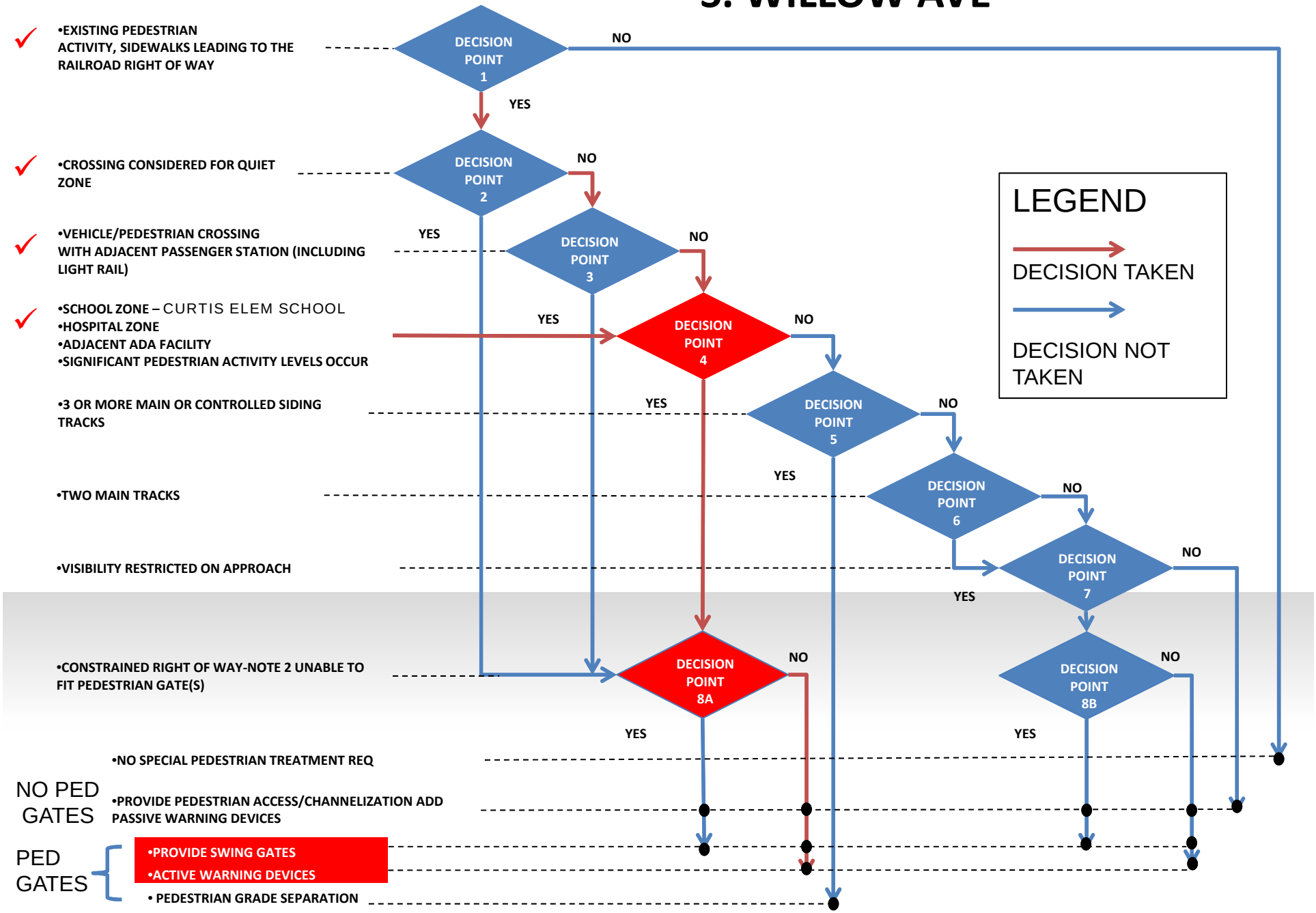
Metro
APPROVED: _____

SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
S. LILAC AVE (DOT) 026138B (CPUC) 101SG-52.4
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-22
SCALE

$DATE$
$PLOTS
$PENTBLS
$PLTDRVLS
$USER$
$TIME$

S. WILLOW AVE


•EXISTING PEDESTRIAN ACTIVITY, SIDEWALKS LEADING TO THE RAILROAD RIGHT OF WAY
•CROSSING CONSIDERED FOR QUIET ZONE
•VEHICLE/PEDESTRIAN CROSSING WITH ADJACENT PASSENGER STATION (INCLUDING LIGHT RAIL)
•SCHOOL ZONE – CURTIS ELEM SCHOOL
•HOSPITAL ZONE
•ADJACENT ADA FACILITY
•SIGNIFICANT PEDESTRIAN ACTIVITY LEVELS OCCUR
•3 OR MORE MAIN OR CONTROLLED SIDING TRACKS
•TWO MAIN TRACKS
•VISIBILITY RESTRICTED ON APPROACH
•CONSTRAINED RIGHT OF WAY-NOTE 2 UNABLE TO FIT PEDESTRIAN GATE(S)
DECISION POINT 1
DECISION POINT 2
DECISION POINT 3
DECISION POINT 4
DECISION POINT 5
DECISION POINT 6
DECISION POINT 7
DECISION POINT 8A
DECISION POINT 8B
YES
NO
LEGEND
DECISION TAKEN
DECISION NOT TAKEN
•NO SPECIAL PEDESTRIAN TREATMENT REQ
NO PED GATES
•PROVIDE PEDESTRIAN ACCESS/CHANNELIZATION ADD PASSIVE WARNING DEVICES
PED GATES
•PROVIDE SWING GATES
•ACTIVE WARNING DEVICES
• PEDESTRIAN GRADE SEPARATION

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Irvine, Ca 92602

SUBMITTED: _____ PROJECT MANAGER

V&A INC.
530 S. HEWITT ST. SUITE 121
LOS ANGELES, CA 90013
213.972.9700

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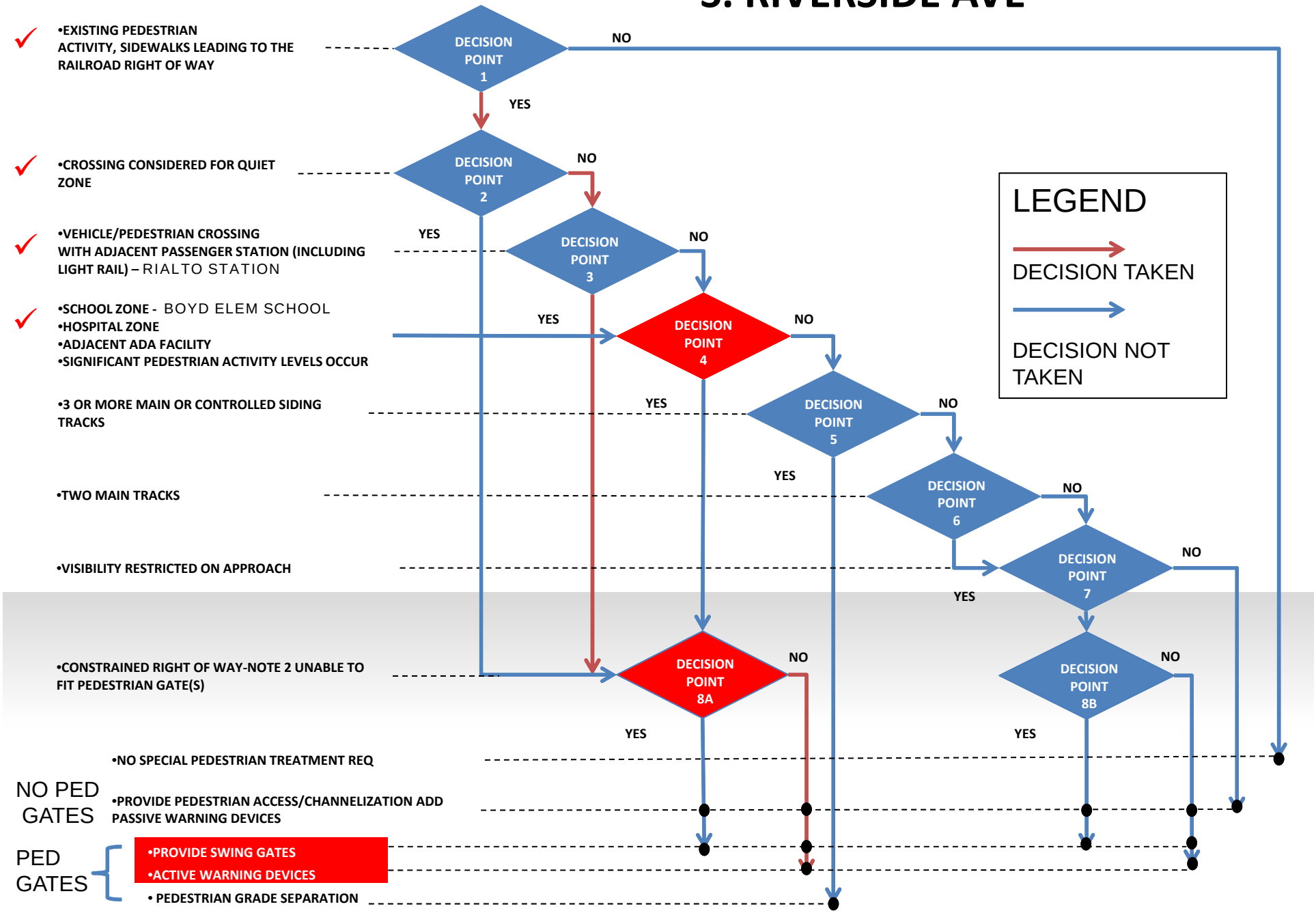
APPROVED: _____

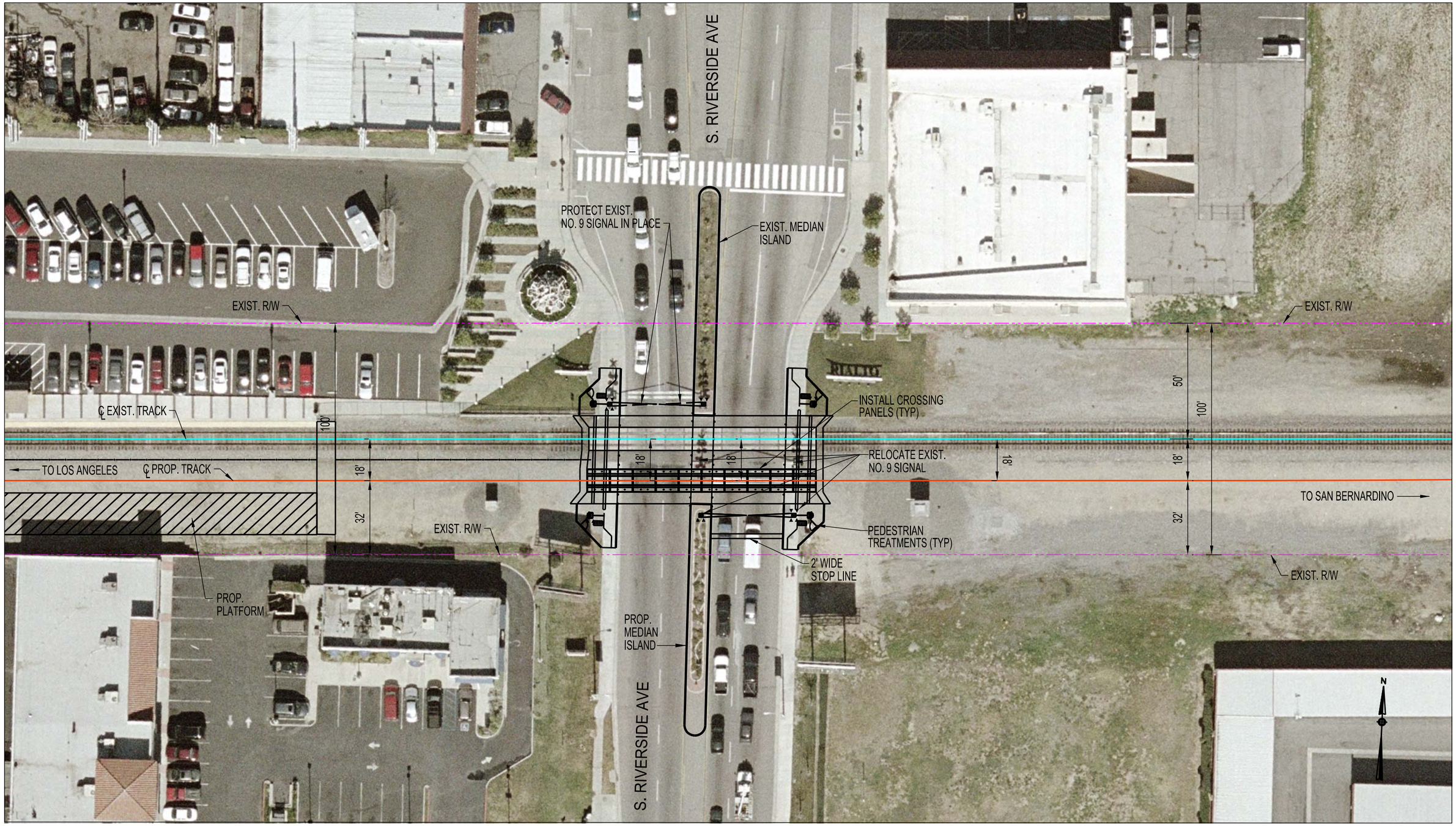
SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
S. WILLOW AVE (DOT) 026137U (CPUC) 101SG-52.6
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION | SHEET NO. D2-24
SCALE

$DATE$
$PLOT$
$PENTBL$
$PLTDRVL$
$USER$
$TIME$

S. RIVERSIDE AVE





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1"=20' HORIZONTAL

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Irvine, Ca 92602

SUBMITTED: _____ PROJECT MANAGER

V&A INC.
530 S. HEWITT ST. SUITE 121
LOS ANGELES, CA 90013
213.972.9700

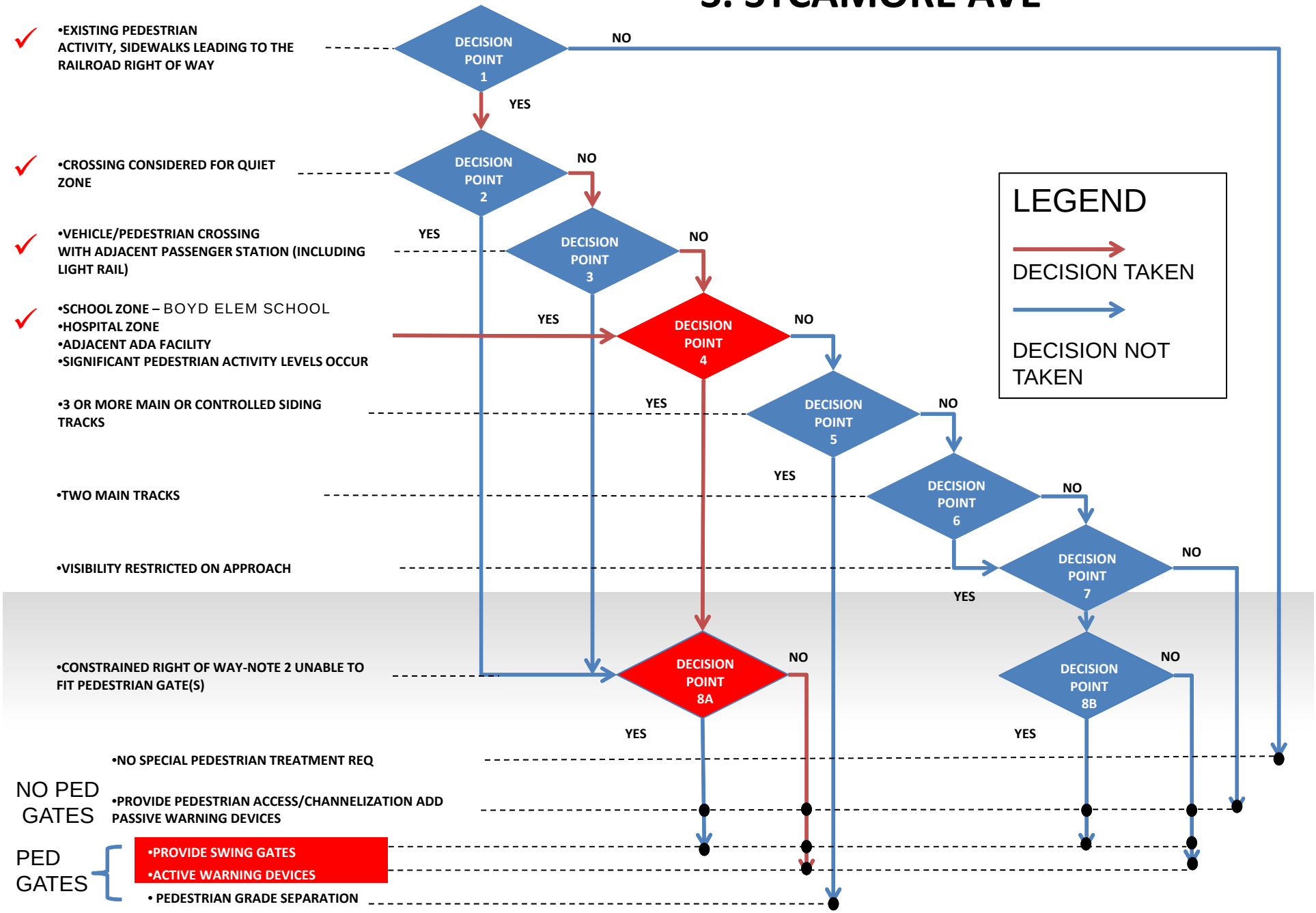
Metro
APPROVED: _____

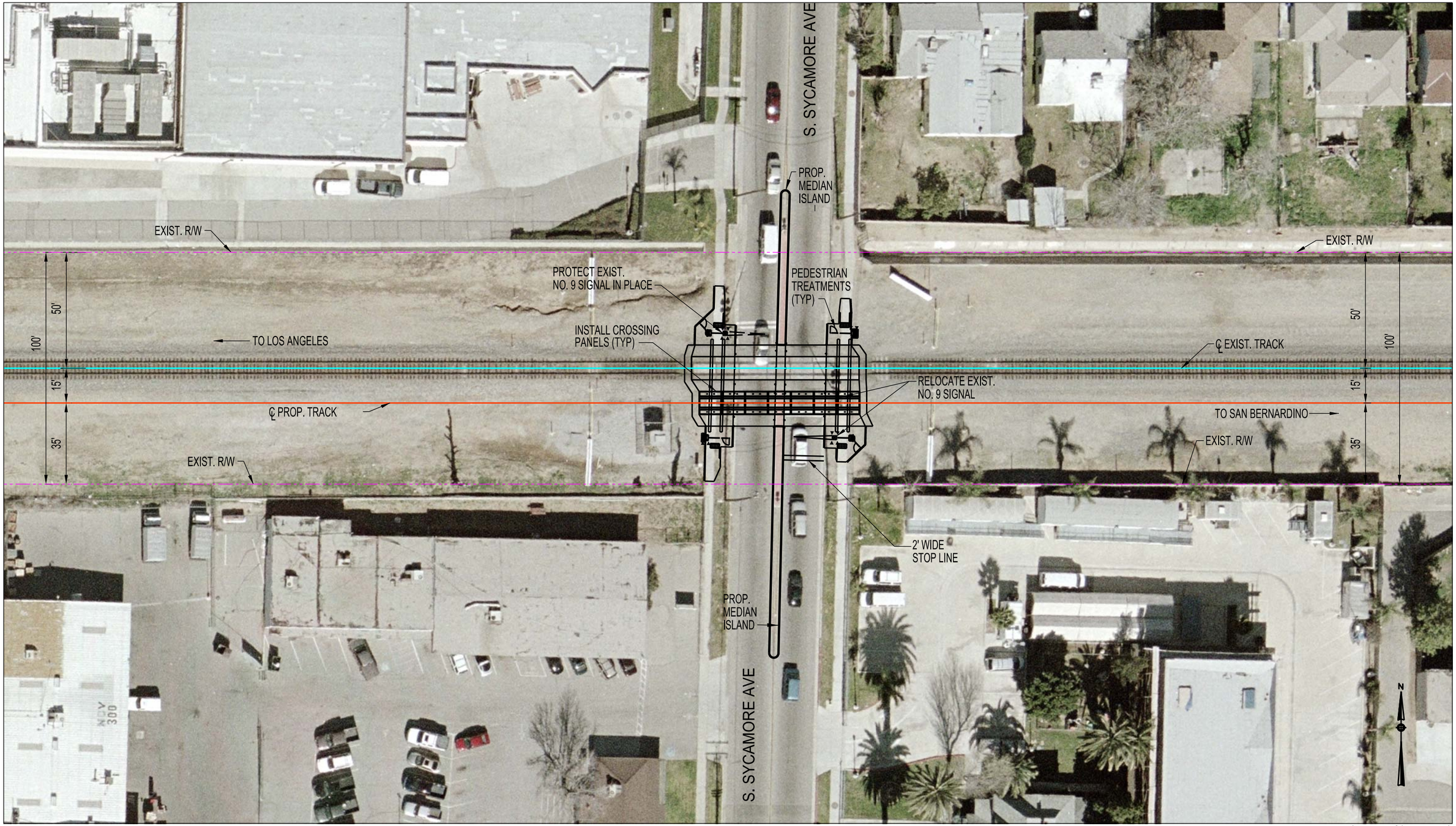
SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
S. RIVERSIDE AVE (DOT) 026136M (CPUC) 101SG-53.0
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-26
SCALE

$DATE$
$FILE$
$PENTBLL$
$PLTDRVL$
$TIME$
$USER$

S. SYCAMORE AVE





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3230 El Camino Real
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SUBMITTED: _____ PROJECT MANAGER

V&A INC.
530 S. HEWITT ST. SUITE 121
LOS ANGELES, CA 90013
213.972.9700

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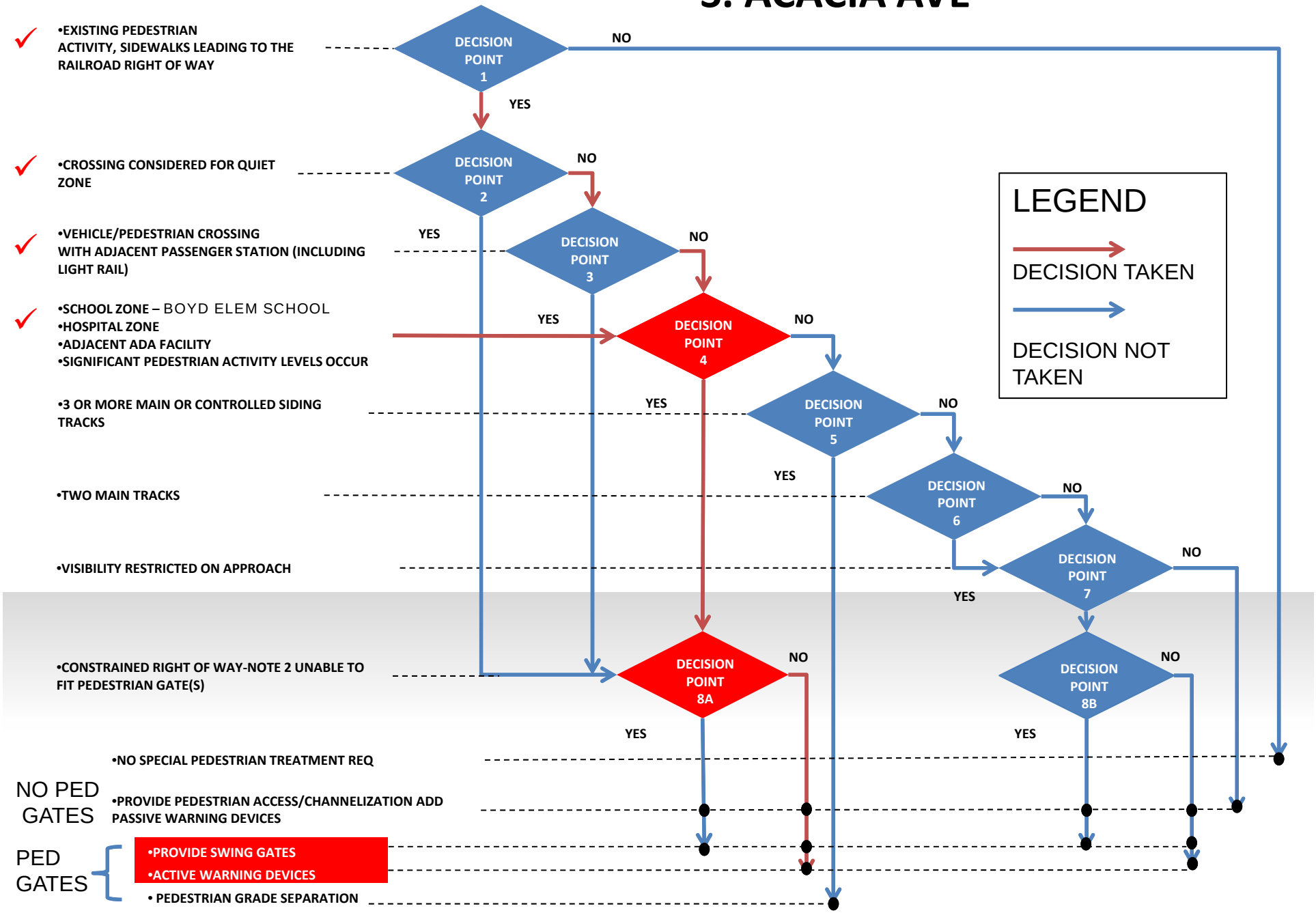
APPROVED: _____

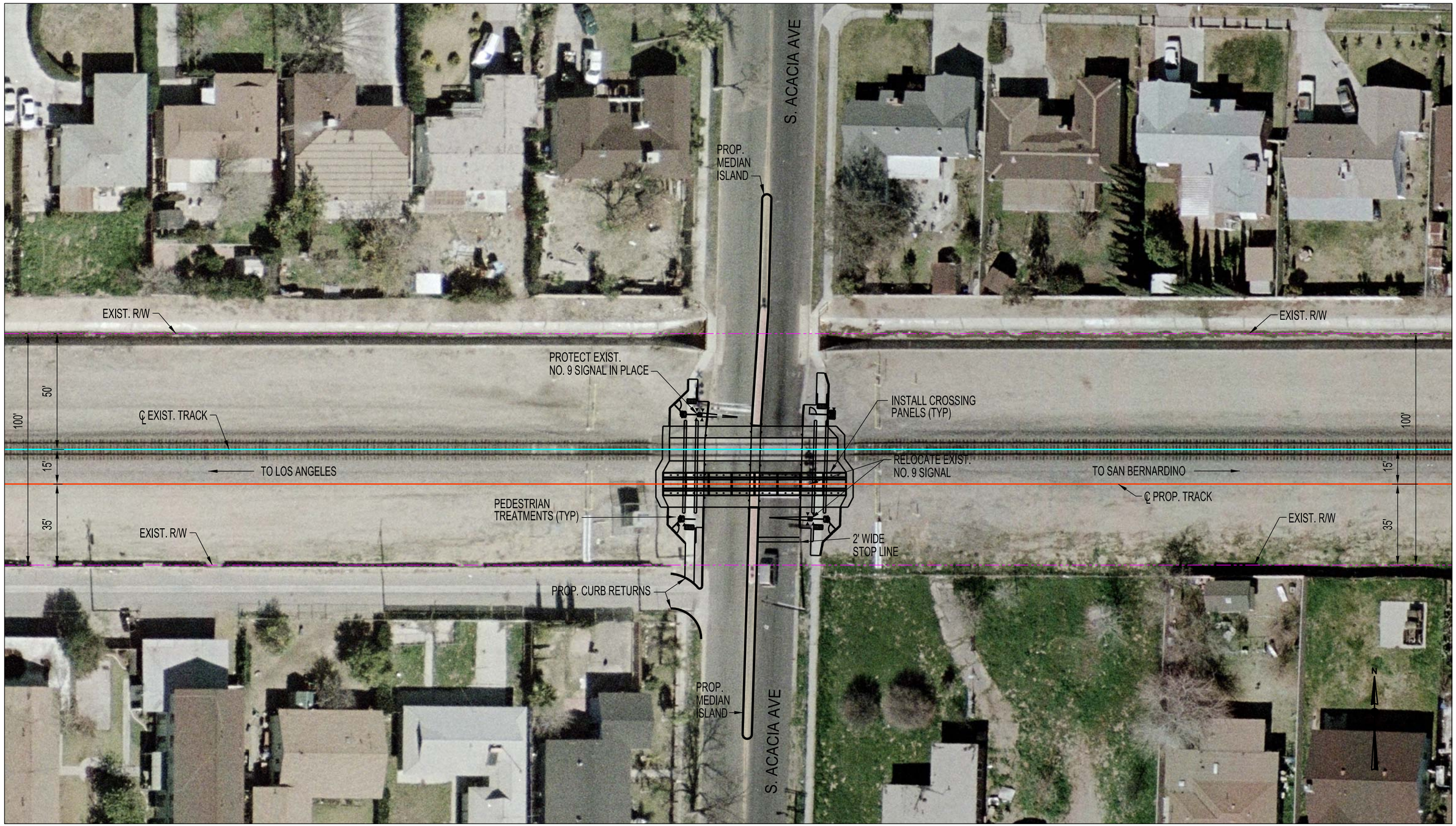
SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
S. SYCAMORE AVE (DOT) 026135F (CPUC) 101SG-53.1
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-28
SCALE

$TIME$
$USER$
$DATE$
$FILE$
$PENTABLE$
$PLTDRVL$

S. ACACIA AVE


•EXISTING PEDESTRIAN ACTIVITY, SIDEWALKS LEADING TO THE RAILROAD RIGHT OF WAY
DECISION POINT 1
NO
YES
•CROSSING CONSIDERED FOR QUIET ZONE
DECISION POINT 2
NO
YES
•VEHICLE/PEDESTRIAN CROSSING WITH ADJACENT PASSENGER STATION (INCLUDING LIGHT RAIL)
DECISION POINT 3
NO
YES
•SCHOOL ZONE – BOYD ELEM SCHOOL
•HOSPITAL ZONE
•ADJACENT ADA FACILITY
•SIGNIFICANT PEDESTRIAN ACTIVITY LEVELS OCCUR
DECISION POINT 4
NO
YES
•3 OR MORE MAIN OR CONTROLLED SIDING TRACKS
DECISION POINT 5
NO
YES
•TWO MAIN TRACKS
DECISION POINT 6
NO
YES
•VISIBILITY RESTRICTED ON APPROACH
DECISION POINT 7
NO
YES
•CONSTRAINED RIGHT OF WAY-NOTE 2 UNABLE TO FIT PEDESTRIAN GATE(S)
DECISION POINT 8A
NO
YES
DECISION POINT 8B
NO
YES
•NO SPECIAL PEDESTRIAN TREATMENT REQ
NO PED GATES
•PROVIDE PEDESTRIAN ACCESS/CHANNELIZATION ADD PASSIVE WARNING DEVICES
PED GATES
•PROVIDE SWING GATES
•ACTIVE WARNING DEVICES
• PEDESTRIAN GRADE SEPARATION
LEGEND
DECISION TAKEN
DECISION NOT TAKEN



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20 0 20 40
1"=20' HORIZONTAL

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METROLINK®

HDR Engineering, Inc.
3230 El Camino Real
Suite 200
Irvine, Ca 92602

SUBMITTED: _____ PROJECT MANAGER

V&A INC.
530 S. HEWITT ST. SUITE 121
LOS ANGELES, CA 90013
213.972.9700

Metro
APPROVED: _____

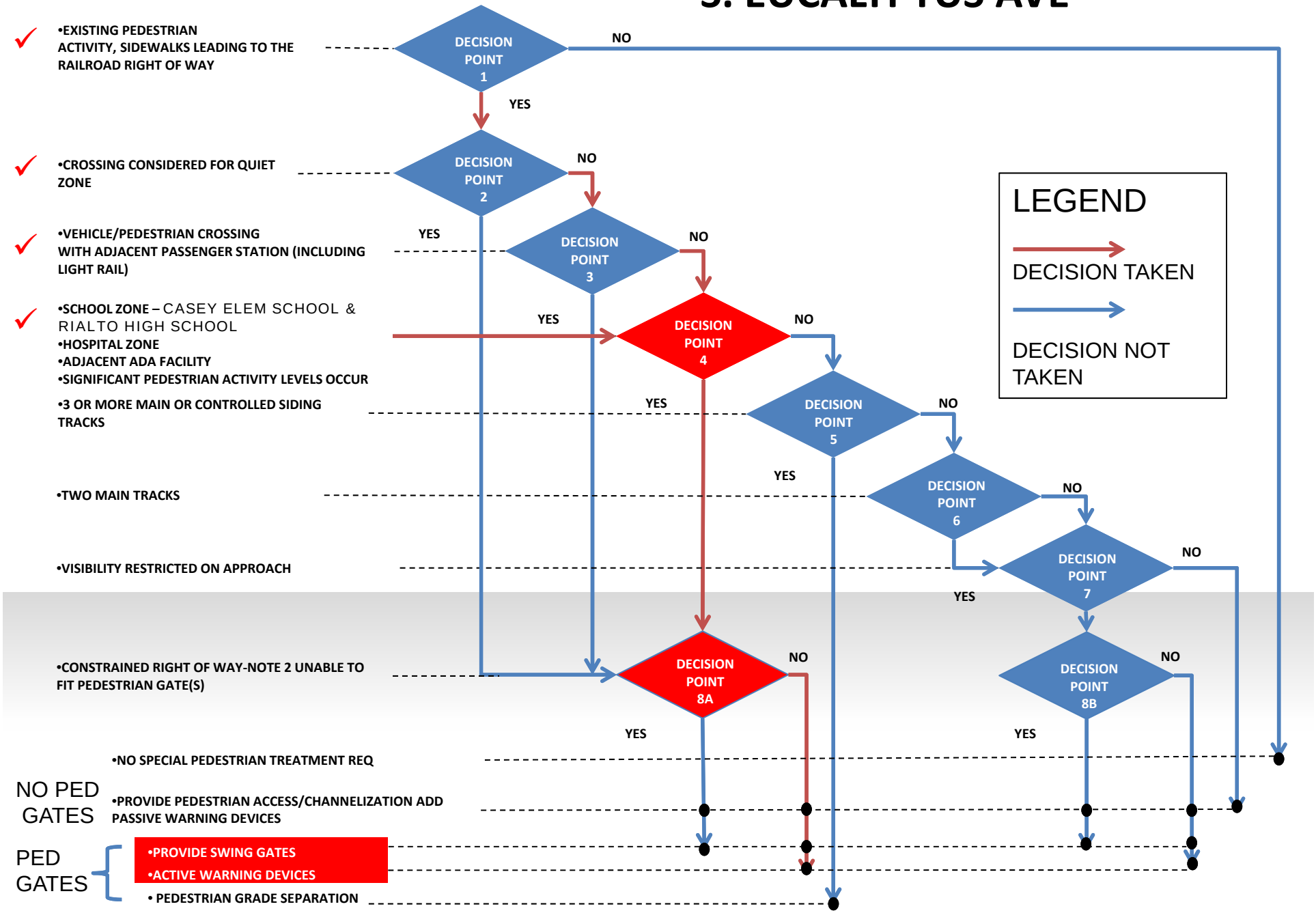
SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN

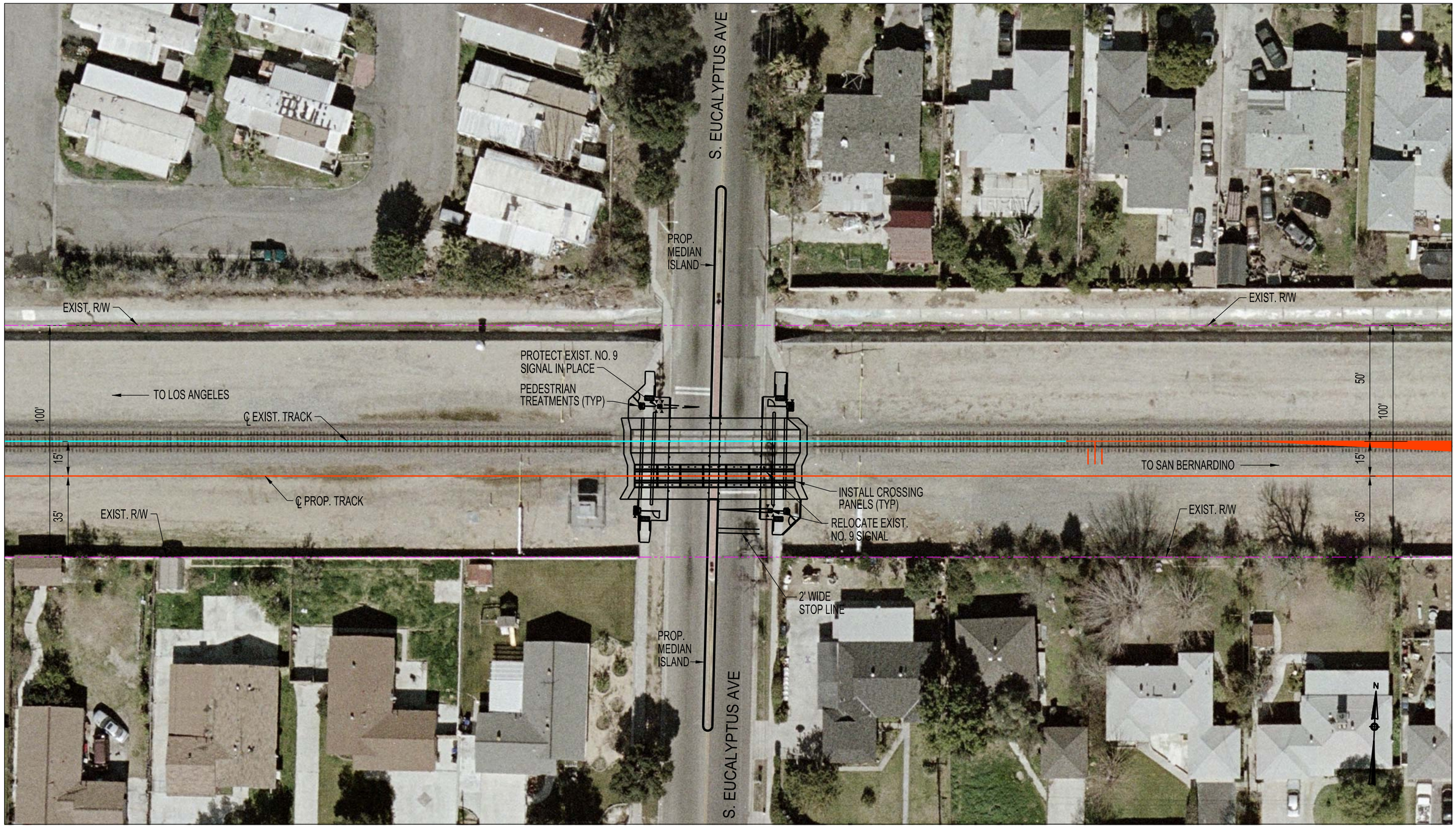
S. ACACIA AVE (DOT) 026134Y (CPUC) 101SG-53.4
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION | SHEET NO. D2-30
SCALE

$DATE$
$PLOT$
$PENTBL$
$PLTDRVL$
$USER$
$TIME$

S. EUCALYPTUS AVE





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SUBMITTED: _____ PROJECT MANAGER

V&A INC.
530 S. HEWITT ST. SUITE 121
LOS ANGELES, CA 90013
213.972.9700

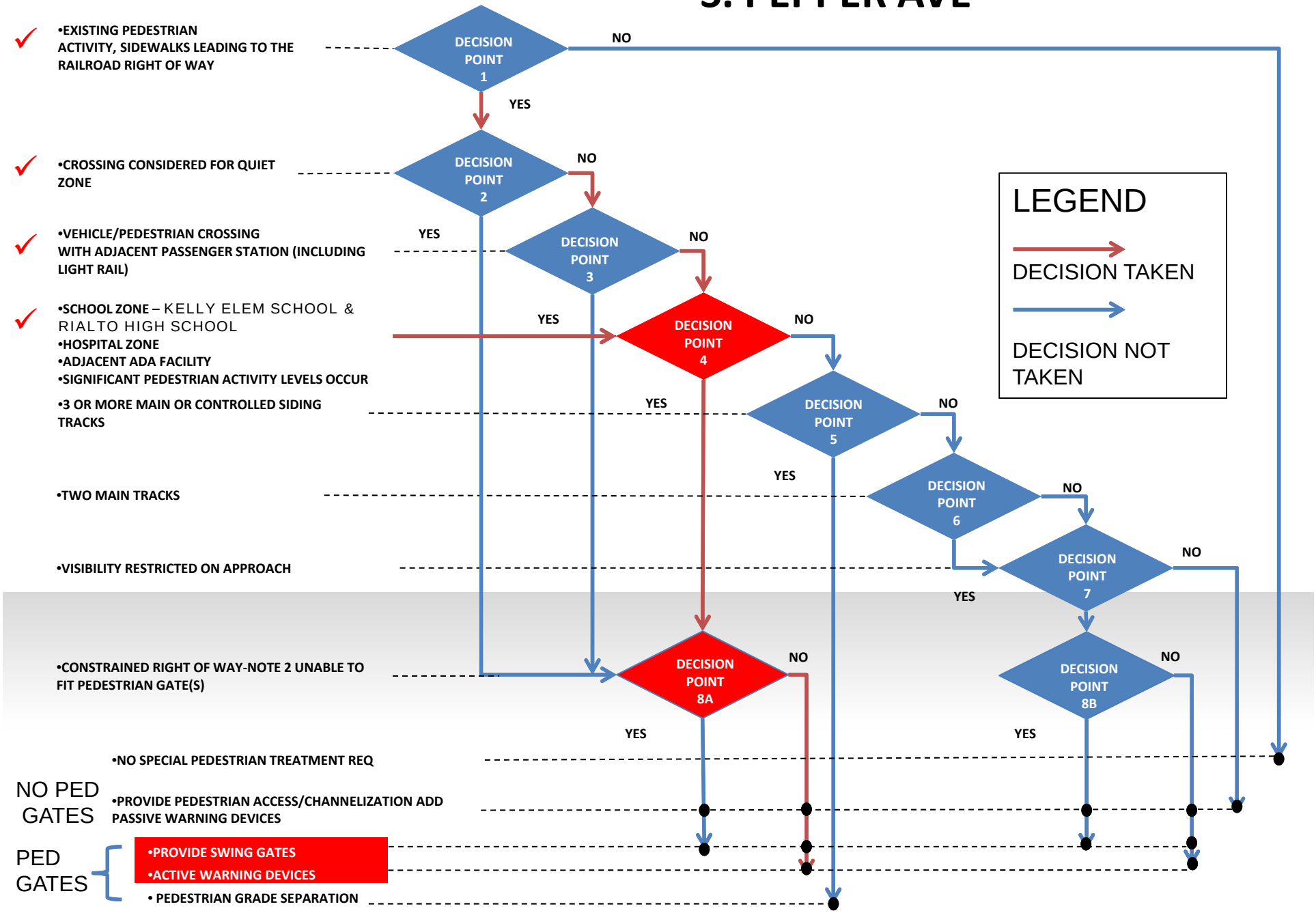
Metro
APPROVED: _____

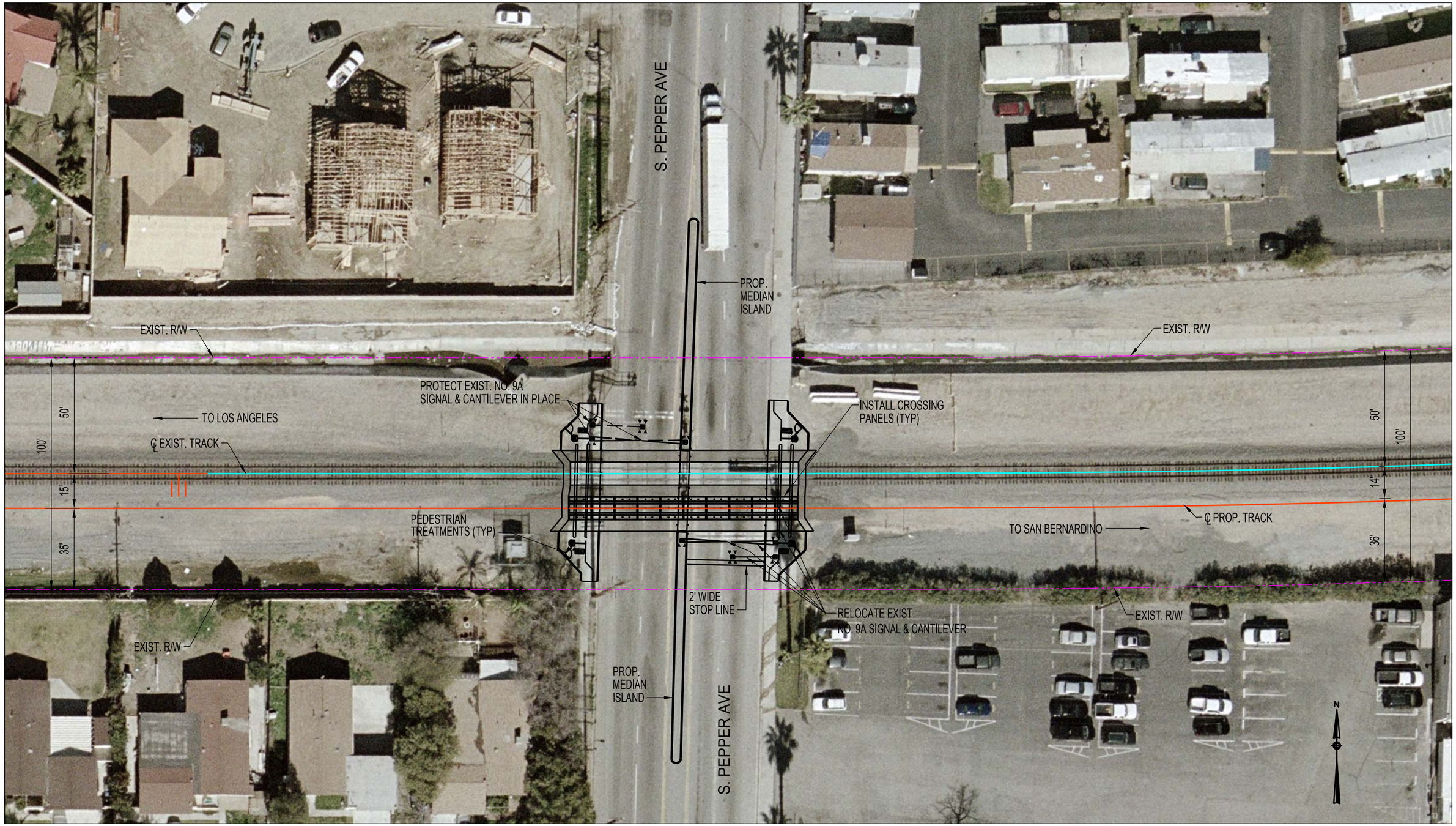
SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
S. EUCALYPTUS AVE (DOT) 026133S (CPUC) 101SG-53.6
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-32
SCALE

$DATE$
$PLOT$
$PENTBL$
$PLTDRV$
$USER$
$TIME$

S. PEPPER AVE


•EXISTING PEDESTRIAN ACTIVITY, SIDEWALKS LEADING TO THE RAILROAD RIGHT OF WAY
DECISION POINT 1
NO
YES
•CROSSING CONSIDERED FOR QUIET ZONE
DECISION POINT 2
NO
YES
•VEHICLE/PEDESTRIAN CROSSING WITH ADJACENT PASSENGER STATION (INCLUDING LIGHT RAIL)
DECISION POINT 3
NO
YES
•SCHOOL ZONE – KELLY ELEM SCHOOL & RIALTO HIGH SCHOOL
•HOSPITAL ZONE
•ADJACENT ADA FACILITY
•SIGNIFICANT PEDESTRIAN ACTIVITY LEVELS OCCUR
DECISION POINT 4
NO
YES
•3 OR MORE MAIN OR CONTROLLED SIDING TRACKS
DECISION POINT 5
NO
YES
•TWO MAIN TRACKS
DECISION POINT 6
NO
YES
•VISIBILITY RESTRICTED ON APPROACH
DECISION POINT 7
NO
YES
•CONSTRAINED RIGHT OF WAY-NOTE 2 UNABLE TO FIT PEDESTRIAN GATE(S)
DECISION POINT 8A
NO
YES
DECISION POINT 8B
NO
YES
LEGEND
DECISION TAKEN
DECISION NOT TAKEN
•NO SPECIAL PEDESTRIAN TREATMENT REQ
NO PED GATES
•PROVIDE PEDESTRIAN ACCESS/CHANNELIZATION ADD PASSIVE WARNING DEVICES
PED GATES
•PROVIDE SWING GATES
•ACTIVE WARNING DEVICES
• PEDESTRIAN GRADE SEPARATION



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3230 El Camino Real
Suite 200
Irvine, Ca 92602

SUBMITTED: _____ PROJECT MANAGER

V&A INC.
530 S. HEWITT ST. SUITE 121
LOS ANGELES, CA 90013
213.972.9700

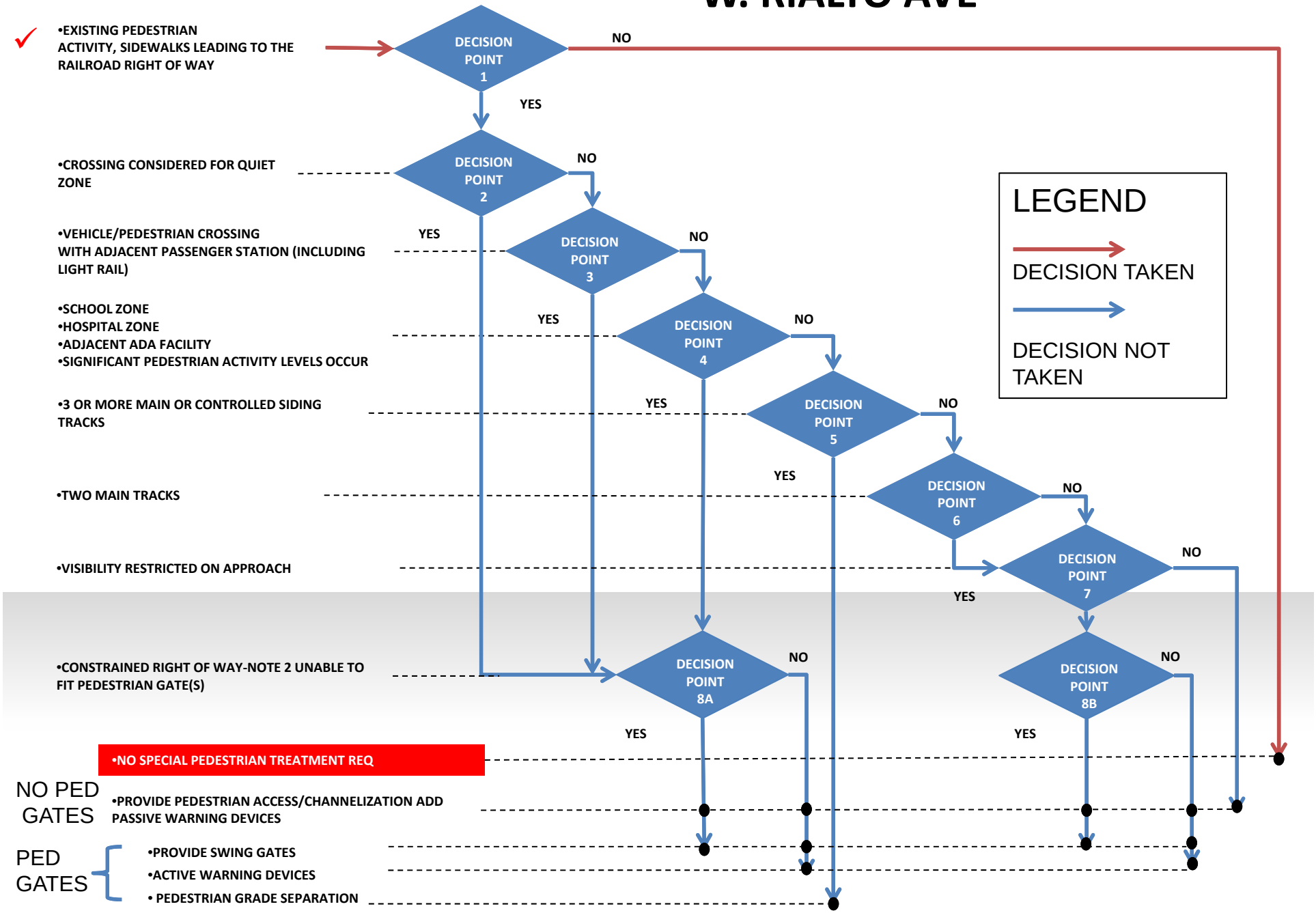
Metro
APPROVED: _____

SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
S. PEPPER AVE (DOT) 026132K (CPUC) 101SG-53.9
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION
SHEET NO. D2-34
SCALE

$DATES
$PLOTS
$PENBILL$
$PLTDRVL$
$USERN
$TIME$

W. RIALTO AVE


•EXISTING PEDESTRIAN ACTIVITY, SIDEWALKS LEADING TO THE RAILROAD RIGHT OF WAY
DECISION POINT 1
NO
YES
•CROSSING CONSIDERED FOR QUIET ZONE
DECISION POINT 2
NO
YES
•VEHICLE/PEDESTRIAN CROSSING WITH ADJACENT PASSENGER STATION (INCLUDING LIGHT RAIL)
DECISION POINT 3
NO
YES
•SCHOOL ZONE
•HOSPITAL ZONE
•ADJACENT ADA FACILITY
•SIGNIFICANT PEDESTRIAN ACTIVITY LEVELS OCCUR
DECISION POINT 4
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•3 OR MORE MAIN OR CONTROLLED SIDING TRACKS
DECISION POINT 5
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•TWO MAIN TRACKS
DECISION POINT 6
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YES
•VISIBILITY RESTRICTED ON APPROACH
DECISION POINT 7
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•CONSTRAINED RIGHT OF WAY-NOTE 2 UNABLE TO FIT PEDESTRIAN GATE(S)
DECISION POINT 8A
NO
YES
DECISION POINT 8B
NO
YES
LEGEND
DECISION TAKEN
DECISION NOT TAKEN
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NO PED GATES
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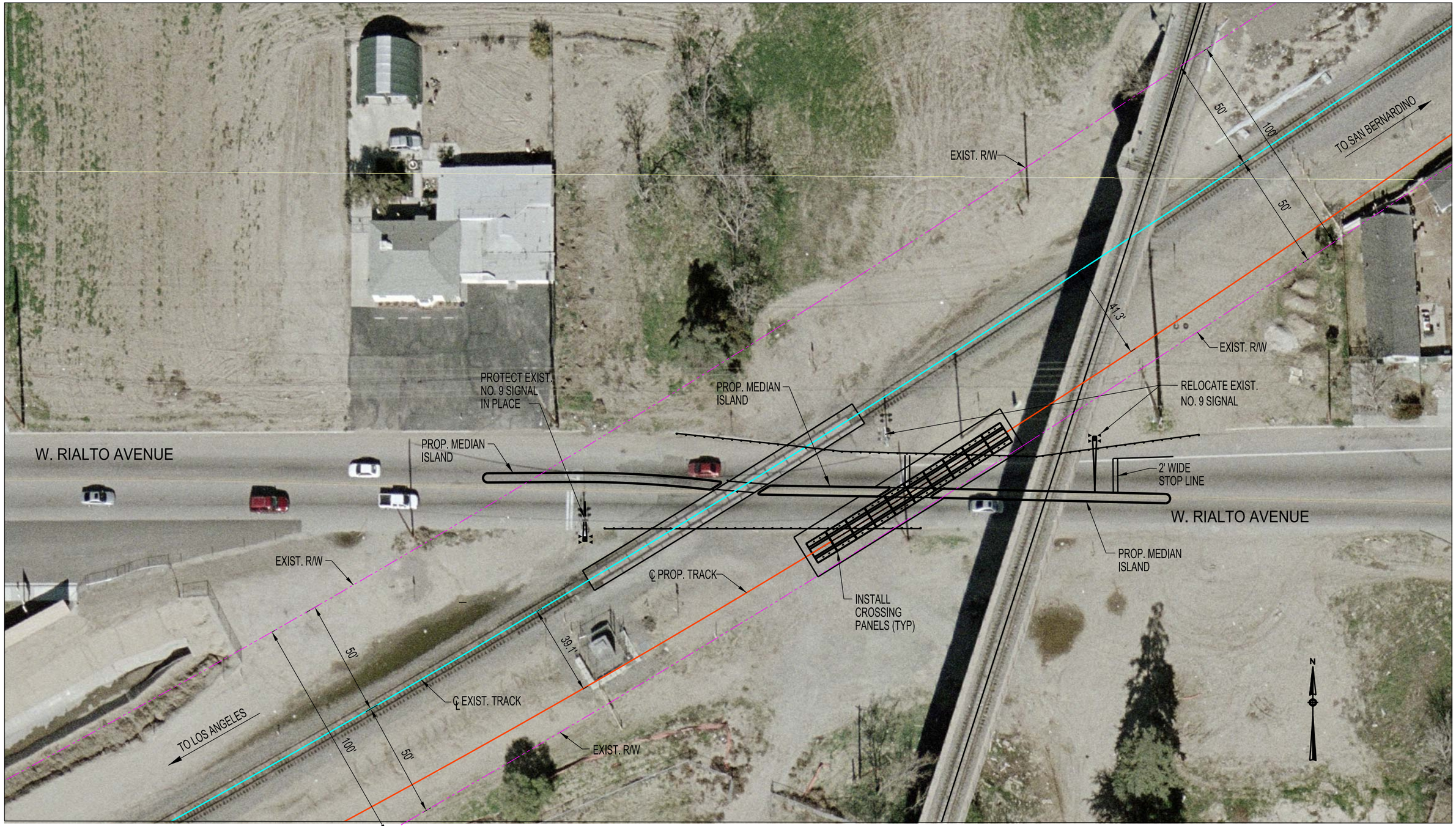
PED GATES
•PROVIDE SWING GATES
•ACTIVE WARNING DEVICES
• PEDESTRIAN GRADE SEPARATION



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V&A INC.
530 S. HEWITT ST. SUITE 121
LOS ANGELES, CA 90013
213.972.9700

Metro
APPROVED: _____

SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STRATEGIC PLAN
W. RIALTO AVE (DOT) 026131D (CPUC) 101SG-54.4
GRADE CROSSING CONCEPT

CONTRACT NO.
DRAWING NO.
REVISION | SHEET NO. D2-36
SCALE

$DATE$
$PLOTS
$PENTBLL$
PL_TORVL
$TIMES
$USER$

APPENDIX E

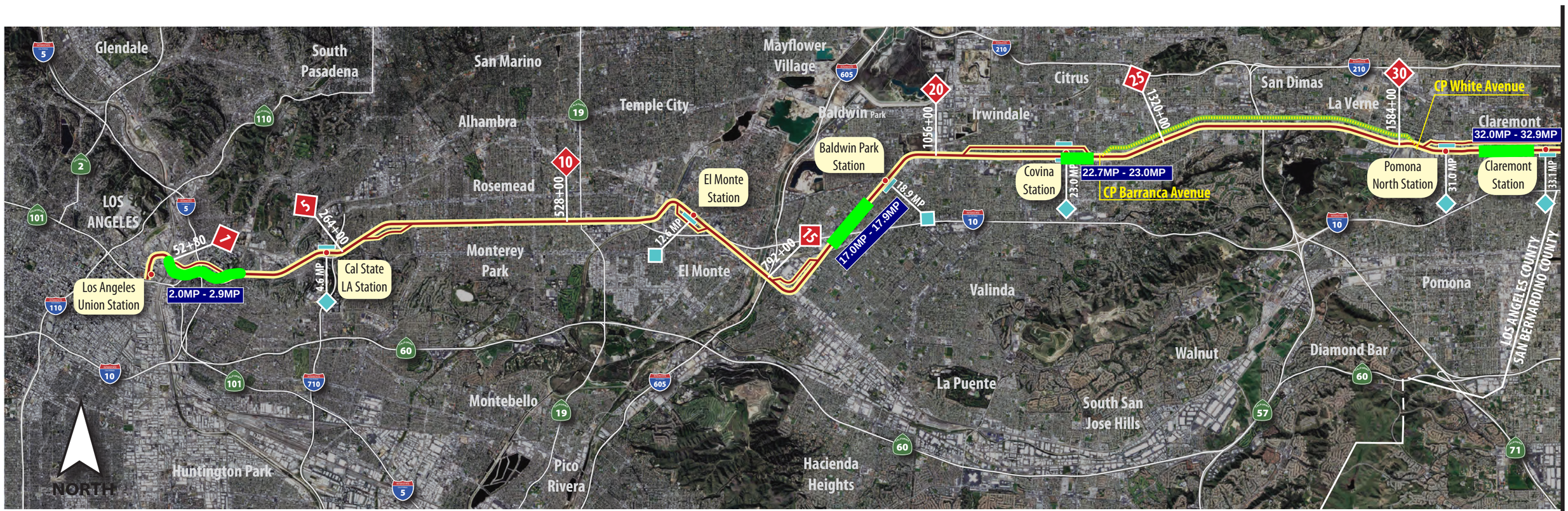
Corridor Safety

APPENDIX E1

Proposed Fencing Locations

PROPOSED SAFETY FENCING LOCATIONS

October 2013



MATCHLINE SEE PAGE 2

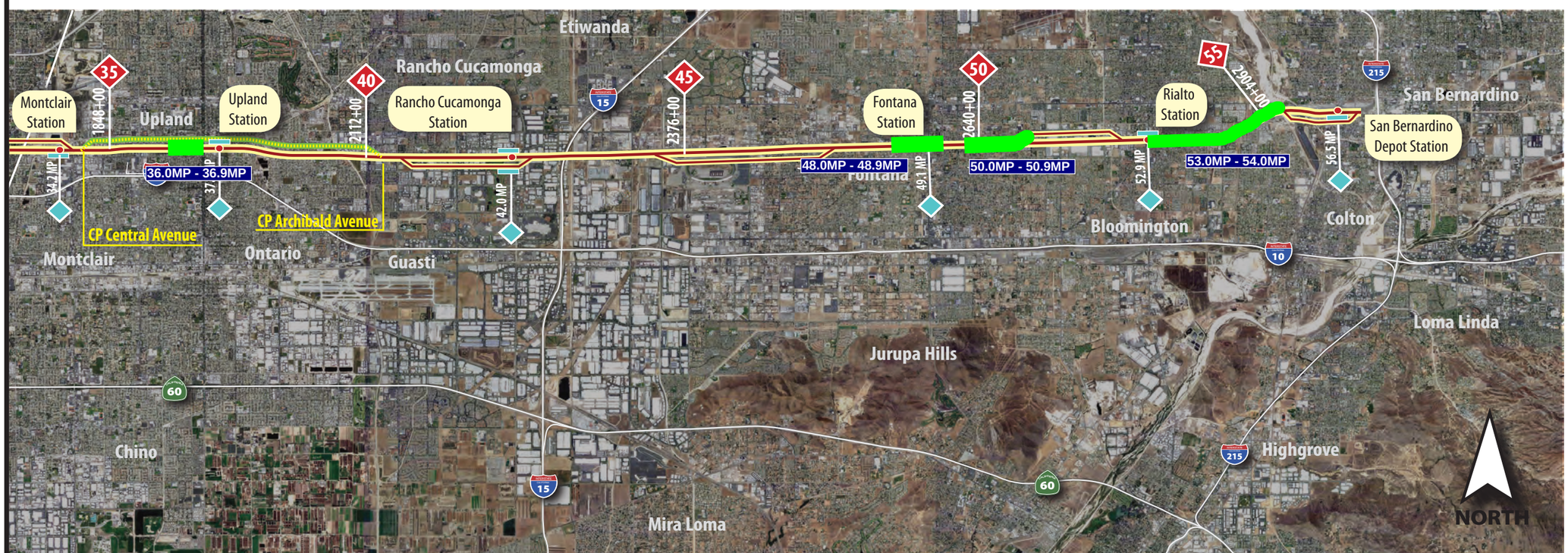
BA INC.

E1-1

Metro | Governments SANBAG Working Together | METROLINK | HDR

PROPOSED SAFETY FENCING LOCATIONS

October 2013



MATCHLINE SEE PAGE 1

LEGEND

PROPOSED SAFETY FENCING

BA INC.

E1-2

Metro | Governments SANBAG Working Together | METROLINK | HDR

APPENDIX E2

Proposed Fence Types

San Bernardino Line Enhancement Assessment
Security Fencing Recommendations (by Type)

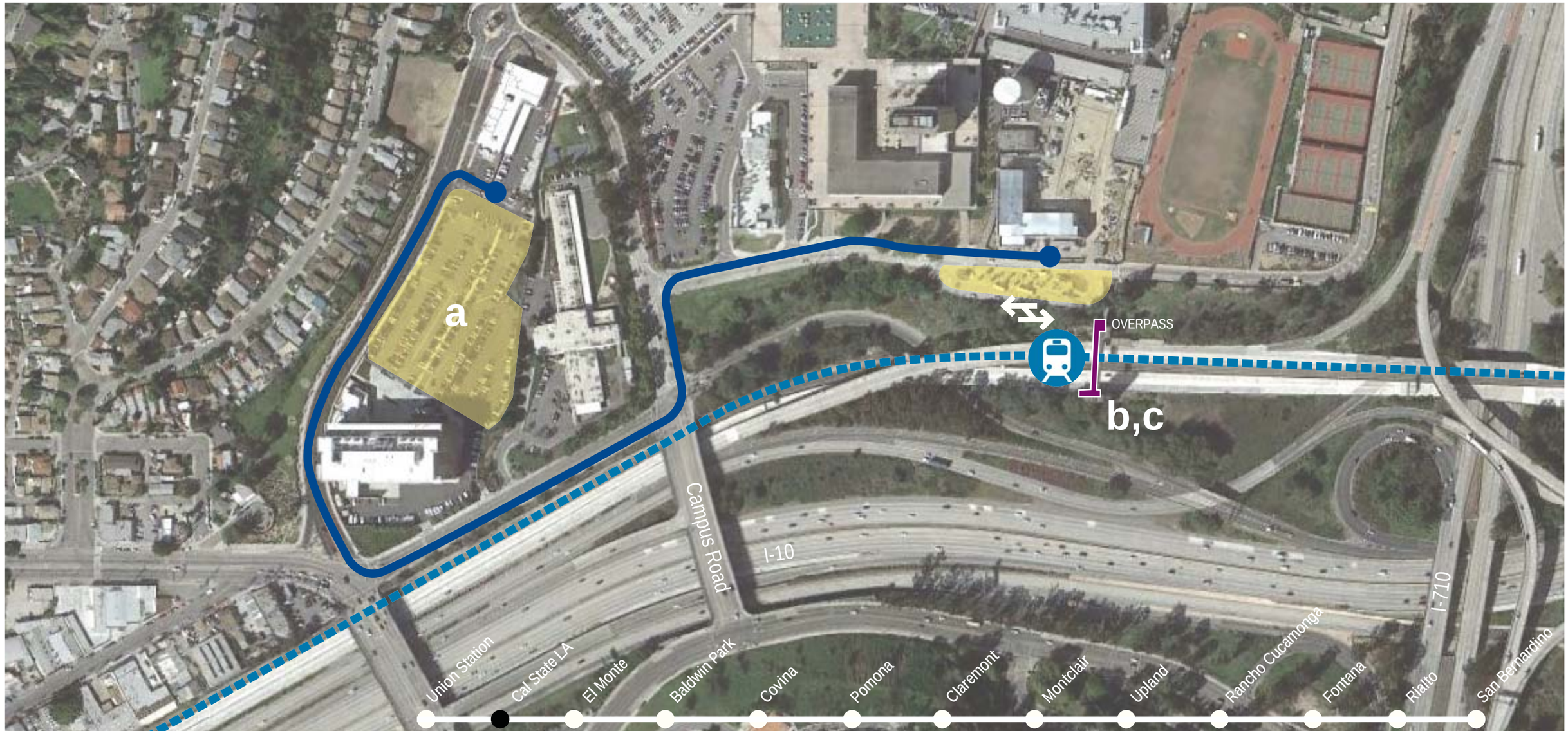
Priority Areas (by Milepost)	Milepost Segments	Welded Wire Mesh	Total Miles	Total LF	Subtotal ($50/LF)	Concrete Block Wall	Total Length	Total LF	Subtotal ($264/LF)	Notes
2.0 - 2.9	2.0 - 2.3	X	0.2	1056	$ 52,800	X	0.1	528	$ 139,392	
	2.3 - 2.4									Existing fence; Possible maintenance needs
	2.4 - 2.5					X	0.1	528	$ 139,392	
	2.5 - 2.6									Existing fence; Possible maintenance needs
	2.6 - 2.9									Existing fence varies between chain link and wall; possible maintenance needs
17.0 - 17.9	17.0 - 17.3	X	0.3	1584	$ 79,200					
	17.3 - 17.9	X	0.6	3168	$ 158,400					
22.7 - 23.0	22.7 - 23.0	X	0.3	1584	$ 79,200					Existing fence types vary throughout; Incidents near Covina Station
32.0 - 32.9	32.0 - 32.9	X	0.4	2112	$ 105,600	X	0.1	528	$ 139,392	Existing fence types vary throughout; possible access point from North Towne Ave; Wall at culdesac locations
36.0 - 36.9	36.0 - 36.4	X	0.4	2112	$ 105,600					Existing fence types vary throughout; possible access point from North San Antonio Ave & Euclid Ave; Wall culdesac locations
	36.4 - 36.6	X	0.2	1056	$ 52,800					Existing fence on northside; Replace chain link with welded wire.
	36.6 - 36.8	X	0.2	1056	$ 52,800	X	0.2	1056	$ 278,784	Replace chain link with welded wire. Upgrade existing wall at Western Christian High School (36.8)
48.0 - 48.9	48.0 - 48.6					X	0.3	1584	$ 418,176	Possible access point from Citrus Ave; Existing fence throughout; close off culdesacs with wall
	48.6 - 48.9	X	0.3	1584	$ 79,200					Maintenance for existing fence
50.0 - 50.9	50.0 - 50.9	X	0.7	3696	$ 184,800	X	0.1	528	$ 139,392	Existing fence throughout; close off culdesacs/grade crossings
52.9 - 55.0	52.9 - 53.2	X	0.3	1584	$ 79,200					Existing fence types throughout; predominately residential; close off at Rialto Ave grade crossing
	53.2 - 54.5					X	0.3	1584	$ 418,176	
	54.5 - 54.8	X	0.3	1584	$ 79,200					
		Wire Mesh Total	**4.2**	**22176**	**$ 1,108,800**	**Block Wall Total**	**1.2**	**6336**	**$ 1,672,704**	

APPENDIX F

Stations

APPENDIX F1

Station Layouts



Cal State LA Station

METROLINK

MP 4.6

5150 State University Drive
90032

Station Condition

0 **Parking Spaces**

570 **Weekday Boardings**

Mini-high (1)
Elevator

258' Side Platform (1)
Single-Track

CSLA Shuttle
Metro Bus
Foothill Transit
County LA Shuttle
Monterey Park Spirit
Alhambra Transit
Children's Court Shuttle

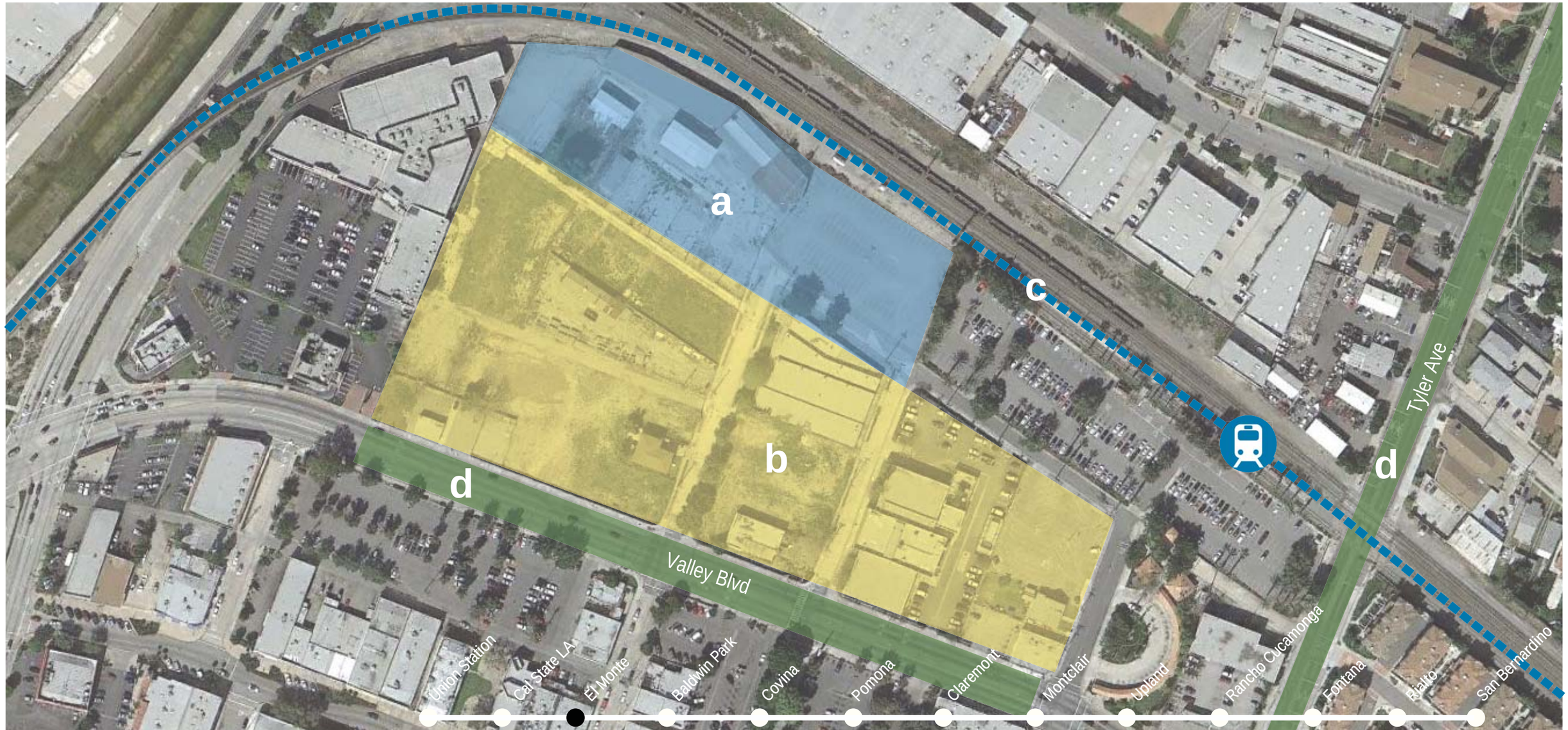
Station Improvements

HDR

a 100 new parking stalls

b Extend platform to 510'

c Add/upgrade surveillance, messaging and signage systems



El Monte Station

METROLINK

MP 12.6

10925 Railroad St.
91731

Station Condition

238 **Parking Spaces**

483 **Weekday Boardings**

Mini-high (1)
11 Disabled Parking

588' Center Platform (1) Double-Track

Metro Bus
Foothill Transit
El Monte Shuttle
El Monte Trolley

Station Improvements

HDR

a Increase parking by 200 spaces

b Oppportunity for TOD

c Add/upgrade surveillance, messaging and signage systems

d Increase bus connectivity

Google earth

Baldwin Park Station

METROLINK

MP 18.9

3825 Downing Ave
91706

Station Condition

420 Parking Spaces

424 Weekday Boardings

Mini-high (1)
14 Disabled Parking

510' Side Platform (1)
Single-Track

Metro Bus
Foothill Transit
Baldwin Park Shuttle
West Covina Shuttle

Station Improvements

HDR

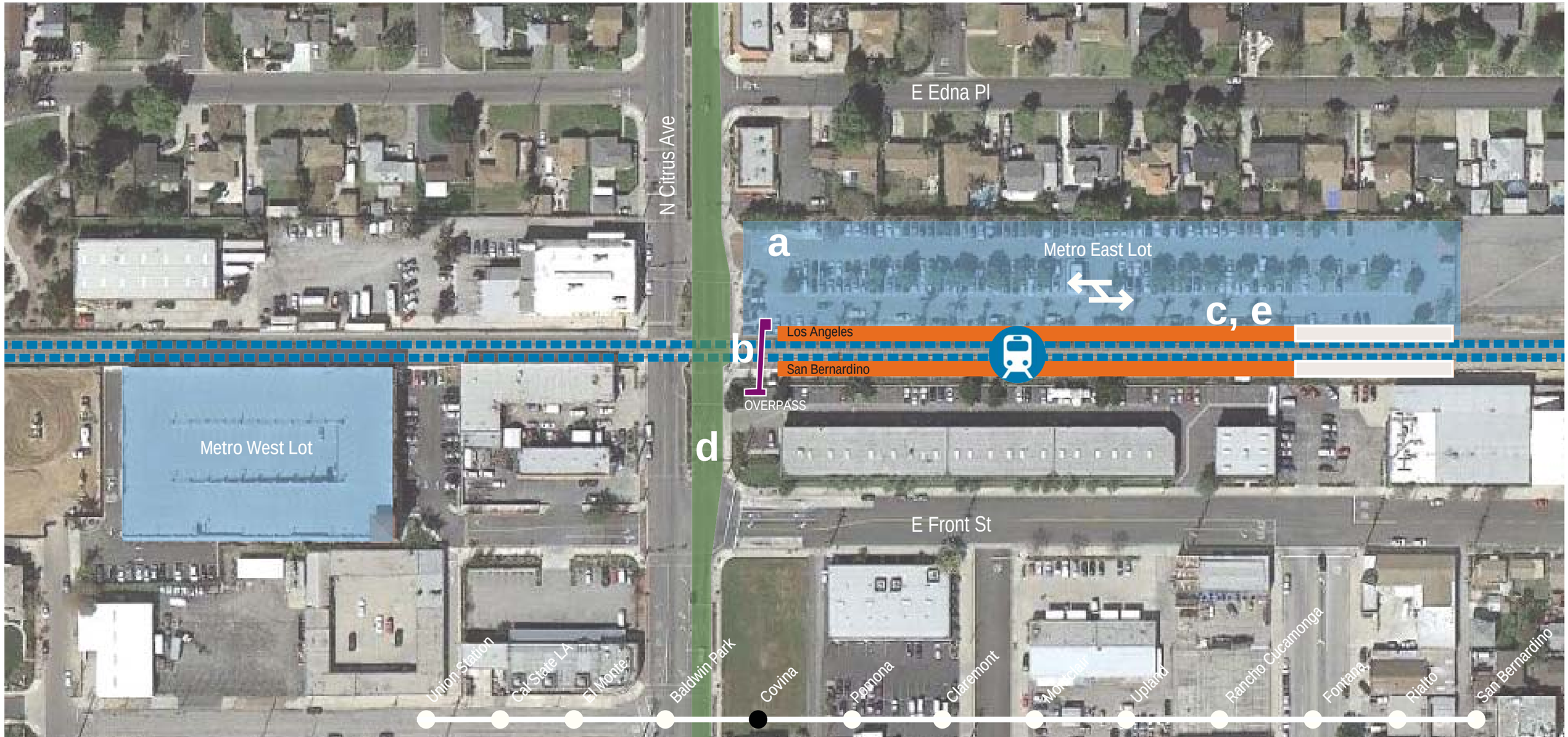
a 100-stall parking structure

b Extend platform to 8 cars

c Add/upgrade surveillance, messaging and signage systems

d Opportunity for TOD

e Construct bike station



Covina Station

METROLINK

MP 23.0

600 North Citrus Avenue
91723

Station Condition

881 **Parking Spaces**

1,098 Weekday Boardings

Mini-high (2)
26 Disabled Parking

36 Bikestation
18 Racks

508' Platform (LA)
510' Platform (SB)

Foothill Transit
Azusa Shuttle
Glendora Shuttle

Station Improvements

HDR

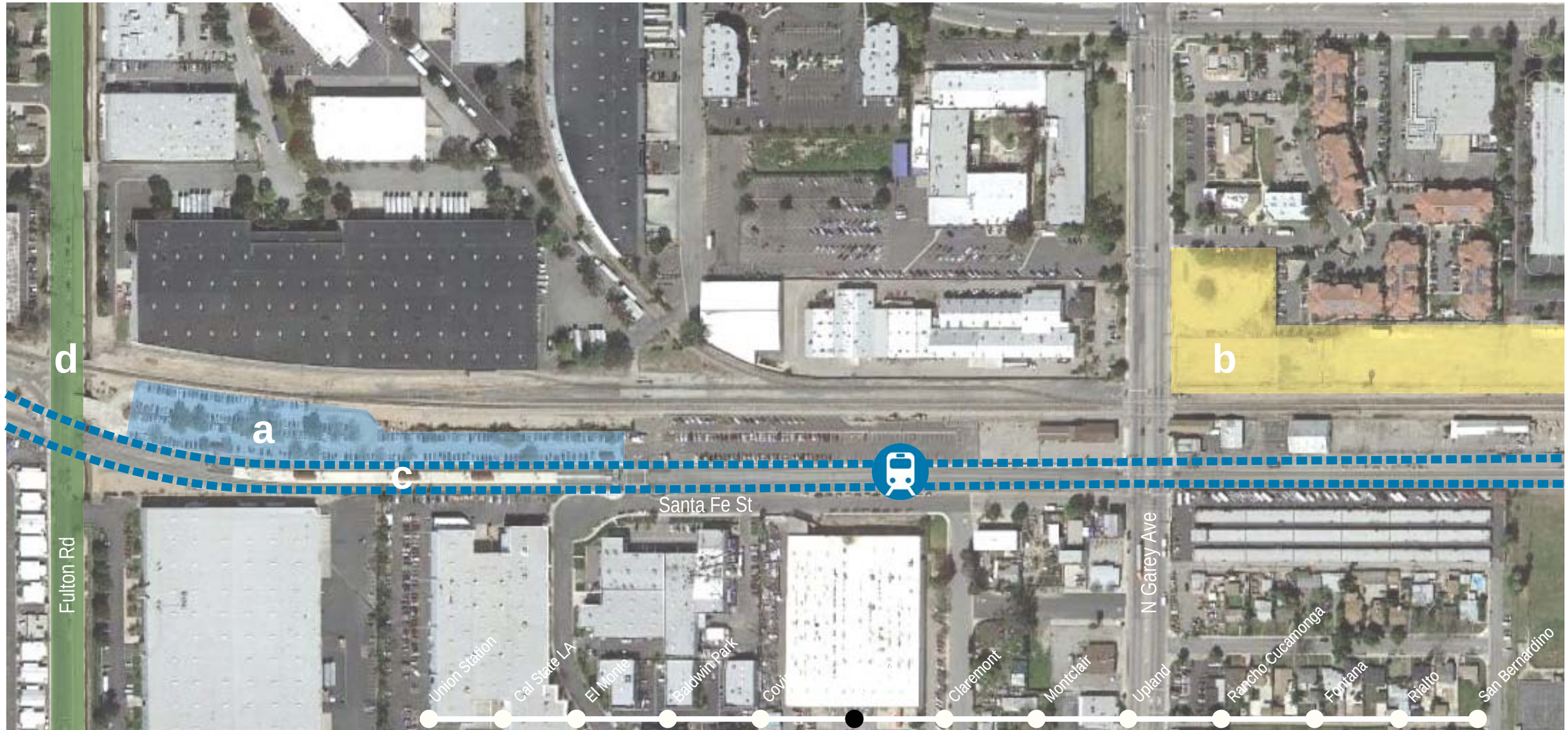
a 200-stall parking structure

b Add pedestrian overpass & gates

c Add/upgrade surveillance, messaging and signage systems

d Add bus service to supplement single bus line along North Citrus Ave

e Extend platforms for 8-car trains



Pomona North

METROLINK

MP 31.0

205 Santa Fe Street
91767

Station Condition

385 Parking Spaces

623 Weekday Boardings

Mini-high (1) 6 Disabled Parking

685' Center Platform (2) Double-Track

Foothill Transit
Bronco Link Shuttle

Station Improvements

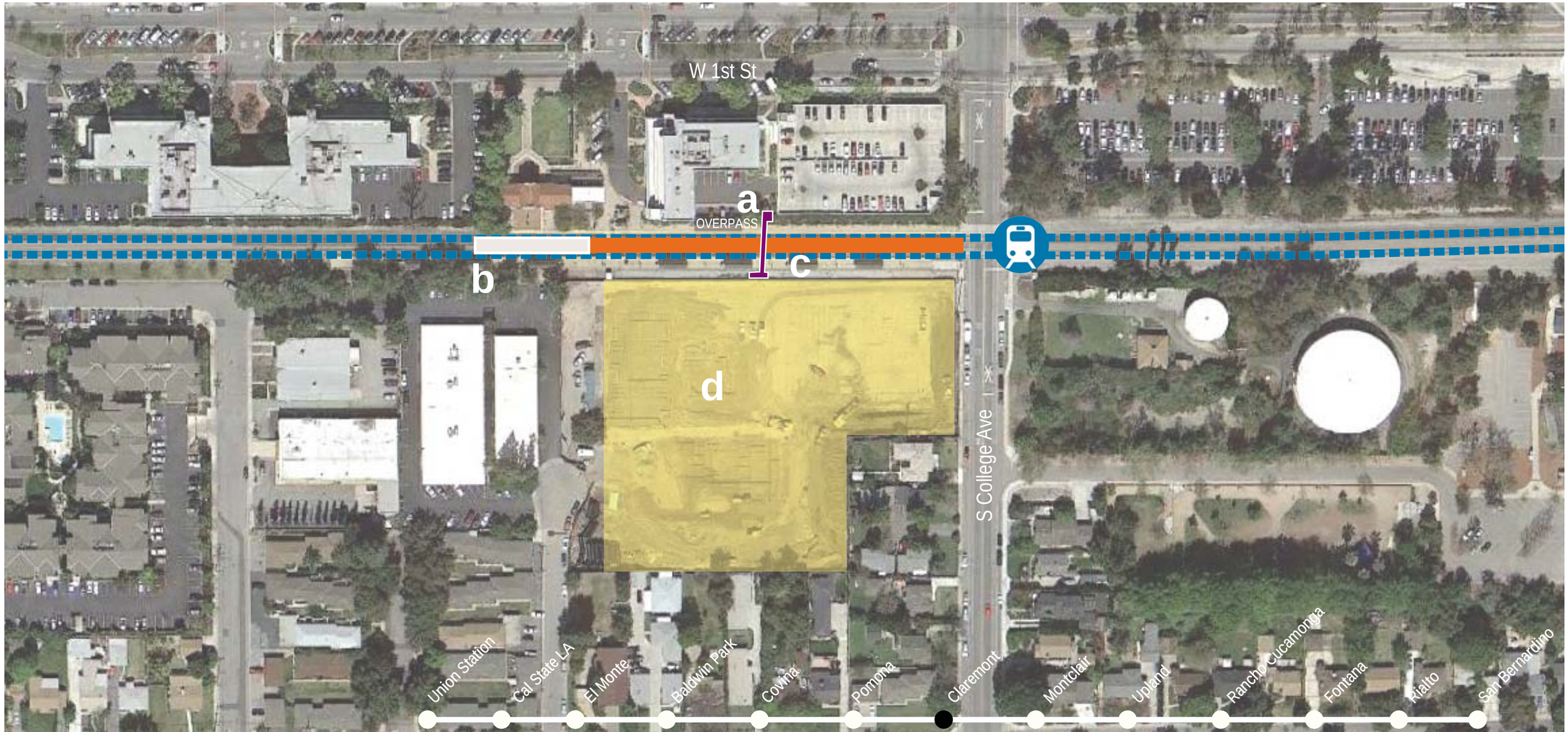
a 200-stall parking structure

b Oppportunity for TOD

c Add/upgrade surveillance, messaging and signage systems

d Add bus service on Fulton Road

HDR



Claremont Station

M METROLINK

MP 33.1

200 West 1st Street
91711

Station Condition

881 Parking Spaces

437 Weekday Boardings

Mini-high (2)
16 Disabled Parking

2 side Platforms (530', 736')

Foothill Transit
Claremont Dial-A-Ride
Pomona Valley Transit
Amtrak California Thruway

Station Improvements

a Pedestrian Overpass

b Extend Platform to fit 8-car trains

c Add/upgrade surveillance, messaging and signage systems

d TOD opportunity

HDR

b
b
b
Richton St
Monte Vista Ave
a
b
c
Union Station
Cal State LA
El Monte
Baldwin Park
Covina
Pomona
Claremont
Montclair
Upland
Rancho Cucamonga
Fontana
Rialto
San Bernardino
Montclair Station
METROLINK
MP 34.2
5091 Richton Street
91763
Station Condition
1600
Parking Spaces
320
Weekday Boardings
Mini-high (2)
32 Disabled Parking
2 side Platforms (685')
4 EV Charging Stations
Foothill Transit
Omnitrans
Station Improvements
a Revitalize underutilize existing facility
b TOD opportunity
c Add/upgrade surveillance, messaging and signage systems
HDR

N 3rd Ave
N 4th Ave
E A St
E Stowell St
S 3rd Ave
a
b
c
d
d
e
f
g
h
Union Station
Cal State L
Pomona
Baldwin Park
Covina
Pomona
Claremont
Montclair
Upland
Rancho Cucamonga
Fontana
Rialto
San Bernardino
Upland Station
MP 37.0
METROLINK
300 East A Street
91786
Station Condition
224 Parking Spaces
580 Weekday Boardings
Mini-high (1) 17 Disabled Parking
700' Side Platform Single-Track
4 Racks 8 Lockers
Omnitrans
Station Improvements
a Existing track
b Proposed track
c Proposed 16' wide platform
d Potential at-grade pedestrian crossings
e Pedestrian connection: overpass or underpass
f Add/upgrade surveillance, messaging and signage systems
g TOD opportunity
h Parking expansion opportunity
HDR

Rancho Cucamonga

METROLINK

MP 42.1

11208 Azusa Court
91730

Station Condition

960 Parking Spaces

1127 Weekday Boardings

Mini-high (2) 24 Disabled Parking

2 side Platforms (510', 680')

2 EV Charging Stations

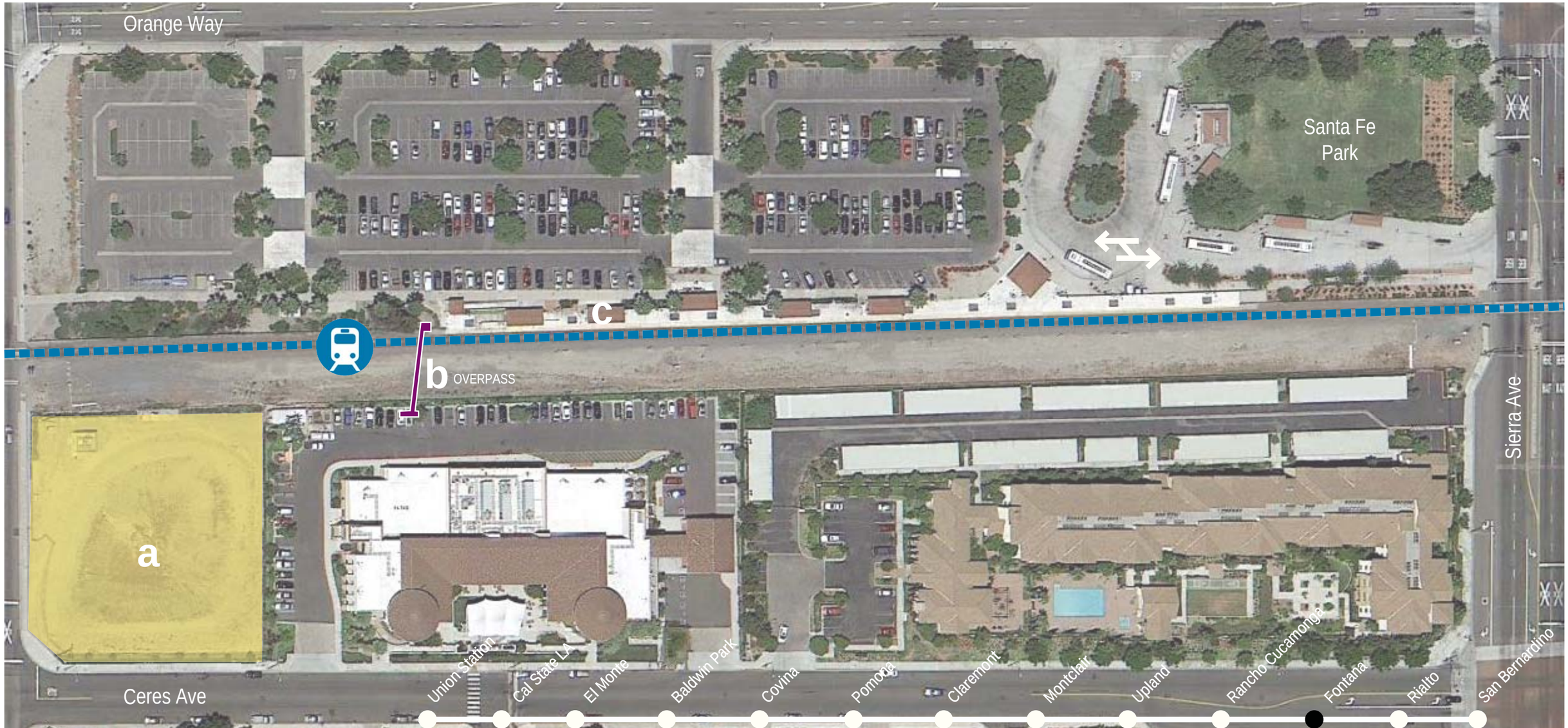
Omnitrans

Station Improvements

a Add/upgrade surveillance, messaging and signage systems

b Parking structure opportunity

HDR



Fontana Station

METROLINK

MP 49.1

16777 Orange Way
92335

Station Condition

321 Parking Spaces

478 Weekday Boardings

Mini-high (1) 23 Disabled Parking

680' Single Platform

Omnitrans

Station Improvements

a TOD opportunity

b Pedestrian overpass for TOD & community center connection

c Add/upgrade surveillance, messaging and signage systems

HDR

S Palm Ave
S Orange Ave
S Riverside Ave
e
e
a
b
c
d
d
f
g
h
Covina
Pomona
Claremont
Montclair
Upland
Rancho Cucamonga
Fontana
Rialto
San Bernardino
Rialto Station
Station Condition
Station Improvements
HDR
METROLINK
MP 52.9
261 South Palm Avenue
92376
212 Parking Spaces
293 Weekday Boardings
Mini-high (1) 7 Disabled Parking
710' Single Platform
2 EV Charging Stations
Omnitrans
a Existing track
b Proposed track
c Proposed 16' wide platform
d Potential at-grade pedestrian crossings
e Planned parking improvements
f Pedestrian connection: overpass or underpass
g Add/upgrade surveillance, messaging and signage systems
h TOD opportunity

APPENDIX F2

El Monte Bus to Rail Connection

El Monte Station

MP 12.6
10925 Railroad Street
91731

CONCEPT 1

- **a** El Monte bus station
- **b** Relocated Metrolink station with vertical circulation 680' center platform
- **c** Proposed second track
- **d** Development Opportunity
- **e** Establish pedestrian connection at grade
- **f** Gateway development
- **g** Future Wal-Mart site
- **h** Santa Fe Trail Plaza

Metro | Governments SANBAG Working Together | METROLINK | HDR

APPENDIX G

Detailed Cost Estimates

SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STUDY
CONCEPTUAL ESTIMATE
12/18/2013

Lone Hill Ave MP 26.55 to CP White MP 30.4 - Double Track

GENERAL

Item	Unit	Unit $	Qty	Item Total	Comments
Mobilization (8%)	LS	$ 2,716,111	1	$ 2,716,111	
Demobilization (2%)	LS	$ 679,028	1	$ 679,028	
SWPPP (1%)	LS	$ 339,514	1	$ 339,514	
Utility Relocation & Permits (3%)	LS	$ 1,018,542	1	$ 1,018,542	
General Traffic Control (1%)	LS	$ 339,514	1	$ 339,514	
General Subtotal				$ 5,092,709	

EARTHWORK

Item	Unit	Unit $	Qty	Item Total	Comments
Clearing & grubbing	LS	$ 375,000	1	$ 375,000	Allowance based on recent construction projects.
Earthwork Subtotal				$ 375,000	

DRAINAGE

Item	Unit	Unit $	Qty	Item Total	Comments
MP 52.70 - Extend 3-24" x 46' RCP	LF	$ 250	25	$ 6,250	Unit cost based on recent construction projects
MP 26.61 Extend 24" x 20' RCP	LF	$ 400	25	$ 10,000	Unit cost based on recent construction projects
MP 27.00-27.20 Concrete lined channel	LF	$ 50	1060	$ 53,000	Unit cost based on recent construction projects
MP 27.54 Extend 8" x 40' PVC	LF	$ 190	25	$ 4,750	Unit cost based on recent construction projects
MP 27.60 Extend 12" x 35' PVC	LF	$ 230	25	$ 5,750	Unit cost based on recent construction projects
MP 27.80 Extend 24" x 24' CMP	LF	$ 400	25	$ 10,000	Unit cost based on recent construction projects
MP 27.89 Extend 8" x 23' PVC	LF	$ 190	25	$ 4,750	Unit cost based on recent construction projects
MP 27.95 Extend 24" x 24' CMP	LF	$ 400	25	$ 10,000	Unit cost based on recent construction projects
MP 28.56 Extend 8" x 22' PVC	LF	$ 190	25	$ 4,750	Unit cost based on recent construction projects
MP 28.89 Extend 2- 48" x 20' steel pipe	LF	$ 2,000	25	$ 50,000	Unit cost based on recent construction projects
MP 29.28 Extend 12" x 40' PVC	LF	$ 230	25	$ 5,750	Unit cost based on recent construction projects
MP 30.14 Extend 36" x 68" CMP	LF	$ 900	25	$ 22,500	Unit cost based on recent construction projects
MP 30.14 Extend 8" x 25' PVC	LF	$ 190	25	$ 4,750	Unit cost based on recent construction projects
Drainage Subtotal				$ 192,250	

EXTERIOR IMPROVEMENTS

ROW Fencing	LF	$ -	0	$ -	
Exterior Improvements Subtotal				$ -	

STRUCTURES

Item	Unit	Unit $	Qty	Item Total	Comments
MP 27.10 Modify & crash walls	LS	$ 2,000,000	1	$ 2,000,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
MP 27.61 Construct 120' bridge	LS	$ 200,000	1	$ 200,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
MP 28.88 Extend 10' x 5' RCB	LS	$ 100,000	1	$ 100,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
MP 29.09 Extend 10' x 4.5' x 14' RCB	LS	$ 100,000	1	$ 100,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
MP 29.16 Widen RR bridge	LS	$ 250,000	1	$ 250,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
MP 29.63 Extend 11' x 21' x 43' RCB	LS	$ 200,000	1	$ 200,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
Retaining Wall	LS	$ 2,000,000	1	$ 2,000,000	Allowance based on recent construction projects. Height to be determined during final design
Structures Subtotal				$ 4,850,000	

TRACK

Item	Unit	Unit $	Qty	Item Total	Comments
Construct new mainline track	TF	$ 500	20300	$ 10,150,000	Unit cost based on recent railroad projects. Includes excavation, grading, ballast, track materials, and finishing.

Construct #20 universal crossover	EA	$ 600,000	1	$ 600,000	Unit cost based on recent railroad projects. Includes excavation, grading, ballast, track materials, and finishing.
Construct #20 crossover	EA	$ 300,000	1	$ 300,000	Unit cost based on recent railroad projects. Includes excavation, grading, ballast, track materials, and finishing.
Remove #10 turnout	EA	$ 25,000	1	$ 25,000	Unit cost based on recent railroad projects.
Shift mainline track	TF	$ 125	7500	$ 937,500	Unit cost based on recent railroad projects.
Track Subtotal				$ 12,012,500	

STATIONS

Item	Unit	Unit $	Qty	Item Total	Comments
Stations Subtotal				$ -	

RAILROAD SIGNALS

Item	Unit	Unit $	Qty	Item Total	Comments
CP Lone Hill	EA	$ 1,685,286	1	$ 1,685,286	Unit cost based on recent railroad projects.
CP White	EA	$ 2,114,229	1	$ 2,114,229	Unit cost based on recent railroad projects.
Railroad Signals Subtotal				$ 3,799,515	

GRADE CROSSINGS

Item	Unit	Unit $	Qty	Item Total	Comments
Lone Hill Ave					
Civil Work	LS	$ -	1	$ -	Unit cost based on recent construction projects
Signal Work	LS	$ 81,348	1	$ 81,348	Unit cost based on recent railroad projects.
Cataract Ave					
Civil Work	LS	$ 161,681	1	$ 161,681	Unit cost based on recent construction projects
Signal Work	LS	$ 600,164	1	$ 600,164	Unit cost based on recent railroad projects.
San Dimas Ave/Intermediate Signal					
Civil Work	LS	$ 243,527	1	$ 243,527	Unit cost based on recent construction projects
Signal Work	LS	$ 1,435,317	1	$ 1,435,317	Unit cost based on recent railroad projects.
Walnut Ave					
Civil Work	LS	$ 233,155	1	$ 233,155	Unit cost based on recent construction projects
Signal Work	LS	$ 885,970	1	$ 885,970	Unit cost based on recent railroad projects.
San Dimas Canyon Rd					
Civil Work	LS	$ 214,095	1	$ 214,095	Unit cost based on recent construction projects
Signal Work	LS	$ 952,508	1	$ 952,508	Unit cost based on recent railroad projects.
Gainey Ceramics (private)					
Civil Work	LS	$ 43,378	1	$ 43,378	Unit cost based on recent construction projects
Signal Work	LS	$ 188,071	1	$ 188,071	Unit cost based on recent railroad projects.
Wheeler Ave/Intermediate Signal					
Civil Work	LS	$ 201,407	1	$ 201,407	Unit cost based on recent construction projects
Signal Work	LS	$ 1,463,306	1	$ 1,463,306	Unit cost based on recent railroad projects.
Fairplex Dr					
Civil Work	LS	$ 357,530	1	$ 357,530	Unit cost based on recent construction projects
Signal Work	LS	$ 873,665	1	$ 873,665	Unit cost based on recent railroad projects.
Arrow Highway					
Civil Work	LS	$ 389,616	1	$ 389,616	Unit cost based on recent construction projects
Signal Work	LS	$ 936,889	1	$ 936,889	Unit cost based on recent railroad projects.
Paperpak (private)					
Civil Work	LS	$ 50,992	1	$ 50,992	Unit cost based on recent construction projects
Signal Work	LS	$ 270,316	1	$ 270,316	Unit cost based on recent railroad projects.
White Ave					
Civil Work	LS	$ 277,965	1	$ 277,965	Unit cost based on recent construction projects
Signal Work	LS	$ 861,227	1	$ 861,227	Unit cost based on recent railroad projects.
Grade Crossings Subtotal				$ 10,722,127	

FIBER RELOCATION

Fiber	LS	$ 2,000,000	1	$ 2,000,000	Allowance based on recent construction projects.
Fiber Relocation Subtotal				$ 2,000,000	

CONSTRUCTION TOTAL $ 39,044,101

SANBAG PROJECT COSTS:

Construction Contingency (25%)	$ 9,761,025	$ 9,761,025	Percentage based on Metrolink standards
Civil Design & Support (10%)	$ 3,904,410	$ 3,904,410	Percentage based on Metrolink standards
S&C Design & Support (3%)	$ 1,171,323	$ 1,171,323	Percentage based on Metrolink standards

Project Management & Agency Costs (2%)			$ 780,882	$ 780,882	Metrolink standard percentage reduced
Construction Management (8%)			$ 3,123,528	$ 3,123,528	Percentage based on Metrolink standards
Flagging (6%)			$ 2,342,646	$ 2,342,646	Percentage based on Metrolink standards
Agency (NA)			$ -	$ -	Metrolink standard percentage removed
PTC Costs			$ 1,166,780	$ 1,166,780	Percentage based on Metrolink standards
Materials (inc. in unit costs above)			$ -	$ -	Percentage based on Metrolink standards
ROW Acquisition			$ 450,000	$ 450,000	Percentage based on Metrolink standards
Escalation	# of yrs:	3	$ 5,557,023	$ 5,557,023	Percentage based on Metrolink standards
Project Costs Subtotal				$ 28,257,617	
SANBAG PROJECT TOTAL				**$ 67,301,718**	

METROLINK PROJECT COSTS

Construction Contingency (25%)			$ 9,761,025	$ 9,761,025	Percentage based on Metrolink standards
Civil Design & Support (10%)			$ 3,904,410	$ 3,904,410	Percentage based on Metrolink standards
S&C Design & Support (3%)			$ 1,171,323	$ 1,171,323	Percentage based on Metrolink standards
Project Management (4%)			$ 1,561,764	$ 1,561,764	Percentage based on Metrolink standards
Construction Management (8%)			$ 3,123,528	$ 3,123,528	Percentage based on Metrolink standards
Flagging (6%)			$ 2,342,646	$ 2,342,646	Percentage based on Metrolink standards
Agency (8%)			$ 3,123,528	$ 3,123,528	Percentage based on Metrolink standards
PTC Costs			$ 1,166,780	$ 1,166,780	Percentage based on Metrolink standards
Materials (inc. in unit costs above)			$ -	$ -	Percentage based on Metrolink standards
ROW Acquisition			$ 450,000	$ 450,000	Percentage based on Metrolink standards
Escalation	# of yrs:	3	$ 5,908,419	$ 5,908,419	Percentage based on Metrolink standards
Project Costs Subtotal				$ 32,513,424	
METROLINK PROJECT TOTAL				**$ 71,557,525**	

SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STUDY
CONCEPTUAL ESTIMATE
12/18/2013

CP Central MP 34.60 to CP Archibald MP 40.20 - Double Track

GENERAL

Item	Unit	Unit $	Qty	Item Total	Comments
Mobilization (8%)	LS	$ 4,215,904	1	$ 4,215,904	
Demobilization (2%)	LS	$ 1,053,976	1	$ 1,053,976	
SWPPP (1%)	LS	$ 526,988	1	$ 526,988	
Utility Relocation & Permits (3%)	LS	$ 1,580,964	1	$ 1,580,964	
General Traffic Control (1%)	LS	$ 526,988	1	$ 526,988	
General Subtotal				$ 7,904,820	

EARTHWORK

Item	Unit	Unit $	Qty	Item Total	Comments
Clearing & grubbing	LS	$ 500,000	1	$ 500,000	
Earthwork Subtotal				$ 500,000	

DRAINAGE

Item	Unit	Unit $	Qty	Item Total	Comments
MP 52.70 - Extend 3-24" x 46' RCP	LF	$ 600	25	$ 15,000	
MP 35.15 - Extend 2-48" x 24' RCP	LF	$ 300	25	$ 7,500	
MP 35.90 - Extend 4' x 3' x 22' RCA	LF	$ 600	25	$ 15,000	
MP 36.10 - Extend 4' x 3' x 22' RCA	LF	$ 600	25	$ 15,000	
MP 39.40 - Extend 48" CMP	LF	$ 600	25	$ 15,000	
MP 39.80 - Extend 24" x 20' CMP	LF	$ 500	25	$ 12,500	
Drainage Subtotal				$ 80,000	

EXTERIOR IMPROVEMENTS

Item	Unit	Unit $	Qty	Item Total	Comments
ROW Fencing - Wire Mesh	LF	$ 50	7212	$ 360,600	Unit costs based on recent Caltrans & railroad projects.
ROW Fencing - Concrete Block Wall	LF	$ 264	1104	$ 291,456	Unit costs based on recent Caltrans & railroad projects.
Exterior Improvements Subtotal				$ 652,056	

STRUCTURES

Item	Unit	Unit $	Qty	Item Total	Comments
MP 34.90 - Construct 64' bridge	LS	$ 1,200,000	1	$ 1,200,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
MP 37.70 - Construct 28' bridge	LS	$ 600,000	1	$ 600,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
MP 38.30 - Construct 60' bridge	LS	$ 1,200,000	1	$ 1,200,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
MP 38.90 - Construct 90' bridge	LS	$ 1,750,000	1	$ 1,750,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
MP 39.20 - Construct 142' bridge	LS	$ 2,500,000	1	$ 2,500,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
MP 39.55 - Construct 30' bridge	LS	$ 600,000	1	$ 600,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
MP 39.59 - Construct 9' bridge	LS	$ 200,000	1	$ 200,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
MP 39.60 - Construct 14' bridge	LS	$ 300,000	1	$ 300,000	Unit costs based on recent Caltrans & railroad projects. Specific type of structure to be determined during PS&E.
Retaining Wall	LS	$ 3,000,000	1	$ 3,000,000	Allowance based on recent construction projects. Height to be determined during final design
Structures Subtotal				$ 11,350,000	

TRACK

Item	Unit	Unit $	Qty	Item Total	Comments

Construct new mainline track	TF	$ 500	26600	$ 13,300,000	Unit cost based on recent railroad projects. Includes excavation, grading, ballast, track materials, and finishing.
Construct #14 turnout	EA	$ 225,000	1	$ 225,000	Unit cost based on recent railroad projects. Includes excavation, grading, ballast, track materials, and finishing.
Construct #20 universal crossover	EA	$ 600,000	1	$ 600,000	Unit cost based on recent railroad projects. Includes excavation, grading, ballast, track materials, and finishing.
Remove #20 crossover	EA	$ 40,000	1	$ 40,000	Unit cost based on recent railroad projects.
Construct #10 turnout	EA	$ 140,000	2	$ 280,000	Unit cost based on recent railroad projects. Includes excavation, grading, ballast, track materials, and finishing.
Remove #10 turnout	EA	$ 25,000	2	$ 50,000	Unit cost based on recent railroad projects.
Shift mainline track	TF	$ 125	5000	$ 625,000	Unit cost based on recent railroad projects.
Track Subtotal				$ 15,120,000	

STATIONS

Item	Unit	Unit $	Qty	Item Total	Comments
Reconstruct Upland Station Platform	EA	$ 2,500,000	1	$ 2,500,000	Unit cost based on recent construction projects
Parking Lot	LS	$ 1,000,000	0	$ -	
Pedestrian Underpass	LS	$ 1,500,000	1	$ 1,500,000	Unit cost based on recent construction projects
Stations Subtotal				$ 4,000,000	

RAILROAD SIGNALS

Item	Unit	Unit $	Qty	Item Total	Comments
CP Vista	EA	$ 2,211,767	1	$ 2,211,767	Unit cost based on recent railroad projects.
CP Baker	EA	$ 2,548,753	1	$ 2,548,753	Unit cost based on recent railroad projects.
CP Archibald	EA	$ 1,801,600	1	$ 1,801,600	Unit cost based on recent railroad projects.
Railroad Signal Subtotal				$ 6,562,120	

GRADE CROSSINGS

Item	Unit	Unit $	Qty	Item Total	Comments
Central Ave					
Civil Work	LS	$ 269,155	1	$ 269,155	Unit cost based on recent construction projects
Signal Work	LS	$ 833,948	1	$ 833,948	Unit cost based on recent railroad projects.
Benson Ave					
Civil Work	LS	$ 242,250	1	$ 242,250	Unit cost based on recent construction projects
Signal Work	LS	$ 281,466	1	$ 281,466	Unit cost based on recent railroad projects.
Mountain Ave					
Civil Work	LS	$ 240,306	1	$ 240,306	Unit cost based on recent construction projects
Signal Work	LS	$ 705,231	1	$ 705,231	Unit cost based on recent railroad projects.
San Antonio Ave					
Civil Work	LS	$ 254,281	1	$ 254,281	Unit cost based on recent construction projects
Signal Work	LS	$ 705,231	1	$ 705,231	Unit cost based on recent railroad projects.
Euclid Ave					
Civil Work	LS	$ 509,086	1	$ 509,086	Unit cost based on recent construction projects
Signal Work	LS	$ 833,948	1	$ 833,948	Unit cost based on recent railroad projects.
2nd Ave					
Civil Work	LS	$ 263,176	1	$ 263,176	Unit cost based on recent construction projects
Signal Work	LS	$ 867,810	1	$ 867,810	Unit cost based on recent railroad projects.
Campus Ave					
Civil Work	LS	$ 175,911	1	$ 175,911	Unit cost based on recent construction projects
Signal Work	LS	$ 676,556	1	$ 676,556	Unit cost based on recent railroad projects.
Grove Ave					
Civil Work	LS	$ 221,871	1	$ 221,871	Unit cost based on recent construction projects
Signal Work	LS	$ 705,231	1	$ 705,231	Unit cost based on recent railroad projects.
Baker Ave					
Civil Work	LS	$ 229,356	1	$ 229,356	Unit cost based on recent construction projects
Signal Work	LS	$ 671,368	1	$ 671,368	Unit cost based on recent railroad projects.
Vineyard Ave					
Civil Work	LS	$ 209,054	1	$ 209,054	Unit cost based on recent construction projects
Signal Work	LS	$ 646,787	1	$ 646,787	Unit cost based on recent railroad projects.
Hellman Ave					
Civil Work	LS	$ 216,580	1	$ 216,580	Unit cost based on recent construction projects
Signal Work	LS	$ 633,625	1	$ 633,625	Unit cost based on recent railroad projects.
Archibald Ave					
Civil Work	LS	$ 323,536	1	$ 323,536	Unit cost based on recent construction projects
Signal Work	LS	$ 718,862	1	$ 718,862	Unit cost based on recent railroad projects.
Grade Crossing Subtotal				$ 11,434,625	

FIBER RELOCATION

Item	Unit	Unit $	Qty	Item Total	Comments
Fiber	LS	$ 3,000,000	1	$ 3,000,000	Allowance based on recent construction projects.
Fiber Relocation Subtotal				$ 3,000,000	
CONSTRUCTION TOTAL				$ 60,603,621	

SANBAG PROJECT COSTS:

Construction Contingency (25%)			$ 15,150,905	$ 15,150,905	Percentage based on Metrolink standards
Civil Design & Support (10%)			$ 6,060,362	$ 6,060,362	Percentage based on Metrolink standards
S&C Design & Support (3%)			$ 1,818,109	$ 1,818,109	Percentage based on Metrolink standards
Project Management & Agency Costs (2%)			$ 1,212,072	$ 1,212,072	Metrolink standard percentage reduced
Construction Management (8%)			$ 4,848,290	$ 4,848,290	Percentage based on Metrolink standards
Flagging (6%)			$ 3,636,217	$ 3,636,217	Percentage based on Metrolink standards
Agency (NA)			$ -	$ -	Metrolink standard percentage removed
PTC Costs			$ 875,085	$ 875,085	Percentage based on Metrolink standards
Materials (inc. in unit costs above)			$ -	$ -	Percentage based on Metrolink standards
ROW Acquisition			$ 450,000	$ 450,000	Percentage based on Metrolink standards
Escalation	# of yrs:	3	$ 8,518,920	$ 8,518,920	Percentage based on Metrolink standards
Project Costs Subtotal				$ 42,569,960	
SANBAG PROJECT TOTAL				**$ 103,173,581**	

METROLINK PROJECT COSTS

Construction Contingency (25%)			$ 15,150,905	$ 15,150,905	Percentage based on Metrolink standards
Civil Design & Support (10%)			$ 6,060,362	$ 6,060,362	Percentage based on Metrolink standards
S&C Design & Support (3%)			$ 1,818,109	$ 1,818,109	Percentage based on Metrolink standards
Project Management (4%)			$ 2,424,145	$ 2,424,145	Percentage based on Metrolink standards
Construction Management (8%)			$ 4,848,290	$ 4,848,290	Percentage based on Metrolink standards
Flagging (6%)			$ 3,636,217	$ 3,636,217	Percentage based on Metrolink standards
Agency (8%)			$ 4,848,290	$ 4,848,290	Percentage based on Metrolink standards
PTC Costs			$ 875,085	$ 875,085	Percentage based on Metrolink standards
Materials (inc. in unit costs above)			$ -	$ -	Percentage based on Metrolink standards
ROW Acquisition			$ 450,000	$ 450,000	Percentage based on Metrolink standards
Escalation	# of yrs:	3	$ 9,064,352	$ 9,064,352	Percentage based on Metrolink standards
Project Costs Subtotal				$ 49,175,755	
METROLINK PROJECT TOTAL				**$ 109,779,376**	

SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STUDY
CONCEPTUAL ESTIMATE
12/18/2013

CP Lilac MP 52.4 to CP Rancho MP 55.1 - Double Track

GENERAL

Item	Unit	Unit $	Qty	Item Total	Comments
Mobilization (8%)	LS	$ 2,613,072	1	$ 2,613,072	
Demobilization (2%)	LS	$ 653,268	1	$ 653,268	
SWPPP (1%)	LS	$ 326,634	1	$ 326,634	
Utility Relocation & Permits (3%)	LS	$ 979,902	1	$ 979,902	
General Traffic Control (1%)	LS	$ 326,634	1	$ 326,634	
General Subtotal				$ 4,899,511	

EARTHWORK

Item	Unit	Unit $	Qty	Item Total	Comments
Clearing & grubbing	LS	$ 250,000	1	$ 250,000	Allowance based on recent construction projects.
Earthwork Subtotal				$ 250,000	

DRAINAGE

Item	Unit	Unit $	Qty	Item Total	Comments
MP 52.70 - Extend 42" CMP	LF	$ 550	25	$ 13,750	Unit cost based on recent construction projects
MP 52.70 - Extend 3-24" x 46' RCP	LF	$ 400	15	$ 6,000	Unit cost based on recent construction projects
MP 54.19 - Extend 48" RCP	LF	$ 600	25	$ 15,000	Unit cost based on recent construction projects
MP 54.24 - Extend 36" RCP	LF	$ 500	25	$ 12,500	Unit cost based on recent construction projects
Drainage Subtotal				$ 47,250	

EXTERIOR IMPROVEMENTS

Item	Unit	Unit $	Qty	Item Total	Comments
ROW Fencing - Wire Mesh	LF	$ 50	5042	$ 252,100	Unit costs based on recent Caltrans & railroad projects.
ROW Fencing - Concrete Block Wall	LF	$ 264	13491	$ 3,561,624	Unit costs based on recent Caltrans & railroad projects.
Exterior Improvement Subtotal				$ 3,813,724	

STRUCTURES

Item	Unit	Unit $	Qty	Item Total	Comments
Retaining Wall	LS	$ 1,500,000	1	$ 1,500,000	Allowance based on recent construction projects. Height to be determined during final design
Structures Subtotal				$ 1,500,000	

TRACK

Item	Unit	Unit $	Qty	Item Total	Comments
Construct new mainline track	TF	$ 500	13500	$ 6,750,000	Unit cost based on recent railroad projects. Includes excavation, grading, ballast, track materials, and finishing.
Construct #20 turnout	EA	$ 300,000	1	$ 300,000	Unit cost based on recent railroad projects. Includes excavation, grading, ballast, track materials, and finishing.
Construct #20 universal crossover	EA	$ 600,000	2	$ 1,200,000	Unit cost based on recent railroad projects. Includes excavation, grading, ballast, track materials, and finishing.
Remove #20 crossover	EA	$ 40,000	1	$ 40,000	Unit cost based on recent railroad projects.
Relocate #10 turnout	EA	$ 80,000	1	$ 80,000	Unit cost based on recent railroad projects.
Shift mainline track	TF	$ 125	900	$ 112,500	Unit cost based on recent railroad projects.
Track Subtotal				$ 8,482,500	

STATIONS

Item	Unit	Unit $	Qty	Item Total	Comments
Reconstruct Rialto Station Platform	EA	$ 2,500,000	1	$ 2,500,000	Unit cost based on recent railroad projects.
Parking Lot	LS	$ 1,000,000	0	$ -	
Pedestrian Underpass	LS	$ 1,500,000	1	$ 1,500,000	Unit cost based on recent railroad projects.
Stations Subtotal				$ 4,000,000	

RAILROAD SIGNALS

Item	Unit	Unit $	Qty	Item Total	Comments
CP Lilac	EA	$ 2,534,210	1	$ 2,534,210	Unit cost based on recent railroad projects.
CP Pepper	EA	$ 2,320,883	1	$ 2,320,883	Unit cost based on recent railroad projects.
CP Rancho	EA	$ 1,608,250	1	$ 1,608,250	Unit cost based on recent railroad projects.

Railroad Signals Subtotal				$ 6,463,343	

GRADE CROSSINGS

Item	Unit	Unit $	Qty	Item Total	Comments
Cactus Ave					
Civil Work	LS	$ -	1	$ -	Unit cost based on recent construction projects
Signal Work	LS	$ 208,650	1	$ 208,650	Unit cost based on recent railroad projects.
Lilac Ave					
Civil Work	LS	$ 158,541	1	$ 158,541	Unit cost based on recent construction projects
Signal Work	LS	$ 570,421	1	$ 570,421	Unit cost based on recent railroad projects.
Willow Ave					
Civil Work	LS	$ 186,176	1	$ 186,176	Unit cost based on recent construction projects
Signal Work	LS	$ 609,100	1	$ 609,100	Unit cost based on recent railroad projects.
Riverside Ave					
Civil Work	LS	$ 245,212	1	$ 245,212	Unit cost based on recent construction projects
Signal Work	LS	$ 657,236	1	$ 657,236	Unit cost based on recent railroad projects.
Sycamore Ave					
Civil Work	LS	$ 166,907	1	$ 166,907	Unit cost based on recent construction projects
Signal Work	LS	$ 609,100	1	$ 609,100	Unit cost based on recent railroad projects.
Acacia St					
Civil Work	LS	$ 187,774	1	$ 187,774	Unit cost based on recent construction projects
Signal Work	LS	$ 609,100	1	$ 609,100	Unit cost based on recent railroad projects.
Eucalyptus Ave					
Civil Work	LS	$ 171,587	1	$ 171,587	Unit cost based on recent construction projects
Signal Work	LS	$ 646,515	1	$ 646,515	Unit cost based on recent railroad projects.
Pepper Ave					
Civil Work	LS	$ 224,346	1	$ 224,346	Unit cost based on recent construction projects
Signal Work	LS	$ 694,652	1	$ 694,652	Unit cost based on recent railroad projects.
Rialto Ave					
Civil Work	LS	$ 182,332	1	$ 182,332	Unit cost based on recent construction projects
Signal Work	LS	$ 478,938	1	$ 478,938	Unit cost based on recent railroad projects.
Grade Crossings Subtotal				$ 6,606,587	

FIBER RELOCATION

Fiber	LS	$ 1,500,000	1	$ 1,500,000	Allowance based on recent construction projects.
Fiber Relocation Subtotal				$ 1,500,000	

CONSTRUCTION TOTAL				$ 37,562,915	

SANBAG PROJECT COSTS:

Construction Contingency (25%)			$ 9,390,729	$ 9,390,729	Percentage based on Metrolink standards
Civil Design & Support (10%)			$ 3,756,291	$ 3,756,291	Percentage based on Metrolink standards
S&C Design & Support (3%)			$ 1,126,887	$ 1,126,887	Percentage based on Metrolink standards
Project Management & Agency Costs (2%)			$ 751,258	$ 751,258	Metrolink standard percentage reduced
Construction Management (8%)			$ 3,005,033	$ 3,005,033	Percentage based on Metrolink standards
Flagging (6%)			$ 2,253,775	$ 2,253,775	Percentage based on Metrolink standards
Agency (NA)			$ -	$ -	Metrolink standard percentage removed
PTC Costs			$ 875,085	$ 875,085	Percentage based on Metrolink standards
Materials (inc. in unit costs above)			$ -	$ -	Percentage based on Metrolink standards
ROW Acquisition			$ 450,000	$ 450,000	Percentage based on Metrolink standards
Escalation	# of yrs:	3	$ 5,325,478	$ 5,325,478	Percentage based on Metrolink standards
Project Costs Subtotal				$ 26,934,536	
SANBAG PROJECT TOTAL				**$ 64,497,451**	

METROLINK PROJECT COSTS

Construction Contingency (25%)			$ 9,390,729	$ 9,390,729	Percentage based on Metrolink standards
Civil Design & Support (10%)			$ 3,756,291	$ 3,756,291	Percentage based on Metrolink standards
S&C Design & Support (3%)			$ 1,126,887	$ 1,126,887	Percentage based on Metrolink standards
Project Management (4%)			$ 1,502,517	$ 1,502,517	Percentage based on Metrolink standards
Construction Management (8%)			$ 3,005,033	$ 3,005,033	Percentage based on Metrolink standards
Flagging (6%)			$ 2,253,775	$ 2,253,775	Percentage based on Metrolink standards
Agency (8%)			$ 3,005,033	$ 3,005,033	Percentage based on Metrolink standards
PTC Costs			$ 875,085	$ 875,085	Percentage based on Metrolink standards
Materials (inc. in unit costs above)			$ -	$ -	Percentage based on Metrolink standards

ROW Acquisition				$ 450,000	$ 450,000	Percentage based on Metrolink standards
Escalation		# of yrs:	3	$ 5,663,544	$ 5,663,544	Percentage based on Metrolink standards
	Project Costs Subtotal				$ 31,028,894	
METROLINK PROJECT TOTAL					**$ 68,591,809**	

SAN BERNARDINO LINE INFRASTRUCTURE IMPROVEMENT STUDY
CONCEPTUAL ESTIMATE
11/11/2013

CP Beech MP 47.5 to CP Locust MP 50.7 - Double Track

GENERAL

Item	Unit	Unit $	Qty	Item Total	Comments
Mobilization (8%)	LS	$ 2,028,569	1	$ 2,028,569	
Demobilization (2%)	LS	$ 507,142	1	$ 507,142	
SWPPP (1%)	LS	$ 253,571	1	$ 253,571	
Utility Relocation & Permits (3%)	LS	$ 760,713	1	$ 760,713	
General Traffic Control (1%)	LS	$ 253,571	1	$ 253,571	
General Subtotal				$ 3,803,567	

EARTHWORK

Item	Unit	Unit $	Qty	Item Total
Clearing & grubbing	LS	$ 250,000	1	$ 250,000
Earthwork Subtotal				$ 250,000

DRAINAGE

Item	Unit	Unit $	Qty	Item Total	
Drainage 48.70 36" x 40' ORCP	LF	$ -	0	$ -	no extension
Drainage Extension - 49.1 24" x 260' ORCP	LF	$ -	0	$ -	no extension
Drainage Extension - 49.11 36" x 22" x 209' CMP	LF	$ -	0	$ -	no extension
Drainage Subtotal				$ -	

EXTERIOR IMPROVEMENTS

Item	Unit	Unit $	Qty	Item Total
ROW Fencing	LF	$ 80	1000	$ 80,000
Exterior Improvements Subtotal				$ 80,000

STRUCTURES

Item	Unit	Unit $	Qty	Item Total
Structures Subtotal				$ -

TRACK

Item	Unit	Unit $	Qty	Item Total
Construct new mainline track	TF	$ 500	15000	$ 7,500,000
Remove train detection device	EA	$ 10,000	1	$ 10,000
Construct #20 universal crossover	EA	$ 600,000	1	$ 600,000
Remove turnout	EA	$ 20,000	1	$ 20,000
Shift mainline track	TF	$ 125	10000	$ 1,250,000
Track Subtotal				$ 9,380,000

STATIONS

Item	Unit	Unit $	Qty	Item Total
Reconstruct Fontana Station Platform	EA	$ 2,500,000	1	$ 2,500,000
Parking Lot	LS	$ 1,000,000	0	$ -
Pedestrian Underpass	LS	$ 1,500,000	1	$ 1,500,000
Stations Subtotal				$ 4,000,000

RAILROAD SIGNALS

Item	Unit	Unit $	Qty	Item Total
CP Beech	LS	$ 2,128,578	1	$ 2,128,578
Railroad Signal Subtotal				$ 2,128,578

GRADE CROSSINGS

Item	Unit	Unit $	Qty	Item Total
Citrus Ave				
Civil Work	LS	$ 240,000	1	$ 240,000

Signal Work	LS	$ 713,459	1	$	713,459
Juniper Ave					
Civil Work	LS	$ 240,000	1	$	240,000
Signal Work	LS	$ 684,085	1	$	684,085
Sierra Ave					
Civil Work	LS	$ 240,000	1	$	240,000
Signal Work	LS	$ 1,410,591	1	$	1,410,591
Mango Ave					
Civil Work	LS	$ 240,000	1	$	240,000
Signal Work	LS	$ 684,085	1	$	684,085
Palmetto Ave					
Civil Work	LS	$ 240,000	1	$	240,000
Signal Work	LS	$ 684,085	1	$	684,085
Alder Ave					
Civil Work	LS	$ 240,000	1	$	240,000
Signal Work	LS	$ 684,085	1	$	684,085
Locust Ave					
Civil Work	LS	$ 240,000	1	$	240,000
Signal Work	LS	$ 1,478,147	1	$	1,478,147
Grade Crossing Subtotal				$	8,018,537

FIBER RELOCATION

Item	Unit	Unit $	Qty	Item Total
Fiber	LS	$ 1,500,000	1	$ 1,500,000
Fiber Relocation Subtotal				$ 1,500,000

CONSTRUCTION TOTAL				$ 29,160,682

SANBAG PROJECT COSTS:

Construction Contingency (25%)		$ 7,290,171	$	7,290,171
Civil Design & Support (10%)		$ 2,916,068	$	2,916,068
S&C Design & Support (3%)		$ 874,820	$	874,820
Project Management & Agency Costs (2%)		$ 583,214	$	583,214
Construction Management (8%)		$ 2,332,855	$	2,332,855
Flagging (6%)		$ 1,749,641	$	1,749,641
Agency (NA)		$ -	$	-
PTC Costs		$ 875,085	$	875,085
Materials (inc. in unit costs above)		$ -	$	-
ROW Acquisition		$ 450,000	$	450,000
Escalation	# of yrs:	$ 1,386,976	$	1,386,976
Project Costs Subtotal			$	18,458,829
SANBAG PROJECT TOTAL			**$**	**47,619,512**

METROLINK PROJECT COSTS

Construction Contingency (25%)		$ 7,290,171	$	7,290,171
Civil Design & Support (10%)		$ 2,916,068	$	2,916,068
S&C Design & Support (3%)		$ 874,820	$	874,820
Project Management (4%)		$ 1,166,427	$	1,166,427
Construction Management (8%)		$ 2,332,855	$	2,332,855
Flagging (6%)		$ 1,749,641	$	1,749,641
Agency (8%)		$ 2,332,855	$	2,332,855
PTC Costs		$ 875,085	$	875,085
Materials (inc. in unit costs above)		$ -	$	-
ROW Acquisition		$ 450,000	$	450,000
Escalation	# of yrs:	$ 1,474,458	$	1,474,458
Project Costs Subtotal			$	21,462,380
METROLINK PROJECT TOTAL			**$**	**50,623,062**

Metrolink-San Bernardino Line Pedestrian Crossing COST ESTIMATES
By V and A, Inc. for HDR, Inc.

Street Crossing	AC PAVEMENT	PCC SIDEWALK	CROSSING PANELS	TACTILE STRIPS	CURB & GUTTER	PAINT/STRIPE	HANDRAIL	INSTALL NO. 9/9E SIGNAL	RELOCATE NO. 9 SIGNAL	RELOCATE NO. 9A SIGNAL & CANTILEVER	INSTALL NO. 8A SIGNAL CANTILEVER	INSTALL PEDESTRIAN GATE	INSTALL PEDESTRIAN SWING GATES	RELOCATE POWER POLE OR STREET LIGHT POLE	FENCE	TYPE III PEDESTRIAN BARRICADE	TOTAL CROSSING COST
	SF	SF	SF	SF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	LF	EA	EA
S. CATARACT AVENUE	1,036	691	800	32	321	290	50	0	0	0	0	0	0	0	0	0	$ 161,681
S. SAN DIMAS AVENUE	1,319	2,371	1,188	32	355	292	51	0	2	0	0	4	4	0	0	0	$ 243,527
S. WALNUT AVENUE	898	1,118	792	40	269	300	53	2	0	2	0	0	4	3	0	0	$ 233,155
S. SAN DIMAS CANYON RD	1,095	1,238	971	32	145	298	52	2	1	0	0	4	4	1	0	0	$ 214,095
GAINEY CERAMICS (Pvt)	159	0	297	0	0	45	0	0	1	0	0	0	0	0	0	0	$ 43,378
WHEELER AVENUE	1,096	1,356	1,089	34	59	430	43	0	2	0	0	4	4	0	0	0	$ 201,407
FAIRPLEX DRIVE	1,191	2,329	1,965	32	366	323	59	1	0	2	0	4	4	2	0	0	$ 357,530
ARROW HWY	1,911	1,761	2,078	32	240	451	63	0	2	0	2	4	4	2	0	0	$ 389,616
PAPER PAK (Pvt)	576	0	198	0	0	0	0	0	1	0	0	0	0	0	0	0	$ 50,992
WHITE AVENUE	1,769	1,547	1,343	32	117	321	37	0	2	0	0	4	4	1	0	0	$ 277,965
LONE HILL TO CP WHITE TOTAL QTY	11,050	12,411	1,072	266	1,872	10	408	ITEMS PART OF RAILROAD SIGNAL ESTIMATE					28	9	0	0	1
UNIT PRICE	$42	$8	$1,000	$53	$45	$7,000	$190						$4,000	$20,000	$78	$300	$2,173,346
UNIT	SF	SF	TF	SF	LF	EA	LF						EA	EA	LF	EA	EA
LONE HILL TO CP WHITE TOTAL COST	$464,100	$99,288	$1,072,100	$14,098	$84,240	$70,000	$77,520						$112,000	$180,000	$0	$0	$2,173,346
S. LILAC AVENUE	947	397	693	16	447	219	20	0	1	0	0	2	2	0	76	2	$ 158,541
S. WILLOW AVENUE	1,176	1,716	693	32	460	328	44	0	1	0	0	4	4	0	0	0	$ 186,176
S. RIVERSIDE AVENUE	1,523	2,845	998	32	502	316	60	0	2	0	0	4	4	0	0	0	$ 245,212
S. SYCAMORE AVENUE	920	1,452	693	32	381	302	29	0	1	0	0	4	4	0	0	0	$ 166,907
S. ACACIA AVENUE	987	1,663	792	32	512	303	32	0	1	0	0	4	4	0	0	0	$ 187,774
S. EUCALYPTUS AVENUE	939	1,536	684	32	447	294	35	0	1	0	0	4	4	0	0	0	$ 171,587
S. PEPPER AVENUE	1,234	1,769	990	32	496	304	65	0	1	1	0	4	4	0	0	0	$ 224,346
W. RIALTO AVENUE	1,050	1,014	990	0	536	417	0	0	1	0	0	0	0	0	0	0	$ 182,332
CP LILAC TO CP RANCHO TOTAL QTY	8,776	12,392	653	208	3,781	8	285	ITEMS PART OF RAILROAD SIGNAL ESTIMATE					26	0	76	2	1
UNIT PRICE	$42	$8	$1,000	$53	$45	$7,000	$190						$4,000	$20,000	$78	$300	$1,522,875
UNIT	SF	SF	TF	SF	LF	EA	LF						EA	EA	LF	EA	EA
CP LILAC TO CP RANCHO TOTAL COST	$368,592	$99,136	$653,300	$11,024	$170,145	$56,000	$54,150						$104,000	$0	$5,928	$600	$1,522,875
TOTAL QTY - BOTH CORRIDORS	19,826	24,803	1,725	474	5,653	18	693	ITEMS PART OF RAILROAD SIGNAL ESTIMATE					54	9	76	2	1
UNIT PRICE	$42	$8	$1,000	$53	$45	$7,000	$190						$4,000	$20,000	$78	$300	$3,696,221
UNIT	SF	SF	TF	SF	LF	EA	LF						EA	EA	LF	EA	EA
TOTAL COST - BOTH CORRIDORS	$832,692	$198,424	$1,725,400	$25,122	$254,385	$126,000	$131,670						$216,000	$180,000	$5,928	$600	$3,696,221

APPENDIX H

Metrolink Existing Equipment Inventory

METROLINK

SAN GABRIEL SUBDIVISION
SCRRA INFRASTRUCTURE ASSETS SPREADSHEETS
INDEX & PROJECT SUMMARY

No.	SUBJECT	CONTENTS	TOTAL PGS	% COMPLETE	DATA AS OF	REVISED DATE	COMMENTS
1	**Table 1: Control Points**						
SG-1	Control Points, Signals, Turnouts, Clearance Points, and Derails	Signal type, track, stationing, elevation, turnout ID, turnout number, frog type, point length, lead length, type of control, rail weight, year, point of switch, clearance point, and derail information.	3	100%	2008-2009	October 1, 2010	
2	**Table 2.1: Curve Characteristics**						
SG-2.1	Historic and Best-Fit Data for Main Track Curves	Historic data and Best-Fit data such as direction, degrees of curvature, radius, spiral length, curve length, superelevation, maximum authorized speed, and maximum allowable speed on the Main Tracks.	4	100%	2008-2009	October 1, 2010	
SG-2.2	Best-Fit Data for Controlled Siding Curves	Best-Fit Curve data such as direction, degrees of curvature, radius, spiral length, curve length, maximum authorized speed, and maximum allowable speed with 0 superelevation on Controlled Sidings.	1	100%	2008-2009	October 1, 2010	
3	**Structures**						
SG-3	Railroad Bridges	Vehicular and Pedestrian bridges and reinforced concrete boxes including bridge number, crossing, type, spans, span length, total length, type of ties, erection date, beginning point, end point, and calculated center point.	2	100%	2008-2009	October 1, 2010	
4	**Grade Crossings**						
SG-4	Vehicular & Public Pedestrian Grade Crossings	Stationing, street name, Department of Transportation number, Public Utilities Commission number, crossing type, city, type of panel, length, warning device type, beginning point, end point, and calculated center point.	3	100%	2008-2009	October 1, 2010	
5	**Stations and Platforms**						
SG-5	Platform Information	Station the platform is at, city, track, number of platforms, boarding type, length of platform, number of pedestrian crossings, platform beginning point, end point, center point, pedestrian crossing, beginning point, end point, and panel type.	1	100%	2008-2009	October 1, 2010	
6	**Corridor Information**						
CL	PTC Clearance Spreadsheet	Most restrictive vertical and horizontal clearances at overpasses, tunnels, RR through truss bridges, and passenger sheds/canopies.	2	100%	2008-2009	October 1, 2010	
SCR	Summary of SCRRA Infrastructure Assets	Summary of corridor wide information	2	100%	Sept. 2009	February 27, 2011	

H1

SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
TABLE 1: CONTROL POINTS

LEGEND

CONTROL POINT & SIGNALS

CP: Control Point
Timetable MP: Milepost listed in Timetable 7
Signal Pnt #: Survey point taken at center of signal mast, at face of base for signal cantilever and bridge
Actual MP: Actual milepost based on distance along centerline of track
Facing Dir: Signal facing direction; **W**=West, for trains travelling Eastbound, **E**=East, for trains travelling Westbound.
Type: Type of signal structure; **MAST** = signal Mast, **DWARF** = Dwarf signal, **CANT** = Signal Cantilever, **BRDG** = Signal Bridge

TURNOUTS

Turnout ID: Turnout idenficiation number; SG002.49ET01 = San Gabriel Sub MP 2.49 PS on East end turnout (Eastward facing point move) on Track No. 1
DIR: Direction of turnout; **RH** = right hand, **LH** = Left Hand
Frog Type: **SPRING** = Spring frog, **RBM** = Railbound Meganese Frog, **SELF** = Self guarded Frog
Control: Control of turnout; **PWR** = power, **HAND** = Hand Throw, **ELEC** = Hand throw with electric lock
Pnt#: Surveyed point number at point of switch
Year: Year turnout installed

DERAILS

Pnt #: Survey Point # at point of switch
Control: **PWR** = Powered, **HAND** = Hand Throw
Type: Single Pt., Double Pt., Sliding, Hinged

Yr data collected: 2009
Date Revised: October 1, 2010

CONTROL POINT						SIGNAL INFORMATION									Turnout Information																			Derail Information				
																										Point of Switch				Clear Point			Point of Switch				
Item No.	CP Name / Signal No.	Time-table MP	Acutal CP MP	East Limit	West Limit	Item No.	Signal Pnt #	Type	TRK	FACING DIR	SIGNAL NUMBER	ACTUAL MP	MT1 Sta	TOR Elev.	Item No.	TURNOUT ID	TO #	Track/ Siding	DIR	SWITCH NUMBER	Frog Type	Point (ft)	Lead (ft)	CONTROL	Rail Wt	YEAR	PNT#	Actual MP	MT1 Sta	TOR Elev.	Survey Pnt	MP	MT Stationing	PS PNT	MP	MT Stationing	Control	TYPE
SEE River Sub East Bank for CP Pasadena JCT.																																					
1	CP Marengo	2.40	2.40	2.27	2.50	1	30086	MAST	MOW	W	TBD	2.27	119+73	316.80	1	SG002.31ESD1	10	SIDNG	RH	TBD	RMB	16.5	78.51	HAND	119	1977	30094	2.31	121+91	318.90	30087	2.28	120+24					
						2	30143	CANT	MT & SIDING	W	EA, EB	2.41	127+06	323.80	2	SG002.49ET01	20	MT	RH	TBD	RMB	39.0	156.12	PWR	136	2001	40092	2.49	131+56	327.29	30148	2.43	128+41					
						3	40104	MAST	MT	E	W	2.50	132+16	327.95																							
	41 & 42					4	30372	MAST	MT	W, E	TBD	4.09	216+09	415.15																							
2	CP Fremont	6.00	6.05	6.03	6.08	5	30743	MAST	MT	W	1E	6.03	318+20	440.53	3	SG006.03WT01	10	MT	RH	1	SPRING	16.5	80.65	PWR	136	2001	30750	6.03	318+55	440.58	30768	6.07	320+24					
						6	30779	MAST	MT	E	1WA	6.08	321+06	440.81																							
						7	30781	MAST	SIDING	E	1WB	6.08	321+05	440.80																							
3	CP Jordan	6.30	6.30	6.26	6.32	8	30833	MAST	MT	W	2EA	6.26	330+78	440.02																							
						9	30853	MAST	SIDING	W	2EB	6.27	330+81	440.01	4	SG006.31ET01	10	MT	LH	2	SPRING	16.5	80.46	PWR	136	2001	30864	6.31	333+27	438.77	30854	6.28	331+62					
						10	30873	MAST	MT	E	2W	6.32	333+63	438.59																							
	81 & 82					11	30963	BRDG	MT	W, E	TBD	8.25	435+49	360.97																							
							30962						435+49																								
	111 &112					12	31522	MAST	MT	W	TBD	11.57	610+73	269.65																							
						13	31523	MAST	MT	E	TBD	11.57	610+74	269.65																							
4	CP Hondo	12.50	12.50	12.43	12.56	14	31317	MAST	MT	W	2E	12.43	656+40	295.14	5	SG012.51WT01	14	MT	RH	TBD	RBM	26.0	108.57	PWR	136	1992	30418	12.51	660+44	294.00	30430	12.55	662+75					
						15	30410	CANT	MT & SIDING	E	2WB	12.56	663+07	294.29																							
5	CP Watson	13.00	12.90	12.88	12.97	16	30524	CANT	MT & SIDING	W	4EA, 4EB	12.88	680+18	292.10	6	SG012.96ET01	20	MT	LH	1	RBM	39.0	156.15	PWR	136	1992	30554	12.96	684+29	291.77	30541	12.89	680+80					
						17	30564	MAST	MT	E	4W	12.97	684+83	291.72																							
	131 & 132					18	41487	MAST	MT	W, E	TBD	13.91	734+44	297.44																							
6	CP Bassett	15.30	15.30	14.99	15.30	19	41643	MAST	MT	W	4E	14.99	791+42	294.06	7	SG015.12ET01	14	MT	LH	3B	RBM	26.0	109.50	PWR	136	1992	41524	15.12	798+38	294.93								
						20	56050	MAST	MT & UPRR	E	1W	15.30	808+01	297.54	8	SG015.15WT01	14	MT	LH	5B	RBM	26.0	108.59	PWR	136	1991	41533	15.15	800+08	295.52	41554	15.20	802+69	41552	15.20	802+65	PWR	SINGLE SPLIT SWITCH
						21	41594	CANT	MT & SIDING	E	4W, 4W	15.30	808+10	297.55	9	SG015.20WT01	20	MT	RH	7A	RBM		156.03	PWR	136		41550	15.20	802+34	296.18								
															10	SG015.82WT01	8	MT	RH	TBD	RBM		78.75	HAND	136		41694	15.82	835+13	303.07	41701	15.84	836+46	41704	15.85	836+67	HAND	HAYES SLIDING
															11	SG016.08ESD1	8	BASSET SIDING	RH	TBD	RBM		78.56	HAND	136		41727	16.08	848+76	307.68								
															N/A		7.5	UPRR TRK	RH		SG		63.47	HAND			56051	16.05	847+19	307.13				56058	16.02	846+08	HAND	HAYES SLIDING
																																		56065	16.02	845+97	HAND	HAYES SLIDING
															12	SG016.17WT01	10	MT	RH	TBD	RBM	19.5	78.68	HAND	136	1991	41740	16.17	853+81	309.68	41749	16.20	855+25	56069	16.20	855+46	HAND	HAYES SLIDING
															13	SG016.27ESD1	10	BASSET SIDING	RH	TBD	RBM	19.5	78.34	HAND	136	1991	41758	16.27	859+25	312.63	41755	16.24	857+70	56071	16.24	857+51	HAND	HAYES SLIDING
															14	SG016.32ESD1	7	BASSET SIDING	RH	TBD	RBM	13.0	54.69	HAND	136	1991	41773	16.32	861+60	313.79	41766	16.30	860+59	56073	16.29	860+35	HAND	HAYES SLIDING
															15	SG016.34ESD1	7	BASSET SIDING	RH	TBD	RBM	13.0	54.84	HAND	136	1991	41782	16.34	862+62	314.30	41778	16.32	861+63	56076	16.31	861+35	HAND	HAYES SLIDING
															16	SG016.37ESD1	7	BASSET SIDING	RH	TBD	RBM	13.0	54.59	HAND	136	1991	41793	16.37	864+29	315.12	41787	16.35	863+36	56079	16.35	863+22	HAND	HAYES SLIDING
7	CP Amar	16.60	16.60	16.55	16.72	22	41817	MAST	SIDING	W	2EB	16.55	873+69	319.70																							
						23	41821	MAST	MT	W	2EA	16.55	873+69	319.70	17	SG016.70ET01	20	MT	RH	1A	RBM	39.0	155.34	PWR	136	1991	41849	16.70	881+98	323.70	41838	16.61	877+24	41825	16.56	874+62	PWR	SINGLE SPLIT SWITCH
						24	41856	MAST	MT	E	2W	16.72	882+87	324.13																							
															18	SG016.98ET01	10	MT	RH	TBD	RBM	19.5	78.48	HAND	136	1991	30597	16.98	896+47	329.95	30585	16.95	895+01	30582	16.94	894+67	HAND	HAYES SLIDING
															19	SG017.00ET01	10	MT	LH	TBD	RBM	19.5	88.00	HAND	136	1991	30602	17.00	897+64	330.41	30596	16.97	896+01	30592	16.96	895+42	HAND	HAYES SLIDING
	181 & 182					25	31551	MAST	MT	W, E	TBD	18.01	950+95	352.43																							
	192					26	31609	MAST	MT	W	TBD	19.25	1016+17	398.22																							
	191					27	31660	MAST	MT	E	TBD	19.61	1035+39	413.83																							
	Orange JCT														20	SG019.90WT01	10	MT	LH	TBD	RBM	19.5	78.57	HAND	136	1991	31688	19.90	1050+50	418.06	31696	19.92	1051+95					
		19.90	19.90			28	31704	MAST	UPRR		TBD	19.97	1054+18	418.10																							
8	CP Irwin	20.40	20.40	20.38	20.49	29	31732	MAST	MT	W	2E	20.38	1075+82	428.11	21	SG020.41WT01	20	MT	EQ	1	RBM	39.0	155.63	PWR	136	1991	31743	20.41	1077+74	429.17	31770	20.48	1081+50					
						30	31764	CANT	MT1 & 2	E	2W	20.49	1081+62	431.30																							
	212, 214, 211, 213					31	31920	CANT	MT1 & 2	W,W,E,E	TBD	21.93	1157+69	497.42																							
9	CP Barranca	23.40	23.40	23.22	23.44	32	32044	CANT	MT1 & 2	W	2E	23.22	1225+76	577.83	22	SG023.37ET01	20	MT	EQ	1	RBM	39.0	155.67	PWR	136	1991	32065	23.37	1233+92	587.71	32049	23.30	1230+23					
						33	32077	MAST	MT	E	2W	23.44	1237+62	592.07																							
	241 & 242					34	32156	MAST	MT	W, E	TBD	24.98	1318+84	704.74																							
	261 & 262					35	32249	MAST	MT	W, E	TBD	26.53	1400+87	831.68																							
															23	SG027.61ET01	10	MT	RH	TBD	RBM	19.5	78.80	HAND	136	1991	32308	27.61	1457+62	916.49	32302	27.58	1455+97	32301	27.57	1455+63	HAND	HAYES SLIDING
	271 & 272					36	32326	MAST	MT	W, E	TBD	27.82	1468+79	935.55																							
	291 & 292					37	42577	MAST	MT	W, E	TBD	29.30	1547+11	1025.04	24	SG029.34ET01	10	MT	RH	TBD	RBM	19.5	78.76	HAND	136	1991	42588	29.34	1549+18	1026.18	42578	29.30	1547+05	42571	29.30	1546+91	HAND	HAYES SLIDING
															25	SG030.30ET01	7	MT	LH	TBD	RBM	13.0	54.88	HAND	136	1991	42708	30.30	1600+04	1050.14	42703	30.28	1598+80	57820	30.27	1598+42	HAND	HAYES HINGED
10	CP White	30.30	30.40	30.35	30.45	38	42725	MAST	MT	W	EA	30.35	1602+55	1050.75	26	SG030.36WT01	20	MT	LH	1	RBM	39.0	156.07	PWR	136	2001	32370	30.36	1603+15	1050.96	33110	30.42	1606+43					
						39	32386	MAST	MT1	E	WA	30.45	1608+01	1053.19																							
						40	32387	MAST	MT2	E	WC	30.45	1608+01	1053.19																							

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SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
TABLE 1: CONTROL POINTS

LEGEND

CONTROL POINT & SIGNALS

CP: Control Point
Timetable MP: Milepost listed in Timetable 7
Signal Pnt #: Survey point taken at center of signal mast, at face of base for signal cantilever and bridge
Actual MP: Actual milepost based on distance along centerline of track
Facing Dir: Signal facing direction; **W**=West, for trains travelling Eastbound, **E**=East, for trains travelling Westbound.
Type: Type of signal structure; **MAST** = signal Mast, **DWARF** = Dwarf signal, **CANT** = Signal Cantilever, **BRDG** = Signal Bridge

TURNOUTS

Turnout ID: Turnout idenficiation number; SG002.49ET01 = San Gabriel Sub MP 2.49 PS on East end turnout (Eastward facing point move) on Track No. 1
DIR: Direction of turnout; **RH** = right hand, **LH** = Left Hand
Frog Type: **SPRING** = Spring frog, **RBM** = Railbound Meganese Frog, **SELF** = Self guarded Frog
Control: Control of turnout; **PWR** = power, **HAND** = Hand Throw, **ELEC** = Hand throw with electric lock
Pnt#: Surveyed point number at point of switch
Year: Year turnout installed

DERAILS

Pnt #: Survey Point # at point of switch
Control: **PWR** = Powered, **HAND** = Hand Throw
Type: Single Pt., Double Pt., Sliding, Hinged

Yr data collected: 2009
Date Revised: October 1, 2010

CONTROL POINT						SIGNAL INFORMATION									Turnout Information																		Derail Information				
																									Point of Switch				Clear Point			Point of Switch				
Item No.	CP Name / Signal No.	Time-table MP	Acutal CP MP	East Limit	West Limit	Item No.	Signal Pnt #	Type	TRK	FACING DIR	SIGNAL NUMBER	ACTUAL MP	MT1 Sta	TOR Elev.	Item No.	TURNOUT ID	TO #	Track/ Siding	DIR	SWITCH NUMBER	Frog Type	Point (ft)	Lead (ft)	CONTROL	Rail Wt	YEAR	PNT#	Actual MP	MT1 Sta	TOR Elev.	Survey Pnt	MP	MT Stationing	PS PNT	MP	MT Stationing	Control	TYPE
11	CP Cambridge	32.30	32.30	32.21	32.42	41	32553	MAST	PASADENA	W	EC	32.21	1700+44	1117.87	27	SG032.28ET01	14	MT1	RH	3	RBM	26.0	108.65	PWR	136	2001	32567	32.28	1704+30	1122.91	33377	32.23	1702+00					
						42	33338	MAST	MT1	W	EA	32.20	1700+39	1117.80																								
						43	32601	MAST	MT1	E	WA	32.42	1711+84	1129.94																								
	321 & 322					44	33415	MAST	MT2	W, E	TBD	32.42	1711+84	1129.95																								
12	CP Vista	34.00	34.05	34.02	34.09	45	32769	MAST	MT1	W	2E	34.02	1796+26	1189.04																								
						46	32773	MAST	MT2	W	E	34.02	1796+27	1189.05	28	SG034.03WT02	14	MT2	LH	1	RBM	26.0	108.49	PWR	136	1994	42353	34.03	1796+68	1189.34								
															29	SG034.08ET01	10	MT1	LH	1X	RBM	16.5	80.46	PWR	136	1994	32793	34.08	1799+59	1190.62								
						47	32803	MAST	MT1	E	2W	34.09	1800+01	1190.91																								
						48	42379	MAST	MT2	E	WA	34.09	1800+00	1190.91																								
13	CP Central	34.60	34.60	34.52	34.60	49	42464	MAST	MT1	W	EA	34.52	1822+63	1205.11																								
						50	42427	MAST	MT2	W	EB	34.52	1822+62	1205.10	30	SG034.60ET01	20	MT1	RH	TBD	RBM	30.0	153.65	PWR	136	1992	42481	34.60	1826+69	1207.19	42470	34.54	1823+47					
						51	32846	MAST	MT	E	W	34.60	1826+92	1207.34																								
	361-362					52	33058	MAST	MT	W, E	TBD	36.80	1942+96	1219.25																								
	381-382					53	42889	MAST	MT	W, E	TBD	38.62	2038+96	1149.95																								
															31	SG040.06WT01	10	MT	LH	TBD	RBM		81.31	HAND	136		43065	40.06	2115+35	1107.92	43075	40.09	2116+91					
14	CP Archibald	40.20	40.20	40.16	40.25	54	43092	MAST	MT	W	E	40.16	2120+54	1108.08	32	SG040.17WT01	20	MT	RH	TBD	RBM	39.0	155.91	PWR	136	1993	43101	40.17	2120+94	1108.10	43119	40.23	2124+34					
						55	43134	MAST	MT	E	WA	40.25	2124+99	1109.08																								
						56	43121	MAST	SIDING	E	WB	40.25	2124+99	1109.08																								
															33	SG040.28WSD1	10	RANCHO SIDING	RH	TBD	SPRING	16.5	81.25	HAND	136	1993	43142	40.28	2126+94	1109.56	46157	40.31	2128+57					
															34	SG041.10ESD1	10	RANCHO SIDING	LH	TBD	SPRING	16.5	80.50	HAND	136	1993	43258	41.10	2169+87	1119.50								
															35	SG041.72ESD1	10	RANCHO SIDING	LH	TBD	SPRING		80.90	HAND	136		43356	41.69	2201+42	1123.88	43347	41.66	2199+87					
															36	SG041.83ET01	10	MT	RH	TBD	SPRING	16.5	80.75	HAND	136	1994	43376	41.83	2208+44	1126.13	43370	41.80	2206+88					
															37	SG042.02ET01	10	MT	RH	TBD	SPRING	16.5	80.66	HAND	136	1994	43454	42.02	2218+62	1128.18	43435	41.99	2217+03	57821	41.97	2216+27	HAND	HAYES HINGED
															38	SG042.02WT01	10	MT	LH	TBD	RBM	16.5	80.30	HAND	136	1994	43456	42.02	2218+75	1128.16	43466	42.05	2220+22	57830	42.11	2223+22	HAND	HAYES SLIDING
															39	SG042.26WSD1	10	RANCHO SIDING	RH	TBD	RBM	16.5	80.55	HAND	136	1993	43513	42.26	2231+41	1126.25	43521	42.29	2233+03	57837	42.32	2234+58	HAND	HAYES HINGED
																																		57843	42.33	2234+94	HAND	HAYES HINGED
15	CP Rochester	42.30	42.40	42.34	42.43	57	43529	MAST	MT	W	EA	42.34	2235+69	1125.72																								
						58	43530	MAST	SIDING	W	EB	42.34	2235+69	1125.72	40	SG042.42ET01	20	MT	LH	TBD	RBM	39.0	155.73	PWR	136	1993	43552	42.42	2239+61	1125.24	43538	42.35	2236+20					
						59	43559	MAST	MT	E	W	42.43	2240+08	1125.23																								
															41	SG042.70ET01	10	MT	RH	TBD	RBM		90.05	HAND	136		43583	42.70	2254+69	1125.09	43573	42.67	2252+93					
															42	SG043.24WT01	10	MT	LH	TBD	SPRING	16.5	80.67	HAND	136	1994	43615	43.24	2283+27	1135.07	43622	43.27	2284+77	57847	43.30	2286+27	HAND	SINGLE SPLIT SWITCH
															43	SG043.45ET01	10	MT	LH	TBD	SPRING	16.5	80.95	HAND	136	1994	43640	43.47	2295+42	1135.51	43635	43.45	2294+03					
	431-432					60	43645	MAST	MT	W, E	TBD	43.51	2297+42	1135.52																								
															44	SG043.58ET01	10	MT	RH	TBD	SPRING	16.5	80.71	HAND	136	1994	43656	43.58	2300+95	1135.33	43651	43.55	2299+28	57849	43.53	2298+24	HAND	HAYES HINGED
																																		57848	43.53	2298+24	HAND	HAYES HINGED
															45	SG043.64WT01	10	MT	LH	TBD	SPRING	16.5	81.10	HAND	136	1994	43660	43.64	2304+34	1134.85	43667	43.67	2305+87	57861	43.69	2306+68	HAND	HAYES HINGED
															46	SG044.22ET01	10	MT	RH	TBD	SPRING	16.5	80.84	HAND	136	1994	43723	44.22	2334+79	1127.22	43713	44.18	2332+64	57864	44.17	2331+94	HAND	HAYES SLIDING
															47	SG044.24WT01	10	MT1	RH	TBD	SPRING	16.5	80.51	HAND	136	1994	43735	44.24	2336+10	1127.21	43741	44.27	2337+50	57870	44.30	2339+16	HAND	HAYES HINGED
						61	43745	MAST	BNSF	E	TBD	44.28	2337+73	1127.34																								
16	CP Nolan	44.50	44.50	44.48	44.67	62	43761	MAST	MT	W	2E	44.48	2348+42	1131.51	48	SG044.49WT01	20	MT1	RH	3B	RBM	39.0	156.05	PWR	136	2000	43769	44.49	2348+97	1131.84	43780	44.55	2352+33					
						63	43807	MAST	BNSF	W	TBD	44.62	2355+67	1134.79																								
															49	SG044.65ET02	10	MT2	LH	3A	SPRING	16.5	80.65	PWR	136	1994	43821	44.65	2357+64	1135.52	43811	44.62	2355+98	43808	44.62	2355+73	PWR	SINGLE SPLIT SWITCH
						64	43841	MAST	MT1	E	2W	44.67	2358+45	1135.81																								
						65	43832	MAST	MT2	E	4W	44.67	2358+45	1135.81																								
17	CP Kaiser	45.60	45.60	45.60	45.86	66	43998	MAST	MT1	W	2E	45.60	2407+91	1154.72	50	SG045.66WT01	10	MT1	RH	3B	SPRING	16.5	80.40	PWR	136	2005	44040	45.66	2410+76	1155.96								
						67	43997	MAST	MT2	W	4E	45.60	2407+90	1154.71	51	SG045.70ET02	10	MT2	RH	3A	SPRING		80.43	PWR	136		44069	45.70	2412+92	1157.17								
						68	44060	MAST	KAISER SIDING	W	8E	45.69	2412+32	1156.84	52	SG045.70WSD1	10	KAISER SIDING	LH	5A	SPRING		80.39	PWR	136		44071	45.70	2412+90	1157.16								
															53	SG045.74ET02	10	MT2	LH	5B	SPRING	16.5	80.74	PWR	136	1994	44080	45.74	2415+05	1158.37								
															54	SG045.75WT02	10	MT2	LH	1A	SPRING		79.02	PWR	136		44086	45.75	2415+63	1158.70								
															55	SG045.79ET01	10	MT1	LH	1B	SPRING	16.5	80.48	PWR	136	2000	44108	45.79	2417+78	1159.91								
															56	SG045.79WT02	10	MT2	RH	7B	SPRING		80.57	PWR	136		44106	45.79	2417+78	1159.91								
															57	SG045.80WT01	10	MT1	LH	9A	SPRING	16.5	80.47	PWR	136	2000	44124	45.81	2418+78	1160.46								
															58	SG045.83ESD1	10	KAISER SIDING	RH	7A	SPRING		80.39	PWR	136		44137	45.83	2419+93	1161.21								
						69	44116	MAST	BNSF SIDING	W	6E	45.80	2418+36	1160.23	N/A		10	BNSF TRK	LH	9B	SPRING		80.66	PWR	136		44151	45.85	2420+94	1161.86								
						70	44162	BRDG	MT1, MT2 & KAISER SIDING & BNSF TRK	E	6W, 2W, 4W, 8W	45.86	2421+50	1162.22																								
							44143					45.86	2421+48	1162.21																								

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SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
TABLE 1: CONTROL POINTS

LEGEND

CONTROL POINT & SIGNALS

CP: Control Point
Timetable MP: Milepost listed in Timetable 7
Signal Pnt #: Survey point taken at center of signal mast, at face of base for signal cantilever and bridge
Actual MP: Actual milepost based on distance along centerline of track
Facing Dir: Signal facing direction; **W**=West, for trains travelling Eastbound, **E**=East, for trains travelling Westbound.
Type: Type of signal structure; **MAST** = signal Mast, **DWARF** = Dwarf signal, **CANT** = Signal Cantilever, **BRDG** = Signal Bridge

TURNOUTS

Turnout ID: Turnout idenficiation number; SG002.49ET01 = San Gabriel Sub MP 2.49 PS on East end turnout (Eastward facing point move) on Track No. 1
DIR: Direction of turnout; **RH** = right hand, **LH** = Left Hand
Frog Type: **SPRING** = Spring frog, **RBM** = Railbound Meganese Frog, **SELF** = Self guarded Frog
Control: Control of turnout; **PWR** = power, **HAND** = Hand Throw, **ELEC** = Hand throw with electric lock
Pnt#: Surveyed point number at point of switch
Year: Year turnout installed

DERAILS

Pnt #: Survey Point # at point of switch
Control: **PWR** = Powered, **HAND** = Hand Throw
Type: Single Pt., Double Pt., Sliding, Hinged

Yr data collected: 2009
Date Revised: October 1, 2010

CONTROL POINT						SIGNAL INFORMATION									Turnout Information																					Derail Information				
																									Point of Switch				Clear Point			Point of Switch				
Item No.	CP Name / Signal No.	Time-table MP	Acutal CP MP	East Limit	West Limit	Item No.	Signal Pnt #	Type	TRK	FACING DIR	SIGNAL NUMBER	ACTUAL MP	MT1 Sta	TOR Elev.	Item No.	TURNOUT ID	TO #	Track/ Siding	DIR	SWITCH NUMBER	Frog Type	Point (ft)	Lead (ft)	CONTROL	Rail Wt	YEAR	PNT#	Actual MP	MT1 Sta	TOR Elev.	Survey Pnt	MP	MT Stationing	PS PNT	MP	MT Stationing	Control	TYPE
18	CP Beech	47.50	47.50	47.48	47.66	71	44356	CANT	MT1 & MT2	W	TBD	47.48	2506+82	1216.76	59	SG047.54ET01	10	MT1	RH	1	SPRING		80.55	PWR	136		44401	47.54	2509+88	1218.42	44381	47.50	2508+10	44372	47.48	2507+08	PWR	SINGLE SPLIT SWITCH
															60	SG047.54ET02	10	MT2	LH	5	RBM		80.79	PWR	136		44406	47.55	2510+39	1218.67	44385	47.51	2508+59	44374	47.50	2508+08	PWR	SINGLE SPLIT SWITCH
						72	44436	MAST	MT1	E	TBD	47.66	2516+47	1221.73	61	SG047.65ET01	20	MT1	LH	3	RBM	39.0	155.97	PWR		2000	44427	47.65	2515+89	1221.36	44416	47.58	2512+47					
	491-492					73	44584	MAST	MT	W, E	TBD	49.21	2598+35	1254.72																								
19	CP Locust	50.70	50.70	50.71	50.79	74	44729	MAST	MT	W	E	50.71	2677+24	1250.60	62	SG050.72WT01	20	MT	LH	TBD	RBM		155.86	PWR	136		44739	50.72	2677+93	1250.66	44754	50.78	2681+38					
						75	44766	MAST	SIDING	E	WB	50.79	2681+94	1249.97																								
						76	44761	MAST	MT	E	WA	50.79	2681+94	1249.97																								
															63	SG051.98ET01	10	MT	LH	TBD	SPRING	16.5	80.59	HAND	136	1994	44912	51.98	2744+57	1228.32	44900	51.95	2742+89	NO PNT	51.93	2741+66	HAND	HAYES HINGED
															64	SG052.05WSD1	10	SIDING	LH	TBD	RBM	16.5	80.49	HAND	136	1978	44934	52.05	2748+07	1225.83	44952	52.08	2749+61	57872	52.09	2750+29	HAND	SINGLE SPLIT SWITCH
															65	SG052.12ET01	10	MT	LH	TBD	SPRING	16.5	79.98	HAND	136	1996	44973	52.12	2752+13	1223.06	44958	52.09	2750+43					
															66	SG052.30ESD1	10	SIDING	RH	TBD	RBM	16.5	80.47	HAND	136	1978	45020	52.30	2761+58	1217.25	45009	52.27	2760+08	57873	52.27	2759+64	HAND	HAYES HINGED
20	CP Lilac	52.40	52.40	52.34	52.43	77	45037	MAST	SIDING	W	EB	52.34	2763+64	1216.31	67	SG052.42ET01	20	MT	RH	TBD	RBM	39.0	155.94	PWR		1993	45064	52.42	2767+71	1214.45	45048	52.35	2764+29					
						78	45040	MAST	MT	W	EA	52.34	2763+64	1216.31																								
						79	45070	MAST	MT	E	W	52.43	2768+42	1214.22																								
	531-532					80	45241	MAST	MT	W, E	TBD	54.04	2853+22	1175.11																								
21	CP Rancho (JCT. BNSF)	55.30	55.30	55.27	55.34	81	45422	MAST	MT	W	2E	55.27	2918+00	1134.26	68	SG055.27WT01	14	MT	RH	1	RBM	22.5	108.63	PWR	136	1993	45431	55.27	2918+37	1133.86									
						82	45426	MAST	BNSF	W	4E	55.27	2918+14	1134.10	N/A		14	BNSF TRK	RH	1X	RBM		108.81	PWR	136		45457	55.33	2921+32	1130.53									
						83	45463	MAST	MT	E	2W	55.34	2921+69	1130.05																								
						84	45464	MAST	BNSF	E	4W	55.34	2921+69	1130.06																								
22	CP VERNON	56.20	56.30	56.25	56.38	85	45643	MAST	MT	W	12E	56.25	2969+90	1089.96	69	SG056.29W003	10	MT	DSS	3	RBM		95.43	PWR	136		45661	56.29	2972+13	1087.03	45656	56.27	2971+21					
																SG056.30W005				5			F to F				45664	56.30	2972+82	1086.46								
						86	45653	MAST	SHORT WAY	W	4E	56.23	2969+19	1091.32	70	SG056.31WT01	8	MT	RH	7	RBM		67.97	PWR	136		45670	56.31	2973+31	1085.97									
						87	45691	DWARF	STORAGE LEAD	W	20E	56.34	2974+71	1085.09	71	SG056.33WT01	8	STORAGE LEAD	LH	9	RBM		68.33	PWR			45674	56.33	2974+33	1085.33				45692	56.34	2974+84	PWR	SINGLE SPLIT SWITCH
						88	46467	MAST	XOVER TO BNSF	E	4W	56.33	2974+19	1085.42	72	SG056.33WT05	8	P-5	RH	15	RBM		68.14	PWR			45675	56.34	2974+50	1085.23									
															73	SG056.35WT01	10	MT	RH	11	RBM		80.10	PWR			45680	56.35	2975+33	1084.71									
															74	SG056.35WT05	8	P-5	LH	13	RBM		68.15	PWR			45686	56.35	2975+46	1084.63									
															75	SG056.37ET06	8	P-6	RH	15X	RBM		68.12	PWR			45753	56.37	2976+52	1083.97									
						89	45711	DWARF	P-1	E	10W	56.38	2977+06	1083.64																								
						90	45712	DWARF	P-2	E	12W	56.38	2977+06	1083.64																								
						91	45729	DWARF	P-3	E	14W	56.38	2977+05	1083.65																								
						92	45741	DWARF	P-4	E	16W	56.38	2977+04	1083.65																								
						93	45752	DWARF	P-5	E	18W	56.38	2977+02	1083.66																								
						94	45763	DWARF	P-6	E	20W	56.38	2976+97	1083.70																								
															76	SG056.50ET01	10	BNSF LOOP XO	RH	TBD	RBM		80.32	HAND	136		45034	56.50	2983+19	1080.53								
															77	SG056.52WT01	10	WEST XO / P-1	RH	TBD	RBM		80.24	HAND	136		46045	56.53	2984+53	1080.05								
															78	SG056.59ET02	10	WEST XO / P-2	RH	TBD	RBM		80.31	HAND	136		45942	56.59	2987+76	1078.61								
															79	SG056.60WT02	10	EAST XO / L-2	LH	TBD	RBM		80.38	HAND	136		45950	56.60	2988+58	1078.16								
	IELF YARD														80	SG056.67ET01	10	EAST XO / L-2	LH	TBD	RBM		80.39	HAND	136		46091	56.67	2992+21	1076.82								
															81	SG056.76WT01	8	L-1	RH	TBD	RBM		68.00	HAND	136		46316	56.76	2997+05	1076.67				46329	56.82	3000+02	HAND	HAYES HINGED
															82	SG056.78WT03	8	L-3	RH	TBD	RBM		67.96	HAND	136		46357	56.78	2998+06	1076.84				46431	56.82	2999+97	HAND	HAYES HINGED
															83	SG056.80WT03	8	L-3	LH	TBD	RBM		67.96	HAND	136		46366	56.80	2999+06	1076.93				46396	56.82	3000+00	HAND	HAYES HINGED
																																		46374	56.82	3000+02	HAND	HAYES HINGED

SUMMARY INFORMATION

Power Switch Machines at Turnouts and Derails:	50
Signal Locations - Wayside Signal Masts, Bridges, Cantilevers, Dwarfs:	94
Track Connections from Controlled Sidings to Main Tracks without Derails	11
Track Connections to Main Track & Controlled Sidings with Hand Throw Turnouts:	31
Track Connections to Main Track & Controlled Sidings with Hand Throw Derails:	26
Track Connections to Main Tracks & Controlled Sidings with Power Derails:	6
Industry, Setout and other Spur Tracks with Derails not interconnected to the Signal System:	15
Industry, Setout & other Spur Track Connections to Main Track & Controlled Sidings w/o Double Point Derails:	36
Track Connections to Main Track & Controlled Sidings without Derails:	11

Main Track #24 Concrete Turnouts:	0
Main Track #20 Concrete Turnouts:	0
Main Track #14 Concrete Turnouts:	0
Main Track #10 Concrete Turnouts:	0
At Grade Tracks / Diamond Crossings:	0
Passenger Yard and Support Tracks #10, #9, #8, #7, #7.5 and #5.5EQ Turnouts:	5

Main Track #24 Wood Turnouts:	0
Main Track #20, #20 EQ Wood Turnouts:	14
Main Track #14 Wood Turnouts:	6
Main and Revenue Terminal #10 Wood Turnouts:	44
Main and Revenue Terminal #9 Wood Turnouts:	0
Main and Signalized Revenue Terminal #8, #8DSS Wood Turnouts:	6
Main and Signalized Revenue Terminal #7 Wood Turnouts:	4
#8, #8DSS Wood Turnouts in IELF:	3
#10 Wood Turnouts in IELF:	1

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SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
TABLE 2.1: CURVE CHARACTERISTICS - MAIN TRACKS

LEGEND

HISTORIC DATA

(E) Curve ID: Curve ID from April 2009 Metrolink Track Charts
Dir: Direction of curve; **R** = Right hand, **L** = Left hand
Degree of Curve: Degree of curve based on chord definition; D = Degree, M = Minute, S = Second
Ls: Length of Spiral, **(in)** = Spiral in, **(out)** = Spiral Out
Lc: Length of Curve
Ea: Actual Superelevation
MAS: Maximum Authorized Speed per Timetable 7; $\mathbf{V_{pass}}$ = Passenger speed, $\mathbf{V_{freight}}$ = Freight speed

BEST-FIT CURVE DATA BASED ON SURVEY POINTS

Actual MP: Actual milepost based on distance along centerline of track
(N) Curve ID: New curve ID per actual MP
TOT: Total length of curve including spirals
Ea: Actual Superelevation per field measurements
Vmax: Maximum speed;
V pass - 4" = Vmax for passenger based on 4" unbalance
V pass - 3.5" = Vmax for passenger based on 3.5" unbalance
V freight = Vmax for freight based on 2" unbalance

Year data collected: 2008-2009
Date Revised: October 1, 2010

HISTORIC DATA														BEST-FIT CURVE DATE BASED ON SURVEY POINTS																		
Item No.	(E) Curve ID.	Track	Dir	Degree Of Curve				Ls (in)	Lc	Ls (out)	Ea	MAS		Item No.	Track	Begin Sta	Actual MP	(N) Curve ID.	Dir	Degree Of Curve				Ls (in)	Lc	Ls (out)	TOT	Avg. Ea	Vmax			Note/Remarks
				D	M	S	Radius					V_{pass}	$V_{freight}$							D	M	S	Radius						V_{pass} - 4"	V_{pass} - 3.5"	$V_{freight}$ - 2"	
														1	MT	52+87	1.00	**1.00-1**	L	1	0	0	5729.65	0	89.33	0	89	0.000	75	70	53	In CP Pasadena Jct.
														2	MT	55+28	1.05	**1.05-1**	R	2	24	0	2387.50	0	159.10	0	159	0.375	51	48	37	In CP Pasadena Jct.
1	1	SIDING	L	8	0	0	716.78	135	792.00	135	1.00	25	25	3	SIDING	57+26	1.08	**1.08-1**	L	7	59	45	717.15	120	730.37	70	920	1.500	31	29	25	
2	2	MT	R	7	30	0	764.49	150	158.40	150	1.00	25	25	4	MT	66+58	1.26	**1.26-1**	R	7	13	0	794.46	70	69.55	120	260	1.500	32	31	26	
3	3	MT	L	10	0	0	573.69	180	422.40	180	1.50	25	25	5	MT	72+48	1.37	**1.37-1**	L	10	0	0	573.69	180	166.11	180	526	1.500	28	26	22	
4	4	MT	L	3	0	0	1910.08	140	633.60	140	1.50	45	30	6	MT	80+50	1.52	**1.52-1**	L	3	0	0	1910.08	140	384.27	140	664	1.500	51	48	40	
5	5	MT	R	3	56	0	1456.96	220	1531.20	220	3.00	45	30	7	MT	89+32	1.69	**1.69-1**	R	3	56	0	1456.96	220	1111.33	220	1551	3.125	50	49	43	
6	6	MT	L	5	0	0	1146.28	220	1372.80	220	4.00	45	30	8	MT	114+48	2.17	**2.17-1**	L	4	58	0	1153.97	515	709.71	315	1540	4.125	48	46	41	
7	7	MT	R	2	36	0	2203.87	100	1056.00	100	1.50	50	30	9	MT	131+96	2.50	**2.50-1**	R	2	33	47	2235.64	115	704.60	160	980	2.000	57	55	47	
8	8	MT	R	1	8	0	5055.59	85	729.00	85	1.00	60	30	10	MT	145+08	2.75	**2.75-1**	R	1	7	0	5131.05	165	650.02	120	935	0.875	78	74	60	
9	9	MT	L	0	17	0	20222.06	40	475.20	40	0.50	60	30	11	MT	161+13	3.05	**3.05-1**	L	0	17	0	20222.06	40	409.34	40	489	0.500	150	142	112	
10	10	MT	L	1	45	0	3274.17	280	1478.40	280	1.50	60	30	12	MT	177+53	3.36	**3.36-1**	L	1	46	10	3238.19	330	1462.43	280	2072	1.500	66	63	53	
11	10A	MT	R	0	14	0	24555.35	50	1267.20	50	0.50	60	30	13	MT	199+84	3.78	**3.78-1**	R	0	14	0	24555.35	50	685.50	50	786	0.500	165	156	123	
12	11	MT	L	0	48	0	7162.03	50	528.00	50	0.50	60	30	14	MT	210+94	4.00	**4.00-1**	L	0	42	0	8185.16	50	403.65	50	504	0.500	95	90	71	
13	12	MT	R	1	0	0	5729.65	80	105.60	80	1.00	60	30	15	MT	219+41	4.16	**4.16-1**	R	1	0	0	5729.65	80	120.75	80	281	1.000	84	80	65	
14	13	MT	R	4	20	0	1322.53	250	844.80	250	2.50	40	30	16	MT	234+64	4.44	**4.44-1**	R	4	13	0	1359.10	280	475.19	250	1005	2.750	47	46	40	
15	14	MT	L	3	40	0	1562.88	160	1003.20	160	3.00	50	30	17	MT	257+37	4.87	**4.87-1**	L	3	42	0	1548.80	265	669.96	265	1200	3.875	55	53	47	
16	15	MT	R	4	10	0	1375.40	300	1233.70	300	5.25	55	30	18	MT	319+53	6.05	**6.05-1**	R	4	10	0	1375.40	300	634.15	300	1234	5.500	57	55	50	
17	16	MT	L	2	4	0	2772.53	100	175.00	100	1.75	55	30	19	MT	333+33	6.31	**6.31-1**	L	2	47	0	2058.73	180	82.92	180	443	2.500	57	55	48	
18	17	MT	L	1	0	0	5729.65	100	264.00	100	1.00	79	30	20	MT	435+33	8.24	**8.24-1**	L	0	49	0	7015.87	120	136.45	165	421	1.000	93	88	72	
19	18	MT	R	1	0	0	5729.65	100	422.00	100	1.00	79	30	21	MT	444+12	8.41	**8.41-1**	R	0	49	0	7015.87	100	288.22	100	488	1.000	93	88	72	
20	19	MT	R	1	0	0	5729.65	100	211.20	100	1.00	79	30	22	MT	455+46	8.63	**8.63-1**	R	0	30	0	11459.19	100	115.84	100	316	1.000	119	113	92	
21	20	MT	L	1	0	0	5729.65	100	264.00	100	1.00	79	30	23	MT	461+67	8.74	**8.74-1**	L	0	48	0	7162.03	100	142.42	100	342	1.000	94	89	73	
22	21	MT	R	0	30	0	11459.19	50	369.60	50	0.50	79	30	24	MT	594+71	11.26	**11.26-1**	R	0	30	0	11459.19	50	133.45	50	233	0.625	114	108	86	
23	22	MT	L	0	30	0	11459.19	50	211.20	50	0.50	79	30	25	MT	598+66	11.34	**11.34-1**	L	0	20	0	17188.76	50	207.78	50	308	0.500	138	130	103	
24	23	MT	L	1	45	0	3274.17	90	264.00	90	1.00	60	30	26	MT	606+61	11.49	**11.49-1**	L	1	15	0	4583.75	90	220.40	90	400	0.500	71	67	53	
25	24	MT	L	6	0	0	955.37	180	792.00	180	4.00	40	30	27	MT	621+84	11.78	**11.78-1**	L	5	58	0	960.70	180	558.10	180	918	3.750	43	41	37	
26	25	MT	R	7	30	0	764.49	180	824.00	180	2.50	25	25	28	MT	647+92	12.27	**12.27-1**	R	07	28	0	767.90	190	430.09		1211	2.250	34	33	28	
																				07	37	0	752.80		295.24			1.375	31	30	25	
																				08	34	0	669.45		216.06	80		1.500	30	28	24	
27	28	MT	R	0	36	0	9549.34	0	219.99	0	0.00	60	30	29	MT	662+42	12.55	**12.55-1**	R	0	36	0	9549.34	0	249.61	0	250	0.000	97	91	69	
28	29	MT	R	0	30	0	11459.19	0	642.50	0	0.00	60	30	30	MT	665+39	12.60	**12.60-1**	R	0	30	0	11459.19	0	621.73	0	622	0.250	110	103	80	
29	30	MT	R	0	20	0	17188.76	220	30.00	220	0.00	60	30	31	MT	691+70	13.10	**13.10-1**	R	0	15	0	22918.33	30	304.04	30	364	0.000	151	141	106	
30	31	MT	L	0	20	0	17188.76	220	30.00	220	0.00	60	30	32	MT	697+94	13.22	**13.22-1**	L	0	41	0	8384.80	30	97.94	30	158	0.375	95	90	70	
31	32	MT	L	0	32	0	10743.00	220	30.00	220	0.00	60	30	33	MT	705+21	13.36	**13.36-1**	L	0	30	0	11459.19	30	219.61	30	280	0.125	108	101	77	
32	33	MT	R	0	32	0	10743.00	220	30.00	220	0.00	60	30	34	MT	710+49	13.46	**13.46-1**	R	0	26	0	13222.13	30	261.07	30	321	0.500	121	114	90	
33	34	MT	R	0	37	0	9291.25	220	30.00	220	0.00	60	30	35	MT	720+33	13.64	**13.64-1**	R	0	30	0	11459.19	30	289.03	30	349	0.500	113	106	84	
34	35	MT	L	0	37	0	9291.25	220	30.00	220	0.00	60	30	36	MT	725+17	13.73	**13.73-1**	L	0	24	0	14323.97	30	365.59	30	426	0.250	123	115	89	
35	36	MT	L	1	30	0	3819.83	310	2.08	310	1.00	60	30	37	MT	756+45	14.33	**14.33-1**	L	1	11	0	4841.98	140	221.66	200	562	0.750	75	71	57	
36	37	MT	R	1	30	0	3819.83	310	2.07	310	1.00	60	30	38	MT	763+73	14.46	**14.46-1**	R	1	17	0	4464.70	190	140.72	250	581	0.875	73	69	56	
37	38	MT	R	0	25	0	13751.02	220	30.00	220	0.00	60	30	39	MT	786+89	14.90	**14.90-1**	R	0	20	0	17188.76	30	263.82	30	324	0.000	130	122	92	
38	39	MT	L	0	25	0	13751.02	220	30.00	220	0.00	60	30	40	MT	792+89	15.02	**15.02-1**	L	0	20	0	17188.76	30	261.16	30	321	0.250	134	126	98	

SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
TABLE 2.1: CURVE CHARACTERISTICS - MAIN TRACKS

LEGEND

HISTORIC DATA

(E) Curve ID: Curve ID from April 2009 Metrolink Track Charts
Dir: Direction of curve; **R** = Right hand, **L** = Left hand
Degree of Curve: Degree of curve based on chord definition; D = Degree, M = Minute, S = Second
Ls: Length of Spiral, **(in)** = Spiral in, **(out)** = Spiral Out
Lc: Length of Curve
Ea: Actual Superelevation
MAS: Maximum Authorized Speed per Timetable 7; V_{pass} = Passenger speed, $V_{freight}$ = Freight speed

BEST-FIT CURVE DATA BASED ON SURVEY POINTS

Actual MP: Actual milepost based on distance along centerline of track
(N) Curve ID: New curve ID per actual MP
TOT: Total length of curve including spirals
Ea: Actual Superelevation per field measurements
Vmax: Maximum speed;
V pass - 4" = Vmax for passenger based on 4" unbalance
V pass - 3.5" = Vmax for passenger based on 3.5" unbalance
V freight = Vmax for freight based on 2" unbalance

Year data collected: 2008-2009
Date Revised: October 1, 2010

HISTORIC DATA														BEST-FIT CURVE DATE BASED ON SURVEY POINTS																		
Item No.	(E) Curve ID.	Track	Dir	Degree Of Curve				Ls (in)	Lc	Ls (out)	Ea	MAS		Item No.	Track	Begin Sta	Actual MP	(N) Curve ID.	Dir	Degree Of Curve				Ls (in)	Lc	Ls (out)	TOT	Avg. Ea	Vmax			Note/Remarks
				D	M	S	Radius					V_{pass}	$V_{freight}$							D	M	S	Radius						V_{pass} - 4"	V_{pass} - 3.5"	$V_{freight}$ - 2"	
39	41	MT	L	7	7	0	805.61	392.85	1701.29	407.35	5.00	40	30	41	MT	814+02	15.42	**15.42-1**	L	06	57	30	823.92	375	906.12	425	1706	5.250	43	42	38	
				6	55	0	828.88																									
40	42	MT	L	1	0	0	5729.65	0	109.72	0	0.00	70	30	42	MT	874+48	16.56	**16.56-1**	L	0	15	30	22179.03	0	247.89	0	248	0.250	153	144	111	
41	43	MT	R	1	0	0	5729.65	0	109.72	0	0.00	70	30	43	MT	882+06	16.71	**16.71-1**	R	1	0	0	5729.65	0	65.13	0	65	0.000	75	70	53	
42	44	MT	L	0	13	0	26444.22	0	116.00	0	0.00	70	30																			
43	45	MT	R	0	20	0	17188.76	390	409.49	390	0.00	70	30	44	MT	894+73	16.95	**16.95-1**	R	0	20	0	17188.76	250	578.71	250	1079	0.250	134	126	98	
44	46	MT	L	0	1	0	343774.68	0	80.00	0	0.00	70	30																			
45	47	MT	R	3	0	0	1910.08	300	1287.56	300	4.50	60	30	45	MT	1016+35	19.25	**19.25-1**	R	3	0	30	1904.79	300	1279.62	315	1895	4.500	63	61	55	
46	48	MT	R	1	8	0	5055.59	150	14.15	150	0.00	60	30	46	MT	1048+39	19.86	**19.86-1**	R	1	8	0	5055.59	150	19.43	150	319	0.000	71	66	50	
47	49	MT	R	0	4	0	85943.67	0	100.00	0	0.00	60	30	47	MT	1073+38	20.33	**20.33-1**	R	0	4	0	85943.67	0	233.31	0	233	0.000	292	273	207	
48	50	MT1	L	0	42	0	8185.16	0	201.83	0	0.00	60	30	48	MT1	1079+51	20.45	**20.45-1**	R	0	42	0	8185.16	0	214.83	0	215	0.125	91	86	65	
49	SD-204	MT2	L	0	42	34	8076.20	0	201.83	0	0.00	60	30	49	MT2	1080+59	20.47	**20.47-2**	L	0	42	0	8185.16	0	213.67	0	214	0.500	95	90	71	
50	51	MT 1	L	0	11	0	31252.26	390	71.78	390	0.00	60	30	50	MT1	1101+31	20.86	**20.86-1**	L	0	13	0	26444.22	100	299.07	100	499	0.375	169	159	125	
51	SD-205	MT2	L	0	11	37	29593.24	390	71.74	389.91	0.00	60	30	51	MT2	1101+47	20.86	**20.86-2**	L	0	14	0	24555.35	100	268.45	100	468	0.000	156	146	110	
52	52	MT 1	L	0	1	0	343774.68	0	80.00	0	0.00	60	30																			
53	SD-206	MT2	L	0	11	37	29593.24	390	71.74	389.91	0.00	60	30																			
54	SD-207	MT2	L	0	23	58	14343.90	0	99.90	0	0.00	60	30	52	MT2	1155+66	21.89	**21.89-2**	L	0	15	0	22918.33	0	165.33	0	165	0.250	155	146	113	
55	53	MT1	R	0	23	0	14946.75	0	100.00	0	0.00	60	30	53	MT1	1156+10	21.90	**21.90-1**	L	0	15	0	22918.33	0	167.76	0	168	0.250	155	146	113	
56	54	MT1	L	0	0	0	N/A	0	200.00	0	0.00	60	30																			
57	SD-208	MT2	L	0	0	15	1375098.71	0	200.00	0	0.00	60	30																			
58	55	MT1	L	0	0	0	N/A	0	200.00	0	0.00	60	30																			
59	SD-209	MT2	R	0	0	23	896803.51	0	200.00	0	0.00	60	30	54	MT2	1209+36	22.90	**22.90-2**	R	1	10	0	4911.15	0	106.23	0	106	0.500	74	69	55	
60	SD-210	MT2	L	1	30	0	3819.83	0	83.00	0	0.00	60	30	55	MT2	1211+09	22.94	**22.94-2**	L	1	0	0	5729.65	0	122.31	0	122	0.500	80	75	59	
61	SD-211	MT2	L	1	30	0	3819.83	0	80.00	0	0.00	60	30	56	MT2	1217+98	23.07	**23.07-2**	L	0	45	0	7639.49	0	114.43	0	114	1.250	99	95	78	
62	SD-212	MT2	R	1	30	0	3819.83	0	55.00	0	0.00	60	30	57	MT2	1220+88	23.12	**23.12-2**	R	0	55	0	6250.52	0	90.50	0	91	0.250	81	76	59	
63	56	MT 1	R	1	0	0	5729.65	0	103.94	0	0.00	60	30	58	MT1	1229+85	23.29	**23.29-1**	R	1	0	0	5729.65	0	144.92	0	145	0.375	79	74	58	
64	57	MT 2	R	1	0	0	5729.65	0	103.94	0	0.00	60	30	59	MT2	1229+91	23.29	**23.29-2**	L	1	0	0	5729.65	0	135.88	0	136	0.000	75	70	53	
65	58	MT	R	0	0	0		0	70.00	0	0.00	60	30	60																		
66	59	MT	L	2	49	0	2034.37	390	380.27	390	4.50	60	30	61	MT	1263+51	23.93	**23.93-1**	L	2	49	0	2034.37	380	393.66	380	1154	4.500	65	63	57	
67	60	MT	R	0	0	0		0	80.00	0	0.00	60	30																			
68	61	MT	L	0	1	0	343774.68	0	160.00	0	0.00	60	30																			
69	62	MT	R	0	1	0	343774.68	0	90.00	0	0.00	60	30																			
70	63	MT	R	2	51	0	2010.59	300	460.00	300	4.50	60	30	62	MT	1353+52	25.63	**25.63-1**	R	2	53	0	1987.35	300	455.66	300	1056	4.500	64	62	56	
71	64	MT	L	0	0	0	N/A	0	400.00	0	0.00	79	30																			
72	65	MT	R	0	0	0	N/A	0	80.00	0	0.00	79	30																			
73	66	MT	L	0	0	0	N/A	0	300.00	0	0.00	79	30																			
74	67	MT	R	0	0	0	N/A	0	100.00	0	0.00	79	30																			
75	68	MT	R	1	0	0	5729.65	390	1349.59	390	1.50	79	30	63	MT	1506+05	28.52	**28.52-1**	R	1	0	0	5729.65	420	1320.08	420	2160	1.500	88	84	70	
76	69	MT	L	2	59	0	1920.75	300	506.00	300	1.50	40	30	64	MT	1578+27	29.89	**29.89-1**	L	2	59	46	1912.62	300	507.66	300	1108	0.750	47	45	36	
77	70	MT	R	3	17	0	1745.29	290	444.86	290	1.50	40	30	65	MT	1592+67	30.16	**30.16-1**	R	3	17	0	1745.29	290	447.52	290	1028	0.750	45	43	34	
78	71	MT 1	R	1	0	0	5729.65	0	286.42	0	0.00	40	30	66	MT 1	1606+15	30.42	**30.42-1**	R	1	0	0	5729.65	0	299.44	0	299	0.125	76	71	55	

SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
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LEGEND

HISTORIC DATA

(E) Curve ID: Curve ID from April 2009 Metrolink Track Charts
Dir: Direction of curve; **R** = Right hand, **L** = Left hand
Degree of Curve: Degree of curve based on chord definition; D = Degree, M = Minute, S = Second
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Lc: Length of Curve
Ea: Actual Superelevation
MAS: Maximum Authorized Speed per Timetable 7; V_{pass} = Passenger speed, $V_{freight}$ = Freight speed

BEST-FIT CURVE DATA BASED ON SURVEY POINTS

Actual MP: Actual milepost based on distance along centerline of track
(N) Curve ID: New curve ID per actual MP
TOT: Total length of curve including spirals
Ea: Actual Superelevation per field measurements
Vmax: Maximum speed;
V pass - 4" = Vmax for passenger based on 4" unbalance
V pass - 3.5" = Vmax for passenger based on 3.5" unbalance
V freight = Vmax for freight based on 2" unbalance

Year data collected: 2008-2009
Date Revised: October 1, 2010

HISTORIC DATA														BEST-FIT CURVE DATE BASED ON SURVEY POINTS																		Note/Remarks
Item No.	(E) Curve ID.	Track	Dir	Degree Of Curve D	M	S	Radius	Ls (in)	Lc	Ls (out)	Ea	MAS V_{pass}	$V_{freight}$	Item No.	Track	Begin Sta	Actual MP	(N) Curve ID.	Dir	Degree Of Curve D	M	S	Radius	Ls (in)	Lc	Ls (out)	TOT	Avg. Ea	Vmax V_{pass} - 4"	V_{pass} - 3.5"	$V_{freight}$ - 2"	
79	72	MT 1	L	2	18	0	2491.29	180	574.46	180	0.00	40	30	67	MT 1	1623+67	30.75	**30.75-1**	L	1	57	0	2938.39	110	228.86	0	836	0.000	54	50	38	
																				1	15	0	4583.75	0	220.46	0		0.000	67	63	47	
																				3	54	0	1469.41	0	186.99	90		1.000	42	40	33	
80	72	MT 2	L	3	0	0	1910.08	300	278.34	300	0.00	40	30	68	MT 2	1624+24	30.76	**30.76-2**	L	1	58	0	2913.49	230	178.24	160	789	0.000	53	50	38	
																				3	55	0	1463.16	160	130.78	90		1.000	42	40	33	
81	73	MT 1	R	1	0	0	5729.65	80	37.36	80	1.00	40	30	69	MT 1	1638+31	31.03	**31.03-1**	R	0	10	0	34377.48	0	215.65	0	216	0.000	185	173	130	
														70	MT 2	1639+63	31.05	**31.05-2**	L	0	30	0	11459.19	0	208.05	0	208	0.000	106	99	75	
														71	MT 2	1643+90	31.13	**31.13-2**	R	0	20	0	17188.76	0	313.47	0	313	0.000	130	122	92	
82	74	MT 1	L	1	0	0	5729.65	80	37.36	80	1.00	40	30	72	MT 1	1647+09	31.19	**31.19-1**	L	0	20	0	17188.76	0	112.65	0	113	0.000	130	122	92	
83	75	MT 2	L	1	15	0	4583.75	240	87.49	240	2.50	79	30	73	MT 2	1656+95	31.38	**31.38-2**	L	1	14	0	4645.69	240	91.33	240	571	2.500	86	83	72	
84	75	MT 1	L	1	15	0	4583.75	240	87.49	240	2.50	79	30	74	MT 1	1657+38	31.39	**31.39-1**	L	1	22	56	4144.96	240	110.97	240	591	2.500	81	**78**	68	
85	76	MT 1	R	1	15	0	4583.75	240	87.49	240	2.50	79	30	75	MT 1	1664+19	31.52	**31.52-1**	R	1	17	0	4464.70	240	138.78	240	619	2.250	83	80	68	
86	76	MT 2	R	1	15	0	4583.75	240	87.49	240	2.50	79	30	76	MT 2	1665+06	31.54	**31.54-2**	R	1	15	0	4583.75	240	87.42	240	567	2.125	83	80	68	
87	77	MT 1	L	1	0	0	5729.65	220	257.80	220	2.00	79	30	77	MT 1	1695+59	32.11	**32.11-1**	L	1	3	0	5456.82	220	235.70	220	676	2.000	90	86	73	
88	77	MT 2	L	1	0	0	5729.65	220	257.80	220	2.00	79	30	78	MT 2	1695+65	32.11	**32.11-2**	L	1	5	0	5288.92	220	213.48	220	653	2.125	89	86	73	
89	78	MT 1	R	1	0	0	5729.65	220	257.90	220	2.00	79	30	79	MT 1	1704+90	32.29	**32.29-1**	R	1	0	0	5729.65	220	257.50	220	698	2.000	92	88	75	
90	78	MT 2	R	1	0	0	5729.65	220	257.90	220	2.00	79	30	80	MT 2	1705+18	32.30	**32.30-2**	R	1	4	0	5371.56	220	219.85	220	660	1.875	88	84	72	
91	79	MT 2	L	0	30	0	11459.19	140	162.32	140	1.25	79	55	81	MT 2	1738+64	32.93	**32.93-2**	L	0	30	0	11459.19	50	42.26	50	142	0.250	110	103	80	
92	79	MT 1	L	0	30	0	11459.19	140	162.32	140	1.25	79	55																			
														82	MT 2	1741+17	32.98	**32.98-2**	R	0	30	0	11459.19	50	42.13	50	142	0.500	113	106	84	
93	80	MT 1	R	0	30	0	11459.19	50	38.62	50	0.50	79	55																			
94	80	MT 2	R	0	30	0	11459.19	50	38.61	50	0.50	79	55																			
														83	MT 1	1751+89	33.18	**33.18-1**	L	0	25	0	13751.02	140	211.74	140	492	0.875	129	122	99	
														84	MT 2	1753+02	33.20	**33.20-2**	L	0	30	0	11459.19	140	159.18	140	439	1.250	122	116	96	
95	81	MT 2	R	0	30	0	11459.19	140	162.32	140	1.25	79	55	85	MT 2	1759+62	33.33	**33.33-2**	R	0	25	0	13751.02	140	220.07	140	500	1.125	132	125	103	
96	81	MT 1	R	0	30	0	11459.19		162.32	140	1.25	79	55	86	MT 1	1760+01	33.33	**33.33-1**	R	0	30	0	11459.19	140	153.94	140	434	0.750	116	110	88	
														87	MT 1	1794+72	33.99	**33.99-1**	R	0	30	0	11459.19	30	53.91	30	114	0.125	108	101	77	
97	82	MT 1	L	0	30	0	11459.19	30	57.50	30	0.00	79	55	88	MT1	1797+26	34.04	**34.04-1**	L	0	30	0	11459.19	30	48.29	30	108	0.125	108	101	77	
98	83	MT 1	R	0	30	0	11459.19	30	57.49	30	0.00	79	55	89	MT 1	1801+25	34.11	**34.11-1**	L	0	30	0	11459.19	30	122.08	30	182	0.000	106	99	75	
														90	MT 1	1803+86	34.16	**34.16-1**	R	0	30	0	11459.19	30	115.11	30	175	0.125	108	101	77	
														91	MT 1	1820+42	34.48	**34.48-1**	R	1	30	0	3819.83	120	75.06	120	315	0.875	68	64	52	
99	84	MT	L	1	13	0	4709.33	330	967.64	330	3.00	79	55	92	MT	1852+01	35.08	**35.08-1**	L	1	14	0	4645.69	330	301.20	330	961	2.750	88	85	74	
100	85	MT	R	1	14	0	4645.69	330	927.51	330	3.00	79	55	93	MT	1865+32	35.33	**35.33-1**	R	1	13	0	4709.33	330	283.07	330	943	3.000	90	87	76	
101	86	MT	R	0	58	0	5927.22	220	1728.42	220	2.00	79	55	94	MT	1972+45	37.36	**37.36-1**	R	1	0	20	5698.00	220	1260.58	220	1701	2.000	92	88	75	
102	87	MT	L	1	0	0	5729.65	220	1702.72	220	2.00	79	55	95	MT	1999+86	37.88	**37.88-1**	L	1	0	20	5698.00	220	1266.30	220	1706	2.000	92	88	75	
103	88	MT	R	0	39	0	8814.78	160	960.40	160	1.00	79	55	96	MT	2063+62	39.08	**39.08-1**	R	0	39	0	8814.78	160	649.34	160	969	1.000	104	99	81	
104	89	MT	L	1	13	0	4709.33	330	721.49	330	3.00	79	55	97	MT	2086+74	39.52	**39.52-1**	L	1	10	0	4911.15	330	81.39	330	741	2.875	91	88	77	
105	90	MT	L	0	18	0	19098.61	190	901.11	190	1.00	79	55	98	MT	2208+61	41.83	**41.83-1**	L	0	18	0	19098.62	190	526.25	190	906	1.000	154	146	119	
														99	MT 2	2352+79	44.56	**44.56-2**	L	0	50	0	6875.55	0	342.98	0	343	0.000	82	77	58	
106	91	MT 2	R	0	45	0	7639.49	30	210.84	30	0.00	79	55	100	MT 2	2376+19	45.00	**45.00-2**	R	0	45	0	7639.49	30	65.30	30	125	0.125	88	83	63	
														101	MT2	2379+04	45.06	**45.06-2**	R	0	45	0	7639.49	30	66.15	30	126	0.000	87	81	61	

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BEST-FIT CURVE DATA BASED ON SURVEY POINTS

Actual MP: Actual milepost based on distance along centerline of track
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Year data collected: 2008-2009
Date Revised: October 1, 2010

HISTORIC DATA													
Item No.	(E) Curve ID.	Track	Dir	Degree Of Curve D	M	S	Radius	Ls (in)	Lc	Ls (out)	Ea	MAS V_{pass}	MAS $V_{freight}$
107	92	MT 1	L	0	45	0	7639.49	30	131.11	30	0.00	79	55
108	93	MT 2	L	0	45	0	7639.49	30	279.17	30	0.00	79	55
109	94	MT2	R	0	45	0	7639.49	30	282.46	30	0.00	79	55
110	95	MT	L	1	0	0	5729.65	220	3172.50	220	2.00	79	55
111	96	MT	R	4	2	0	1420.85	180	1007.34	180	3.00	45	30
112	97	MT	L	1	0	0	5729.65	40	256.91	40	0.50	45	30
113	98	MT	L	2	0	0	2864.93	70	240.82	70	1.00	45	15
114	99	MT	R	4	0	0	1432.69	180	458.70	180	3.00	45	15
115	100	MT	L	4	0	0	1432.69	180	387.86	180	3.00	45	15
116	101	MT	R	0	35	0	9822.18	50	878.24	50	0.50	15	10

BEST-FIT CURVE DATE BASED ON SURVEY POINTS																				
Item No.	Track	Begin Sta	Actual MP	(N) Curve ID.	Dir	Degree Of Curve D	M	S	Radius	Ls (in)	Lc	Ls (out)	TOT	Avg. Ea	Vmax V_{pass} - 4"	V_{pass} - 3.5"	$V_{freight}$ - 2"	Note/Remarks
102	MT 2	2404+67	45.54	**45.54-2**	L	0	45	0	7639.49	30	215.87	30	276	0.000	87	81	61	
103	MT2	2408+88	45.62	**45.62-2**	R	0	45	0	7639.49	30	219.17	30	279	0.000	87	81	61	
104	MT2	2511+34	47.56	**47.56-2**	L	1	30	0	3819.83	0	190.87	0	191	0.000	61	57	43	
105	MT	2848+50	53.95	**53.95-1**	L	1	0	6	5720.12	220	2947.05	220	3387	1.500	88	84	70	
106	MT	2907+79	55.07	**55.07-1**	R	4	3	6	1414.42	190	633.16	190	1013	3.125	50	48	42	
107	MT	2920+75	55.32	**55.32-1**	L	1	0	0	5729.65	40	242.73	40	323	0.750	82	77	62	
108	MT	2929+78	55.49	**55.49-1**	L	2	0	0	2864.93	120	189.15	120	429	1.000	59	56	46	
109	MT	2936+99	55.62	**55.62-1**	R	4	0	0	1432.69	180	458.03	180	818	2.875	49	47	41	
110	MT	2949+87	55.87	**55.87-1**	L	4	0	0	1432.69	180	367.21	180	727	3.500	51	50	44	
111	MT	2960+28	56.07	**56.07-1**	R	0	35	0	9822.18	50	871.54	50	972	0.500	104	98	78	
112	EAST XO	2990+07	56.63	**56.63-1**	L	6	30	0	881.95	0	101.24	0	101	0.000	29	27	20	
113	L1	2999+12	56.80	**56.80-1**	L	7	3	38	812.00	85	274.52		835	0.000	28	26	20	
						5	50	6	982.35		475.84	0		0.000	31	29	22	

SUMMARY INFORMATION

Total Feet of Mainline Curved Track (not including control sidings) **68,054 ft**

			% Curved Track
Total Feet of Curved Track	> 10°	526 ft.	0.77%
	9 - 10°	0 ft.	0.00%
	8 - 9°	1,211 ft.	1.78%
	7 - 8°	2,015 ft.	2.96%
	6 - 7°	1,807 ft.	2.66%
	5 - 6°	918 ft.	1.35%
	4 - 5°	6,338 ft.	9.32%
	3 - 4°	7,963 ft.	11.70%
	2 - 3°	5,328 ft.	7.83%
	1 - 2°	23,577 ft.	34.64%
	30' - 1°	9,632 ft.	14.15%
	< 30'	8,739 ft.	12.84%
	Total	**68,054 ft.**	**100.00%**

SUMMARY OF CURVE SPEEDS

Tangent Track Speed > 100 mph

	Vpass - 4"		Vpass - 3.5"	
Curve Speed	Length (ft)	% Curve Trk	Length (ft)	% Curve Trk
>100 mph	14424	21.20%	12093	17.77%
90-100 mph	9171	13.48%	3570	5.25%
80-90 mph	12136	17.83%	18598	27.33%
70-80 mph	3638	5.35%	3701	5.44%
60-70 mph	6682	9.82%	7898	11.60%
50-60 mph	8401	12.34%	5204	7.65%
40-50 mph	9748	14.32%	13136	19.30%
30-40 mph	2391	3.51%	260	0.38%
20-30 mph	1463	2.15%	3594	5.28%
<20 mph	0	0.00%	0	0.00%
	68,054	**100.00%**	68,054	**100.00%**

SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
TABLE 2.2: CURVE CHARACTERISTICS - CONTROLLED SIDINGS

LEGEND

BEST-FIT CURVE DATA BASED ON SURVEY POINTS

Actual MP: Actual milepost based on distance along centerline of track
(N) Curve ID: New curve ID per actual MP
TOT: Total length of curve including spirals
Calc Ea: Superelevation calculated for MAS per Timetable No.7
MAS: Maximum authorized speed
Actual Ea: Not field verified
V pass: Vmax for passenger based on 3.5" unbalance
V freight: Vmax for freight based on 2" unbalance

Year data collected: 2008-2009
Date Revised: October 1, 2010

BEST-FIT CURVE DATA BASED ON SURVEY POINTS																					Note/Remarks
Item No.	Siding Track	Begin Sta	Actual MP	(N) Curve ID	Dir	Degree Of Curve D	M	S	Radius	Ls (in)	Lc	Ls (ft/s)	TOT	Calc Ea	Pass Ea	Frt Ea	MAS V_{pass}	MAS $V_{freight}$	Calc Vmax (Ea=0) V_{pass}	Calc Vmax (Ea=0) $V_{freight}$	
1	Siding	55+12	1.04	1.04-S	R	6	2	0	950.09	0	148.87	0	149	0.000	-0.860	-0.311	25	20	29	22	
2	Siding	57+38	1.09	1.09-S	L	8	13	0	699.33	120	704.08	70	894	0.375	0.095	0.301	25	20	25	19	
3	Siding	66+57	1.26	1.26-S	R	8	12	55	699.45	70	51.33	120	241	0.375	0.094	0.300	25	20	25	19	
4	Siding	72+59	1.37	1.37-S	L	10	22	17	553.19	170	199.50	90	459	1.125	1.040	0.905	25	20	22	17	Operating Vpass is greater than Vpass - 3.5"
5	Siding	80+10	1.52	1.52-S	L	3	3	28	1873.94	215	371.30	80	666	0.875	0.846	-0.069	45	30	40	31	Operating Vpass is greater than Vpass - 3.5"
6	Siding	89+66	1.70	1.70-S	R	3	52	23	1479.58	150	1065.21		1716	2.000	1.999	0.444	45	30	36	27	Operating Vpass is greater than Vpass - 3.5"
						2	24	22	2381.46		221.05	280		0.000	-0.081	-0.480	45	30	46	34	
7	Siding	114+43	2.17	2.17-S	L	4	39	0	1232.51	450	187.05		1536	3.125	3.091	0.930	45	30	33	25	Operating Vpass is greater than Vpass - 3.5"
						5	9	30	1111.13		574.35			3.875	3.824	1.255	45	30	31	24	Operating Vpass is greater than Vpass - 3.5"
						1	45	0	3274.17		214.19	110		0.000	-1.019	-0.897	45	30	53	40	
8	Fremont	320+68	6.07	6.07-S	R	3	33	30	1618.02	200	592.17	160	952	0.000	-2.941	-1.751	15	10	38	28	
9	El Monte	664+15	12.58	12.58-S	L	2	35	57	2218.90	0	97.84	0	98	0.000	-2.773	-1.273	20	20	44	33	
10	El Monte	665+93	12.61	12.61-S	R	0	39	0	8814.78	0	277.54	0	278	0.000	-3.318	-1.818	20	20	88	66	
11	El Monte	669+80	12.69	12.69-S	L	4	45	0	1206.57	0	39.44	0	39	0.000	-2.170	-0.670	20	20	32	25	
12	El Monte	670+92	12.71	12.71-S	R	1	30	4	3816.80	0	199.21	0	199	0.000	-3.079	-1.579	20	20	58	44	
13	El Monte	680+21	12.88	12.88-S	L	2	11	0	2644.58	0	128.77	0	129	0.000	-2.889	-1.389	20	20	48	36	
14	Basset	801+67	15.18	15.18-S	R	2	15	0	2546.64	0	183.31	0	183	0.000	-2.082	-0.582	30	30	47	36	
15	Basset	814+11	15.42	15.42-S	L	7	4	17	810.76	355	900.21	415	1670	2.500	0.958	2.458	30	30	27	20	Operating Vpass is greater than Vpass - 3.5"
16	Basset	878+44	16.64	16.64-S	R	1	37	60	3544.19	0	134.70	0	135	0.000	-2.471	-0.971	30	30	55	42	
17	Rancho	2123+39	40.22	40.22-S	L	2	0	0	2864.93	80	63.10	80	223	5.250	5.237	0.835	79	45	50	38	
18	Rancho	2209+51	41.85	41.85-S	L	0	19	60	18093.43	190	479.03	190	859	0.000	-2.044	-1.528	79	45	122	93	
19	Rancho	2225+87	42.16	42.16-S	L	0	15	60	22918.33	0	189.70	0	190	0.000	-2.335	-1.622	79	45	137	104	
20	Rancho	2229+57	42.23	42.23-S	R	0	20	60	17188.76	0	124.95	0	125	0.000	-1.971	-1.504	79	45	120	90	
21	Rancho	2235+41	42.34	42.34-S	L	2	0	0	2864.93	0	148.96	0	149	5.250	5.237	0.835	79	45	50	38	Operating Vpass is greater than Vpass - 3.5"
22	Rialto	2680+65	50.77	50.77-S	R	1	40	60	3437.87	0	171.73	0	172	3.875	3.854	0.386	79	45	55	41	Operating Vpass is greater than Vpass - 3.5"
23	Rialto	2763+44	52.34	52.34-S	R	2	0	0	2864.93	0	143.92	0	144	5.250	5.237	0.835	79	45	50	38	Operating Vpass is greater than Vpass - 3.5"

SUMMARY INFORMATION

Total Feet of Controlled Sidings		11,207 ft	
			% Curved Track
Total Feet of Curved Track	> 10°	459 ft.	4.10%
	9 - 10°	0 ft.	0.00%
	8 - 9°	1,135 ft.	10.13%
	7 - 8°	1,670 ft.	14.91%
	6 - 7°	149 ft.	1.33%
	5 - 6°	1,536 ft.	13.70%
	4 - 5°	39 ft.	0.35%
	3 - 4°	3,335 ft.	29.76%
	2 - 3°	926 ft.	8.26%
	1 - 2°	506 ft.	4.51%
	30' - 1°	278 ft.	2.48%
	< 30'	1,174 ft.	10.47%
	Total	**11,207 ft.**	**100.00%**

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SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
TABLE 3: STRUCTURES - RAILROAD BRIDGES

LEGEND

Historic MP: Milepost of the structure from Bridge Book 2009
Actual MP: Actual milepost along centerline of track at the face of East bridge abutment wall
EBW Sta: Engineering Stationing along centerline of track at the face East of bridge abutment wall
Crossing: Name of street/highways, waterway, or facility which the railroad crosses
Type of Crossing: **STRT** = Street/Highways, **DRAIN** = Drainge, **WATER** = Waterway/Creek, **PED** = Pedestrian underpass

Span Length: Length of each span
Total Length: Total length of total spans
Ties: Ties in existing track on bridge
Erection Date: Year bridge built
City/County: City or county where bridge is located

No. of Tracks: Number of tracks on bridge
Tracks: Names of tracks on bridge
Beginning Pnt (WBW) Beginning point of bridge, face of West abutment wall at low
End Pnt (EBW): End point of bridge, face of East abutment wall at low
Calculated Center Pnt: Center of bridge structure on center of track calculated using beginning and end points

Note: Definition of railroad bridge:
1. Any structure with a bridge deck supporting one or more railroad tracks above land or water.
2. Concrete boxes used by pedestrians and/or vehicles.

Yr data collected: 2009
Date Revised: October 1, 2010

Item #	Bridge #	Actual MP	EBW Sta	Crossing	Type of Crossing	Bridge Type	Total Spans	Span Length	Total Length	Ties	Erection Date	Track	No Tracks	CITY	Begin Pnt (WBW)			End Pnt (EBW)			Calculated Center Pnt		Notes/Remarks
															#	MP	Sta	#	MP	Sta	MP	Sta	
1	4.000	4.00	211+18	MILLER AVE	PED	REINFORCED CONCRETE BOX	1	6.0	6.0	CONCRETE	1950	MT	1	Alhambra	NO PT.	4.00	211+06	NO PT.	4.00	211+18	4.00	211+12	
2	4.590	4.59	242+59	I-10W TO CAMPUS	STRT	POURED IN PLACE CONCRETE	1	33.0	33.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	4.59	242+15	NO PT.	4.59	242+59	4.59	242+37	
3	4.819	4.82	254+68	10 TO 710 INTERCHANGE	STRT	POURED IN PLACE CONCRETE	1	36.9	36.9	CONCRETE	1973	MT	1	Alhambra	NO PT.	4.82	254+31	NO PT.	4.82	254+68	4.82	254+49	Length not found in Bridge Book
4	4.841	4.83	256+59	FWY 710 N-S UP	STRT	POURED IN PLACE CONCRETE	2	84, 83	167.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	4.83	255+04	NO PT.	4.86	256+59	4.84	255+82	
5	4.991	4.97	265+17	I-10 UP	STRT	POURED IN PLACE CONCRETE	2	179, 151	330.0	CONCRETE	1973	MT	1	Alhambra	30668	4.97	262+18	30676	5.02	265+17	4.99	263+67	
6	5.775	5.74	304+10	SOUTH FREMONT AVE UP	STRT	PRESTRESSED CONCRETE	2	41.0	82.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	5.74	303+29	NO PT.	5.76	304+10	5.75	303+70	
7	6.756	6.76	357+67	ATLANTIC BLVD UP	STRT	PRESTRESSED CONCRETE	2	41.0	82.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	6.76	356+86	NO PT.	6.77	357+67	6.77	357+26	
8	7.081	7.08	374+57	SIXTH STREET UP	STRT	PRESTRESSED CONCRETE	1	46.0	46.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	7.08	374+07	NO PT.	7.09	374+57	7.09	374+32	
9	7.415	7.42	392+46	GARFIELD AVE UP	STRT	PRESTRESSED CONCRETE	2	40, 41	81.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	7.42	391+69	NO PT.	7.43	392+46	7.43	392+07	
10	8.260	8.26	437+15	NEW AVE UP	STRT	PRESTRESSED CONCRETE	2	41.0	82.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	8.26	436+34	NO PT.	8.28	437+15	8.27	436+75	
11	8.757	8.76	463+37	DEL MAR UP	STRT	PRESTRESSED CONCRETE	2	41.0	82.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	8.76	462+55	NO PT.	8.78	463+37	8.77	462+96	
12	8.923	8.93	472+02	ALHAMBRA WASH	DRAIN	PRESTRESSED CONCRETE	1	54.0	54.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	8.93	471+28	NO PT.	8.94	472+02	8.93	471+65	
13	9.267	9.27	490+28	SAN GABRIEL BLVD UP	STRT	PRESTRESSED CONCRETE	2	41.0	82.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	9.27	489+50	NO PT.	9.29	490+28	9.28	489+89	
14	9.770	9.77	516+82	WALNUT GROVE UP	STRT	PRESTRESSED CONCRETE	2	41.0	82.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	9.77	516+03	NO PT.	9.79	516+82	9.78	516+42	
15	10.145	10.15	536+67	RUBIO WASH	DRAIN	PRESTRESSED CONCRETE	1	93.0	93.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	10.15	535+81	NO PT.	10.16	536+67	10.16	536+24	
16	10.269	10.27	544+16	ROSEMEAD BLVD UP	STRT	PRESTRESSED CONCRETE	4	1=36.5, 2-3=51.5, 4=34.5	174.0	CONCRETE	1973	MT	1	Alhambra	NO PT.	10.27	542+37	NO PT.	10.31	544+16	10.29	543+27	
17	11.261	11.28	596+29	EATON WASH UP	DRAIN	PRESTRESSED CONCRETE	1	67.0	67.0	CONCRETE	1973	MT	1	El Monte	NO PT.	11.28	595+66	NO PT.	11.29	596+29	11.29	595+98	
18	11.393	11.40	602+10	BALDWIN AVE UP	STRT	PRESTRESSED CONCRETE	1	41.0	41.0	CONCRETE	1973	MT	1	El Monte	31175	11.40	601+74	31178	11.40	602+10	11.40	601+92	
19	11.674	11.68	618+53	WEST BOUND BUSWAY UP	STRT	THRU PLATE GIRDER	2	106.84, 94.66	201.5	CONCRETE	1956	MT	1	El Monte	31210	11.68	616+52	31213	11.71	618+53	11.70	617+53	
20	11.774	11.77	653+40	RIO HONDO RIVER	WATER	PRESTRESSED CONCRETE (BEAMS)	40	VARIES	3084.0	WOOD	1973	MT	1	El Monte	31225	11.77	621+21	31303	12.38	653+40	12.07	637+30	
21	13.020	13.01	687+98	RAMONA BLVD UP	STRT	PRESTRESSED CONCRETE	2	63.6	127.1	CONCRETE	2007	MT	1	El Monte	30570	13.01	686+80	30574	13.03	687+98	13.02	687+39	
22	13.297	13.29	702+85	PECK RD UP	STRT	I BEAM/CONCRETE DECK	2	50.5	101.0	CONCRETE	1992	MT	1	El Monte	41390	13.29	701+91	41393	13.31	702+85	13.30	702+38	
23	14.094	14.09	745+00	GARVEY AVE UP	STRT	THRU PLATE GIRDER	1	102.8	102.8	CONCRETE	1992	MT	1	El Monte	31338	14.09	744+08	31341	14.11	745+00	14.10	744+54	
24	14.164	14.25	781+60	SAN GABRIEL RIVER / UPRR	WATER/RR	POST STRESSED CONCRETE	29	VARIES	2894.8	CONCRETE	1992	MT	1	Industry	31348	14.25	752+59	31399	14.80	781+60	14.53	767+10	
25	16.738	16.73	885+09	WALNUT CREEK (L.A.C.F.C)	WATER	DECK PLATE GIRDER (OPEN DECK)	2	89, 88	177.0	WOOD	1957	MT	1	Industry	41858	16.73	883+31	41861	16.76	885+09	16.75	884+20	
26	19.794	19.79	1045+97	BIG DALTON WASH	WATER	THRU PLATE GIRDER	1	90.0	90.0	CONCRETE	1959	MT	1	Irwindale	31673	19.79	1045+07	31676	19.81	1045+97	19.80	1045+52	
27	28.886	28.91	1526+56	SURFACE DRAINAGE	DRAIN	REINFORCED CONC. BOX/RAIL TOP (10'x5'x20')	1	10.0	10.0	CONCRETE	1991	MT	1	La Verne	NO PT.	28.91	1526+36	NO PT.	28.91	1526+56	28.91	1526+42	
28	29.096	29.09	1536+55	UNKNOWN WASH	DRAIN	REINFORCED CONC. BOX/RAIL TOP	1	10.0	10.0	CONCRETE	1991	MT	1	La Verne	42550	29.09	1536+44	42551	29.10	1536+55	29.10	1536+49	
29	30.810	30.80	1626+81	THOMPSON WASH	WATER	PRESTRESSED CONCRETE	1	33.0	33.0	CONCRETE	2003	MT 1 & 2	2	Pomona	33147	30.80	1626+47	33149	30.81	1626+81	30.81	1626+64	
															32411	30.81	1626+62	32414	30.81	1626+82	30.81	1626+72	
30	34.090	34.09	1802+14	MONTA VISTA AVE UP	STRT	PRESTRESSED CONCRETE	4	1=27, 2-3=52, 4=27	158.0	WOOD	1993	MT 1 & 2	2	Montclair	32806	34.09	1800+05	32810	34.13	1802+14	34.11	1801+10	
															42380	34.09	1800+06	42384	34.13	1802+12	34.11	1801+09	
31	34.330	34.33	1813+00	MONTCLAIR STATION	PED	REINFORCED CONCRETE BOX	1	14.0	14.0	WOOD	2007	MT 1 & 2	2	Montclair	42410	34.33	1812+87	42411	34.34	1813+00	34.34	1812+94	
															42442	34.33	1812+86	42444	34.34	1813+01	34.34	1812+94	
32	34.600	34.63	1828+50	SURFACE DRAINAGE	DRAIN	RAIL TOP/BALLAST DECK TIMBER	2	9.0	18.0	WOOD	1915	MT	1	Montclair	32855	34.63	1828+30	32856	34.63	1828+50	34.63	1828+40	
33	34.900	34.93	1844+87	UNKNOWN WASH	WATER	PRESTRESSED CONCRETE [SLAB 20"]	4	16.0	64.0	WOOD	1924	MT	1	Montclair	32869	34.93	1844+23	32870	34.94	1844+87	34.93	1844+55	
34	37.700	37.73	1992+42	UNKNOWN WASH	WATER	PRESTRESSED CONCRETE	1	27.9	27.9	WOOD	1970	MT	1	Upland	42803	37.73	1992+14	42806	37.74	1992+42	37.73	1992+28	

SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
TABLE 3: STRUCTURES - RAILROAD BRIDGES

LEGEND

Historic MP: Milepost of the structure from Bridge Book 2009
Actual MP: Actual milepost along centerline of track at the face of East bridge abutment wall
EBW Sta: Engineering Stationing along centerline of track at the face East of bridge abutment wall
Crossing: Name of street/highways, waterway, or facility which the railroad crosses
Type of Crossing: **STRT** = Street/Highways, **DRAIN** = Drainge, **WATER** = Waterway/Creek, **PED** = Pedestrian underpass

Span Length: Length of each span
Total Length: Total length of total spans
Ties: Ties in existing track on bridge
Erection Date: Year bridge built
City/County: City or county where bridge is located

No. of Tracks: Number of tracks on bridge
Tracks: Names of tracks on bridge
Beginning Pnt (WBW) Beginning point of bridge, face of West abutment wall at low
End Pnt (EBW): End point of bridge, face of East abutment wall at low
Calculated Center Pnt: Center of bridge structure on center of track calculated using beginning and end points

Note: Definition of railroad bridge:
1. Any structure with a bridge deck supporting one or more railroad tracks above land or water.
2. Concrete boxes used by pedestrians and/or vehicles.

Yr data collected: 2009
Date Revised: October 1, 2010

Item #	Bridge #	Actual MP	EBW Sta	Crossing	Type of Crossing	Bridge Type	Total Spans	Span Length	Total Length	Ties	Erection Date	Track	No Tracks	CITY	Begin Pnt (WBW)			End Pnt (EBW)			Calculated Center Pnt		Notes/Remarks
															#	MP	Sta	#	MP	Sta	MP	Sta	
35	38.300	38.36	2026+02	UNKNOWN WASH	WATER	PRESTRESSED CONCRETE [SLAB 20"]	3	20.0	60.0	WOOD	2001	MT	1	Rancho Cucamonga	42866	38.36	2025+41	42868	38.37	2026+02	38.37	2025+72	
36	38.900	38.98	2058+86	UNKNOWN WASH	WATER	PRESTRESSED CONCRETE	5	18.0	90.0	WOOD	2002	MT	1	Rancho Cucamonga	42918	38.98	2057+95	42921	38.99	2058+86	38.98	2058+40	
37	39.200	39.24	2072+85	CUCAMONGA CREEK	WATER	WIDEFLANGE BEAM SPAN (BALLAST DECK)	3	45.89, 50, 45.89	141.8	WOOD	1949	MT	1	Rancho Cucamonga	42957	39.24	2071+63	42962	39.26	2072+85	39.25	2072+24	
38	39.550	39.60	2091+22	UNKNOWN WASH	WATER	RAIL TOP/BALLAST DECK TIMBER	3	10.0	30.0	WOOD	1945	MT	1	Rancho Cucamonga	NO PT.	39.60	2090+89	NO PT.	39.61	2091+22	39.60	2091+06	
39	39.590	39.64	2092+85	UNKNOWN WASH	WATER	RAIL TOP/BALLAST DECK TIMBER	1	9.0	9.0	WOOD	1923	MT	1	Rancho Cucamonga	43030	39.64	2092+76	43032	39.64	2092+85	39.64	2092+81	
40	39.600	39.64	2093+21	UNKNOWN WASH	WATER	RAIL TOP/BALLAST DECK TIMBER	1	14.0	14.0	WOOD	1953	MT	1	Rancho Cucamonga	43038	39.64	2093+12	43039	39.64	2093+21	39.64	2093+17	
41	40.120	40.08	2116+16	ARCHIBALD AVE	DRAIN	RAIL TOP/BALLAST DECK TIMBER	1	8.0	8.0	WOOD	1930	MT & SPUR	1	Rancho Cucamonga	NO PT.	40.08	2115+99	NO PT.	40.08	2116+16	40.08	2116+07	
42	40.700	40.77	2153+10	DEER CANYON CREEK	WATER	PRESTRESSED CONCRETE	1	34.1	34.1	WOOD CONCRETE	1984	MT & SIDING	2	Rancho Cucamonga	43208 43206	40.77 40.77	2152+77 2152+77	43210 43212	40.78 40.78	2153+10 2153+09	40.78 40.78	2152+93 2152+93	
43	40.890	40.90	2159+44	DRAINAGE	DRAIN	RAIL TOP/BALLAST DECK TIMBER	1	9.0	9.0	WOOD CONCRETE	1921	MT & SIDING	2	Rancho Cucamonga	43221 43218	40.90 40.90	2159+35 2159+34	43224 43225	40.90 40.90	2159+44 2159+45	40.90 40.90	2159+39 2159+39	
44	40.900	40.90	2159+91	DRAINAGE	DRAIN	RAIL TOP/BALLAST DECK TIMBER	1	9.0	9.0	WOOD CONCRETE	1921	MT & SIDING	2	Rancho Cucamonga	NO PT. NO PT.	40.90 40.90	2159+78 2159+78	NO PT. NO PT.	40.91 40.91	2159+91 2159+90	40.91 40.91	2159+84 2159+84	
45	40.890	41.14	2173+72	HAVEN AVE	STRT	PRESTRESSED CONCRETE (SINGLE BOX GIRDER)	1	172.5	172.5	CONCRETE	2010	MT & SIDING	2	Rancho Cucamonga	43284 43287	41.14 41.14	2172+33 2172+33	43292 43294	41.17 41.17	2173+72 2173+73	41.17 41.17	2173+72 2173+73	Haven Ave grade Sep project
46	-	42.09	2222+48	Ped Walkway UP (Rancho Cucamonga Station)	PED	REINFORCED CONCRETE BOX (SCREWED)	1	10.0	10.0	Wood Concrete	2010	MT1 & Siding	2	Rancho Cucamonga	No pnt No pnt	42.1 42.1	2222+28 2222+18	No pnt No pnt	42.1 42.1	2222+48 2222+36	42.1 42.1	2222+38 2222+27	Rancho Cucamonga Station Improvements
47	42.201	42.20	2229+48	MILLIKEN AVE	STRT	PRESTRESSED CONCRETE	2	79.33, 79.58	159.0	WOOD CONCRETE	1992	MT & SIDING	2	Rancho Cucamonga	43499 43497	42.20 42.19	2227+90 2227+83	43502 43503	42.23 42.22	2229+48 2229+40	42.21 42.21	2228+69 2228+62	
48	43.100	43.13	2277+95	DAY CREEK FLOOD CONTROL	WATER	WIDE FLANGE BEAM SPAN	2	40.0	80.0	WOOD	1950	MT	1	Rancho Cucamonga	43608	43.13	2277+09	43610	43.14	2277+95	43.13	2277+52	
49	44.200	44.22	2335+99	ETIWANDA CREEK	WATER	PRESTRESSED CONCRETE	4	28.0	112.0	WOOD	1998	MT	1	Rancho Cucamonga	43731	44.22	2334+86	43733	44.24	2335+99	44.23	2335+42	
50	45.000	45.04	2378+50	SAN SEVAINE FLOOD CONTROL	WATER	PRESTRESSED CONCRETE	2	27.8	55.7	WOOD	1997	MT1	1	San Bernard. County	43873	45.04	2377+92	43874	45.05	2378+50	45.04	2378+21	
51	45.000	45.03	2378+50	SAN SEVAINE FLOOD CONTROL	WATER	PRESTRESSED CONCRETE	3	27.83	84	CONCRETE	2002	MT2	1	San Bernard. County	43885	45.03	2377+63	43887	45.05	2378+50	45.04	2378+07	
52	55.630	55.65	2940+59	EAST BRANCH LYTLE CREEK	WATER	PRESTRESSED CONCRETE (BOX BEAMS)	4	1=44, 2/3=79, 4=44	246.0	CONCRETE	1994	MT	1	San Bernardino	45524	55.65	2938+21	45525	55.69	2940+59	55.67	2939+40	
53	55.710	55.79	2951+15	BNSF R.R.	RR	POURED IN PLACE CONCRETE	7	VARIES	518.0	CONCRETE	1994	MT	1	San Bernardino	45550	55.79	2945+70	45564	55.89	2951+15	55.84	2948+43	

SUMMARY INFORMATION

	# of bridges	Total Span Length
Railroad bridges over waterway and drainge facility:	27	4710.5
Roadroad bridges over steet/highways:	21	2422.8
Railroad bridges over pedestrian underpasses:	3	30.0
Railroad bridges over Railroad and waterway:	1	2894.8
Railraod bridges over Railroad only	1	518.0
Total:	**53**	**Total Span Length: 10,576.03**

Average Age: 36.62
Median Age: 28.94

Number & Length of Railroad Bridges by Decade:

	# of Bridge		Total Span Length	% of Total
1900-1909	0	1900-1909	0	0.00%
1910-1919	1	1910-1919	18	0.17%
1920-1929	4	1920-1929	91	0.86%
1930-1939	1	1930-1939	8	0.08%
1940-1949	2	1940-1949	172	1.62%
1950-1959	6	1950-1959	569	5.38%
1960-1969	0	1960-1969	0	0.00%
1970-1979	19	1970-1979	4727	44.69%
1980-1989	1	1980-1989	34	0.32%
1990-1999	11	1990-1999	4367	41.29%
2000+	8	2000 +	591	5.58%
Total	**53**	**Total**	**10576**	**100.00%**

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SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
TABLE 4: GRADE CROSSINGS

LEGEND

Historic MP: Milepost of the crossing from Track Chart dated April 2009
Actual MP: Actual milepost along centerline of track at the center of crossing
DOT#: Department of Transportation number
PUC#: Public Utilities Commission assigned number
Xing Type: **PUB** = Public at-grade crossing
PED = Pedestrian only public at-grade crossing
PVT = Private vehicular & pedestrian at-grade crossing

Panel Xing Surface: Crossing panel surface material
AC = Asphalt Concrete
RUB = Rubber crossing panels
CONC = Concrete crossing panels

Warning Device Type
Control: Type of control for the warning device
CWD: Constant warning device

PUC Standard Warning Device:
8A Cantilevered flashing lights
9A Cantilevered flashing lights with gate
9 Flashing lights with gate
8 Flashing lights
1R Crossbuck
1X Private crossing sign
STOP Stop sign

Yr data collected: 2009
Date Revised: October 1, 2010

Item #	Historic MP	Actual MP	Sta	STREET NAME	DOT #	PUC #	Xing Type	CITY	PANEL XING SURFACE	TRK	Length (ft)	WARNING DEVICE TYPE (RAILROAD DIRECTION) CONTROL	NW Quadrant	N Median	SE Quadrant	S Median	NE Quadrant	SW Quadrant	Begin Pnt #	Begin Pnt MP	Begin Pnt Sta	End Pnt #	End Pnt MP	End Pnt Sta	Calculated Center Pnt MP	Calculated Center Pnt Sta	NOTES/ REMARKS
1	12.69	12.70	670+56	Tyler St	746893V	101SG-12.69	PUB	El Monte	CONC	MT1	90	CWD	9A		9A		8	8	30526	12.7	670+11	30529	12.7	671+01	12.7	670+56	
									CONC	MT2	90								30504	12.7	670+18	30508	12.7	671+08	12.7	670+63	
2	13.92	13.92	735+18	Cogswell Rd	746898E	101SG-13.92	PUB	El Monte	CONC	MT1	60	CWD	9		9		8	8	41488	13.9	734+88	41490	13.9	735+48	13.9	735+18	
3	15.12	15.13	798+93	Temple Ave	746903Y	101SG-15.12	PUB	Industry	CONC	MT1	80	CWD	9	9	9	9			41526	15.1	798+53	41529	15.1	799+33	15.1	798+93	
4	16.07	16.09	849+48	Temple Ave	747270P	101SG-16.07	PUB	Industry	CONC	MT1	70	CWD	9	8	9	8			41732	16.1	849+13	41735	16.1	849+83	16.1	849+48	
									CONC	SIDING	70								41730	16.1	849+12	41736	16.1	849+82	16.1	849+47	
5	16.42	16.43	867+63	Amar Rd	747272D	101SG-16.42	PUB	Industry	CONC	MT1	100	CWD	9A	9	9A	9			41802	16.4	867+13	41804	16.4	868+13	16.4	867+63	
									CONC	MT2	100								41808	16.4	867+13	41810	16.4	868+13	16.4	867+63	
6	16.73	16.72	882+87	LA County Flood Pvt Xing	747274S	101SG-16.73-X	PVT	Industry	CONC	MT1	20	STOP	STOP & 1X		STOP & 1X				41852	16.7	882+77	41854	16.7	882+97	16.7	882+87	
7	16.74	16.77	885+59	LA County Flood Pvt Xing	747275Y	101SG-16.74-X	PVT	Baldwin Park	CONC	MT1	20	STOP	STOP & 1X		STOP & 1X				41863	16.8	885+49	41866	16.8	885+69	16.8	885+59	
8	16.90	16.90	892+48	Hamburger Lane (Virginia Ave)	747276F	101SG-16.9	PUB	Baldwin Park	CONC	MT1	60	CWD	9		9				41869	16.9	892+18	41871	16.9	892+78	16.9	892+48	
9	17.33	17.34	915+34	Francisquito Ave	747278U	101SG-17.33	PUB	Baldwin Park	CONC	MT1	80	CWD	9	9	9	9			30631	17.3	914+94	30634	17.3	915+74	17.3	915+34	
10	17.60	17.59	928+72	Foster Ave Ped Xing	849789M & 914496L	101SG-17.6-D	PED	Baldwin Park	CONC	MT1	10	CWD	8		8				31536	17.6	928+67	31539	17.6	928+77	17.6	928+72	
11	18.02	18.03	951+74	Merced Ave	747279B	101SG-18.02	PUB	Baldwin Park	CONC	MT1	80	CWD	9A		9A				31555	18.0	951+34	31556	18.0	952+14	18.0	951+74	
12	18.36	18.36	969+67	Macdevitt St	747280V	101SG-18.36	PUB	Baldwin Park	CONC	MT1	50	CWD	9		9				31565	18.4	969+42	31566	18.4	969+92	18.4	969+67	
13	18.71	18.71	988+14	Pacific Ave	747281C	101SG-18.71	PUB	Baldwin Park	CONC	MT1	80	CWD	9	9	9	9			31575	18.7	987+74	31578	18.7	988+54	18.7	988+14	
14	18.97	18.98	1002+10	Ramona Blvd	747282J	101SG-18.97	PUB	Baldwin Park	CONC	MT1	200	CWD	9A	9	9A	9	9	9	31593	19.0	1001+10	31594	19.0	1003+10	19.0	1002+10	
15	19.90	19.89	1050+02	Azusa Canyon Rd	747283R	101SG-19.9	PUB	Irwindale	CONC	MT1	60	CWD	9		9A				31684	19.9	1049+72	31685	19.9	1050+32	19.9	1050+02	
16	20.38	20.40	1077+05	Irwindale Ave	747302T	101SG-20.38	PUB	Irwindale	CONC	MT1	48	CWD	9	9	9	9			31739	20.4	1076+81	31740	20.4	1077+29	20.4	1077+05	
17	20.89	20.90	1103+32	Vincent Ave	747303A	101SG-20.89	PUB	Covina	CONC	MT1	79	CWD	9A		9A				31817	20.9	1102+93	31823	20.9	1103+72	20.9	1103+32	
									CONC	MT2	79								31819	20.9	1102+94	31825	20.9	1103+72	20.9	1103+33	
18	21.39	21.40	1130+02	Lark Ellen Ave	747304G	101SG-21.39	PUB	Covina	CONC	MT1	79	CWD	9A		9A				31876	21.4	1129+63	31878	21.4	1130+41	21.4	1130+02	
									CONC	MT2	79								31874	21.4	1129+63	31881	21.4	1130+41	21.4	1130+02	
19	21.90	21.91	1156+69	Azusa Ave	747305N	101SG-21.9	PUB	Covina	CONC	MT1	100	CWD	9A	9	9A	9			31907	21.9	1156+19	31916	21.9	1157+19	21.9	1156+69	
									CONC	MT2	100								31908	21.9	1156+20	31914	21.9	1157+19	21.9	1156+69	
20	22.40	22.41	1183+36	Hollenbeck Ave	747306V	101SG-22.4	PUB	Covina	CONC	MT1	80	CWD	9A		9				31958	22.4	1182+96	31960	22.4	1183+76	22.4	1183+36	
									CONC	MT2	80								31956	22.4	1182+96	31963	22.4	1183+76	22.4	1183+36	
21	22.91	22.92	1210+07	Citrus Ave	747307C	101SG-22.91	PUB	Covina	CONC	MT1	110	CWD	9	9	9	9			31984	22.9	1209+52	31986	22.9	1210+62	22.9	1210+07	
									CONC	MT2	110								31997	22.9	1209+52	32001	22.9	1210+62	22.9	1210+07	
22	23.41	23.42	1236+71	Barranca Ave	747310K	101SG-23.41	PUB	Covina	CONC	MT1	80	CWD	9A		9A				32070	23.4	1236+31	32072	23.4	1237+11	23.4	1236+71	
23	23.92	23.93	1263+41	Grand Ave	747311S	101SG-23.92	PUB	Covina	CONC	MT1	99	CWD	9	9	9	9			32097	23.9	1262+91	32099	23.9	1263+90	23.9	1263+41	
24	24.45	24.46	1291+34	Glendora Ave	747312Y	101SG-24.45	PUB	Covina	CONC	MT1	90	CWD	9	9	9	9			32138	24.4	1290+89	32140	24.5	1291+79	24.5	1291+34	
25	24.72	24.73	1305+52	Cypress St	747313F	101SG-24.72	PUB	Covina	CONC	MT1	242	CWD	9A	9	9A	9			32147	24.7	1304+31	32149	24.7	1306+73	24.7	1305+52	
26	25.00	25.00	1319+77	Bonnie Cove Ave	747314M	101SG-25.0	PUB	Covina	CONC	MT1	90	CWD	9A		9A				32159	25.0	1319+32	32161	25.0	1320+22	25.0	1319+77	
27	25.39	25.40	1341+05	Covina Blvd	747315U	101SG-25.39	PUB	Covina	CONC	MT1	240	CWD	9A		9A				32178	25.4	1339+84	32180	25.4	1342+25	25.4	1341+05	
28	25.53	25.53	1348+20	Sunflower Ave	747316B	101SG-25.53	PUB	Covina	CONC	MT1	90	CWD	9A		9A				32184	25.5	1347+75	32186	25.5	1348+65	25.5	1348+20	
29	26.04	26.05	1375+25	Valley Center Ave	747317H	101SG-26.04	PUB	Covina	CONC	MT1	79	CWD	9A		9A				32225	26.0	1374+86	32227	26.1	1375+65	26.0	1375+25	
30	26.54	26.55	1401+66	Lone Hill Ave	747318P	101SG-26.54	PUB	San Dimas	CONC	MT1	101	CWD	9	9	9	9			32250	26.5	1401+16	32252	26.6	1402+17	26.5	1401+66	
31	27.54	27.55	1454+47	Cataract Ave	747320R	101SG-27.54	PUB	San Dimas	CONC	MT1	79	CWD	9A		9A				32291	27.5	1454+08	32294	27.6	1454+86	27.5	1454+47	
									CONC	UP	79								32289	27.5	1454+07	32295	27.6	1454+86	27.5	1454+47	
32	27.79	27.80	1467+68	San Dimas Ave	747321X	101SG-27.79	PUB	San Dimas	CONC	MT1	101	CWD	9	9	9	9			32319	27.8	1467+17	32321	27.8	1468+18	27.8	1467+68	
33	28.04	28.05	1480+87	Walnut Ave	747322E	101SG-28.04	PUB	San Dimas	CONC	MT1	49	CWD	9A		9/9A				32333	28.0	1480+62	32338	28.1	1481+12	28.0	1480+87	
34	28.55	28.56	1508+05	San Dimas Canyon Rd	914497T	101SG-28.55	PUB	La Verne	CONC	MT1	70	CWD	9		9				42485	28.6	1507+70	42488	28.6	1508+40	28.6	1508+05	
35	28.80	28.86	1523+57	Gainey Ceramics Pvt Xing	747324T	101SG-28.8-X	PVT	La Verne	CONC	MT1	29	CWD	9		9				42518	28.9	1523+43	42520	28.9	1523+72	28.9	1523+57	
36	29.28	29.28	1546+18	Wheeler Ave	914498A	101SG-29.28	PUB	La Verne	CONC	MT1	108	CWD	9	9	9	9			42562	29.3	1545+64	42568	29.3	1546+72	29.3	1546+18	
									CONC	UP	108								42564	29.3	1545+64	42566	29.3	1546+72	29.3	1546+18	
37	29.97	29.98	1583+07	Fairplex Dr	747328V	101SG-29.97	PUB	La Verne	CONC	MT1	79	CWD	9A		9A				42636	30.0	1582+67	42638	30.0	1583+46	30.0	1583+07	
38	30.14	30.15	1592+04	Arrow Hwy	747329C	101SG-30.14	PUB	La Verne	CONC	MT1	139	CWD	9	9	9	9			42663	30.1	1591+34	42665	30.2	1592+73	30.2	1592+04	

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SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
TABLE 4: GRADE CROSSINGS

LEGEND

Historic MP: Milepost of the crossing from Track Chart dated April 2009
Actual MP: Actual milepost along centerline of track at the center of crossing
DOT#: Department of Transportation number
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Warning Device Type
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8A Cantilevered flashing lights
9A Cantilevered flashing lights with gate
9 Flashing lights with gate
8 Flashing lights
1R Crossbuck
1X Private crossing sign
STOP Stop sign

Yr data collected: 2009
Date Revised: October 1, 2010

Item #	Historic MP	Actual MP	Sta	STREET NAME	DOT #	PUC #	Xing Type	CITY	PANEL XING SURFACE	TRK	Length (ft)	WARNING DEVICE TYPE (RAILROAD DIRECTION)							Begin Pnt			End Pnt			Calculated Center Pnt		NOTES/ REMARKS
												CONTROL	NW Quadrant	N Median	SE Quadrant	S Median	NE Quadrant	SW Quadrant	#	MP	Sta	#	MP	Sta	MP	Sta	
39	30.21	30.22	1595+51	Paper Pak Pvt Xing	914499G	101SG-30.21-X	PVT	La Verne	CONC	MT1	20	CWD	8						42681	30.2	1595+41	42683	30.2	1595+61	30.2	1595+51	
40	30.32	30.33	1601+51	White Ave	747330W	101SG-30.32	PUB	La Verne	CONC	MT1	99	CWD	9	9	9	9			42713	30.3	1601+01	42716	30.3	1602+00	30.3	1601+51	
41	30.79	30.80	1626+05	Fulton Rd	747331D	101SG-30.79	PUB	Pomona	CONC	MT1	64	CWD	9		9				33143	30.8	1625+73	33145	30.8	1626+37	30.8	1626+05	
									CONC	MT2	61								32406	30.8	1625+85	32409	30.8	1626+45	30.8	1626+15	
42	31.05	31.03	1638+35	Pomona Station Entry	747334K & 747334Y	101SG-31.05	PUB	Pomona	CONC	MT1	48	CWD	9		9		9E	9E	N/A	31.0	1638+11	N/A	31.0	1638+59	31.0	1638+35	
									CONC	MT2	40								N/A	31.0	1638+15	N/A	31.0	1638+55	31.0	1638+35	
43	31.22	31.23	1649+08	N. Garey Ave	747335F	101SG-31.22	PUB	Pomona	CONC	MT1	104	CWD	9A	9	9A	9			32444	31.2	1648+56	32447	31.2	1649+60	31.2	1649+08	
									CONC	MT2	100								33248	31.2	1648+59	33252	31.2	1649+59	31.2	1649+09	
44	31.90	31.91	1684+80	N. Towne Ave	747336M	101SG-31.9	PUB	Pomona	CONC	MT1	96	CWD	9A	9	9A	9			32518	31.9	1684+32	32520	31.9	1685+28	31.9	1684+80	
									CONC	MT2	100								33319	31.9	1684+30	33321	31.9	1685+30	31.9	1684+80	
45	32.40	32.44	1712+67	Cambridge Ave	026730Y	101SG-32.4	PUB	Claremont	CONC	MT1	72	CWD	9A		9A				32605	32.4	1712+31	32608	32.4	1713+03	32.4	1712+67	
									CONC	MT2	72								33421	32.4	1712+33	33423	32.4	1713+05	32.4	1712+69	
46	32..9	32.91	1737+77	Indian Hill Blvd	026180A	101SG-32.9	PUB	Claremont	CONC	MT1	84	CWD	9	9	9	9			32642	32.9	1737+35	32644	32.9	1738+19	32.9	1737+77	
									CONC	MT2	88								42215	32.9	1737+31	42218	32.9	1738+19	32.9	1737+75	
47	33.05	33.08	1746+44	Claremont Station Ped Xing	922846W	101SG-33.05-D	PED	Claremont	CONC	MT1	8	CWD					8	8	32662	33.1	1746+40	32663	33.1	1746+48	33.1	1746+44	
									CONC	MT2	8								42243	33.1	1746+40	42245	33.1	1746+48	33.1	1746+44	
48	33.10	33.16	1751+07	College Ave	026179F	101SG-33.1	PUB	Claremont	CONC	MT1	72	CWD	9		9			8	32673	33.2	1750+71	32676	33.2	1751+43	33.2	1751+07	
									CONC	MT2	72								42249	33.2	1750+72	42251	33.2	1751+44	33.2	1751+08	
49	33.60	33.68	1778+08	Claremont Blvd	026178Y	101SG-33.6	PUB	Claremont	CONC	MT1	160	CWD	9	9	9	9			32740	33.7	1777+28	32742	33.7	1778+88	33.7	1778+08	
									CONC	MT2	156								42320	33.7	1777+06	42323	33.7	1778+62	33.7	1777+84	
50	34.60	34.61	1827+67	Central Ave	026177S	101SG-34.6	PUB	Montclair	CONC	MT1	100	CWD	9	9	9	9			32849	34.6	1827+17	32851	34.6	1828+17	34.6	1827+67	
51	35.10	35.11	1853+97	Benson Ave	026176K	101SG-35.1	PUB	Upland	CONC	MT1	81	CWD	9	9	9	9			32890	35.1	1853+56	32894	35.1	1854+37	35.1	1853+97	
52	35.70	35.73	1886+70	Mountain Ave	026175D	101SG-35.7	PUB	Upland	CONC	MT1	114	CWD	9	9	9	9			32972	35.7	1886+13	32974	35.7	1887+27	35.7	1886+70	
53	36.20	36.27	1915+11	San Antonio Ave	026174W	101SG-36.2	PUB	Upland	CONC	MT1	90	CWD	9	9	9	9			33021	36.3	1914+66	33022	36.3	1915+56	36.3	1915+11	
54	36.80	36.81	1943+63	Euclid Ave (Northbound)	026173P	101SG-36.8	PUB	Upland	CONC	MT1	73	CWD			9			9	33061	36.8	1943+27	33064	36.8	1944+00	36.8	1943+63	
55	36.80	36.84	1944+92	Euclid Ave (Southbound)	026173P	101SG-36.8	PUB	Upland	CONC	MT1	73	CWD	9				9		33065	36.8	1944+55	33068	36.8	1945+28	36.8	1944+92	
56	36.90	36.98	1952+32	2nd Ave	026172H	101SG-36.9	PUB	Upland	CONC	MT1	72	CWD	9		9				33081	37.0	1951+96	33083	37.0	1952+68	37.0	1952+32	
57	37.30	37.38	1973+52	Campus Ave	026168T	101SG-37.3	PUB	Upland	CONC	MT1	60	CWD	9		9				42752	37.4	1973+22	42755	37.4	1973+82	37.4	1973+52	
58	38.10	38.13	2013+31	Grove Ave	026167L	101SG-38.1	PUB	Ontario	CONC	MT1	98	CWD	9A	9	9A	9			42844	38.1	2012+82	42846	38.1	2013+80	38.1	2013+31	
59	38.60	38.63	2039+66	Baker Ave	026166E	101SG-38.6	PUB	Rancho Cucamonga	CONC	MT1	64	CWD	9		9				42891	38.6	2039+34	42893	38.6	2039+98	38.6	2039+66	
60	39.10	39.13	2066+18	Vineyard Ave	026165X	101SG-39.1	PUB	Rancho Cucamonga	CONC	MT1	89	CWD	9	9	9	9			42942	39.1	2065+73	42944	39.1	2066+62	39.1	2066+18	
61	39.60	39.64	2092+98	Hellman Ave	026164R	101SG-39.6	PUB	Rancho Cucamonga	CONC	MT1	24	CWD	9		9				43033	39.6	2092+86	43035	39.6	2093+10	39.6	2092+98	
62	40.10	40.14	2119+61	Archibald Ave	026161V	101SG-40.1	PUB	Rancho Cucamonga	CONC	MT1	89	CWD	9	9	9	9			43085	40.1	2119+16	43087	40.2	2120+05	40.1	2119+61	
63	40.60	40.65	2146+40	Hermosa Ave (Turner Ave)	026160N	101SG-40.6	PUB	Rancho Cucamonga	CONC	MT1	96	CWD	9	9	9	9			46184	40.6	2145+92	46190	40.7	2146+88	40.7	2146+40	
									CONC	SIDING	96								46186	40.6	2145+92	46188	40.7	2146+88	40.7	2146+40	
64	42.80	42.88	2264+01	Rochester Ave	026154K	101SG-42.8	PUB	Rancho Cucamonga	CONC	MT1	104	CWD	9	9	9	9			43590	42.9	2263+49	43593	42.9	2264+52	42.9	2264+01	
65	44.10	44.14	2330+61	Etiwanda Ave	026151P	101SG-44.1	PUB	Rancho Cucamonga	CONC	MT1	104	CWD	9	9	9	9			43700	44.1	2330+09	43702	44.2	2331+13	44.1	2330+61	
66	45.30	45.40	2397+04	Calabash Ave Ped Xing	026150H	101SG-45.3-D	PED	San Bernadino County	CONC	MT1	45	CWD	9		8				43942	45.4	2396+82	43948	45.4	2397+27	45.4	2397+04	
									CONC	MT2	48								43940	45.4	2396+80	43951	45.4	2397+28	45.4	2397+04	
67	47.10	47.16	2490+01	Beech Ave	026148G	101SG-47.1	PUB	San Bernadino County	CONC	MT1	36	CWD	9		9				44311	47.2	2489+83	44314	47.2	2490+19	47.2	2490+01	
									CONC	MT2	40								44309	47.2	2489+81	44315	47.2	2490+21	47.2	2490+01	
68	48.10	48.17	2543+12	Citrus Ave	026147A	101SG-48.1	PUB	Fontana	CONC	MT1	104	CWD	9	9	9	9			44473	48.2	2542+60	44476	48.2	2543+65	48.2	2543+12	
69	48.90	48.94	2584+17	Juniper Ave	026146T	101SG-48.9	PUB	Fontana	CONC	MT1	72	CWD	9		9				44527	48.9	2583+81	44528	48.9	2584+53	48.9	2584+17	
70	49.10	49.19	2597+41	Sierra Ave	026145L	101SG-49.1	PUB	Fontana	CONC	MT1	84	CWD	9	9	9	9			44571	49.2	2596+99	44573	49.2	2597+83	49.2	2597+41	
71	49.30	49.44	2610+57	Mango Ave	026144E	101SG-49.3	PUB	Fontana	CONC	MT1	73	CWD	9		9				44616	49.4	2610+20	44618	49.4	2610+93	49.4	2610+57	
72	49.60	49.69	2623+75	Palmetto Ave	026143X	101SG-49.6	PUB	Fontana	CONC	MT1	57	CWD	9		9				44646	49.7	2623+47	44648	49.7	2624+03	49.7	2623+75	
73	50.10	50.19	2650+15	Alder Ave	026142R	101SG-50.1	PUB	Fontana	CONC	MT1	72	CWD	9		9				44687	50.2	2649+79	44689	50.2	2650+51	50.2	2650+15	

SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
TABLE 4: GRADE CROSSINGS

LEGEND

Historic MP: Milepost of the crossing from Track Chart dated April 2009
Actual MP: Actual milepost along centerline of track at the center of crossing
DOT#: Department of Transportation number
PUC#: Public Utilities Commission assigned number
Xing Type: **PUB** = Public at-grade crossing
PED = Pedestrian only public at-grade crossing
PVT = Private vehicular & pedestrian at-grade crossing

Panel Xing Surface: Crossing panel surface material
AC = Asphalt Concrete
RUB = Rubber crossing panels
CONC = Concrete crossing panels

Warning Device Type
Control: Type of control for the warning device
CWD: Constant warning device

PUC Standard Warning Device:
8A Cantilevered flashing lights
9A Cantilevered flashing lights with gate
9 Flashing lights with gate
8 Flashing lights
1R Crossbuck
1X Private crossing sign
STOP Stop sign

Yr data collected: 2009
Date Revised: October 1, 2010

Item #	Historic MP	Actual MP	Sta	STREET NAME	DOT #	PUC #	Xing Type	CITY	PANEL XING SURFACE	TRK	Length (ft)	WARNING DEVICE TYPE (RAILROAD DIRECTION)							Begin Pnt			End Pnt			Calculated Center Pnt		NOTES/ REMARKS
												CONTROL	NW Quadrant	N Median	SE Quadrant	S Median	NE Quadrant	SW Quadrant	#	MP	Sta	#	MP	Sta	MP	Sta	
74	50.60	50.69	2676+58	Locust Ave	026141J	101SG-50.6	PUB	Rialto	CONC	MT1	36	CWD	9		9				44722	50.7	2676+40	44724	50.7	2676+76	50.7	2676+58	
75	51.40	51.44	2716+17	Cedar Ave	026140C	101SG-51.4	PUB	Rialto	CONC	MT1	84	CWD	9	9	9	9			44841	51.4	2715+75	44848	51.5	2716+59	51.4	2716+17	
									CONC	MT2	84								44844	51.4	2715+75	44845	51.5	2716+59	51.4	2716+17	
76	52.10	52.19	2755+77	Cactus Ave	026139H	101SG-52.1	PUB	Rialto	CONC	MT1	81	CWD	9	9	9	9			44986	52.2	2755+36	44994	52.2	2756+17	52.2	2755+77	
									CONC	MT2	80								44983	52.2	2755+37	44991	52.2	2756+17	52.2	2755+77	
77	52.40	52.44	2769+03	Lilac Ave	026138B	101SG-52.4	PUB	Rialto	CONC	MT1	72	CWD	9		9				45072	52.4	2768+67	45074	52.5	2769+39	52.4	2769+03	
78	52.60	52.69	2782+25	Willow Ave	026137U	101SG-52.6	PUB	Rialto	CONC	MT1	72	CWD	9		9				45100	52.7	2781+89	45103	52.7	2782+61	52.7	2782+25	
79	53.00	52.94	2795+47	Riverside Ave	026136M	101SG-53.0	PUB	Rialto	CONC	MT1	98	CWD	9	9	9	9			45127	52.9	2794+98	45129	53.0	2795+95	52.9	2795+47	
80	53.10	53.19	2808+69	Sycamore Ave	026135F	101SG-53.1	PUB	Rialto	CONC	MT1	72	CWD	9		9				45151	53.2	2808+33	45153	53.2	2809+05	53.2	2808+69	
81	53.40	53.45	2821+91	Acacia St	026134Y	101SG-53.4	PUB	Rialto	CONC	MT1	72	CWD	9		9				45172	53.4	2821+55	45174	53.5	2822+27	53.4	2821+91	
82	53.60	53.70	2835+12	Eucalyptus Ave	026133S	101SG-53.6	PUB	Rialto	CONC	MT1	72	CWD	9		9				45193	53.7	2834+76	45195	53.7	2835+48	53.7	2835+12	
83	53.90	53.95	2848+34	Pepper Ave	026132K	101SG-53.9	PUB	San Bernadino	CONC	MT1	98	CWD	9A	9	9A	9			45215	53.9	2847+85	45218	54.0	2848+82	53.9	2848+34	
84	54.40	54.54	2879+59	Rialto Ave	026131D	101SG-54.4	PUB	San Bernadino	CONC	MT1	132	CWD	9		9				45317	54.5	2878+93	45323	54.6	2880+25	54.5	2879+59	
85	55.20	55.24	2916+75	Rancho Ave	026130W	101SG-55.2	PUB	San Bernadino	CONC	MT1	48	CWD	9		9				45408	55.2	2916+51	45410	55.2	2916+99	55.2	2916+75	

SUMMARY INFORMATION

Total number of public at-grade crossing:		78
Total number of pedestrian only public at-grade crossings		3
Total number of private vehicular & pedestrian at-grade crossing		4
Total		**85**
Total number of at-grade crossing with CWD protection:	83	
Total number of at-grade crossing without CWD protection:	2	

At-Grade Crossing by Panel Crossing Surface

Panel surface	# of Crossing Tracks	Total Length of Panels
AC	0	0
Concrete	109	8894
Rubber	0	0
Total	109	8894

At-Grade Crossing with warning device

Type	# of Warning Devices
8	13
8A	0
9	185
9A	43
9E	2
STOP & 1X	4
Total	247

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SAN GABRIEL SUBDIVISION
PTC Mapping and Data Collection
TABLE 5: STATIONS AND PLATFORMS

LEGEND

Historic MP: Milepost of stations from Track chart dated April 2009.
Actual MP: Actual milepost along centerline of track at the center of the station platform
Track: Adjacent track serviced by the platform
Boarding Type: **CB** = Center Boarding, **OB** = Outside boarding
Length: Length of boarding area on platform.

Center Pnt: Center of edge of platform calculated based on begin and end points.
Xing: Pedestrian crossings servicing the platforms

Yr data collected: 2009
Date Revised October 1, 2010

No.	Historic MP	Actual MP	Station	City	Platform											Pedestrian Crossing							Notes/ Remarks
					Track	Platform #	Boarding Type	Length (ft)	# of ped xing	Begin Point Pnt #	Begin Point Sta	End Pnt Pnt #	End Pnt Sta	Center Pnt MP	Center Pnt Sta	Xing Trk	Begin Pnt #	MT1 Sta	End Pnt #	MT1 Sta	Length (ft)	Panel	
1	4.6	4.63	Cal State LA	Alhambra	MT	1	OB	258	0	31455	243+29	31465	245+86	4.63	244+57								
2	12.6	12.63	El Monte	El Monte	MT	1	CB	588	2	30414	663+71	30478	669+58	12.63	666+64	SIDING	30495	666+62	30497	666+74	12	RUB	
					EL MONTE SIDING											SIDING	30501	669+47	30502	669+59	12	RUB	
3	18.8	18.89	Baldwin Park	Baldwin Park	MT	1	OB	510	0	31585	994+70	31589	999+80	18.89	997+25								
4	23.0	23.00	Covina	Irwindale	MT1	2	OB	508	0	31988	1211+62	31996	1216+70	23.00	1214+16								
					MT2			510		32007	1211+62	32017	1216+72	23.00	1214+17								
5	31.0	30.97	Pomona	Pomona	MT	1	CB	507	1	33175	1632+94	32408	1638+01	30.97	1635+48	MT	33180	1634+63	33182	1634+71	8	CONC	
6	33.0	33.12	Claremont	Claremont	MT1	2	OB	530	1	32658	1745+46	32675	1750+76	33.11	1748+11	MT1	32662	1746+40	32663	1746+48	8	CONC	
					MT2			736		42241	1743+05	No Pt.	1750+40	33.08	1746+72	MT2	42243	1746+40	42245	1746+48	8	CONC	
7	34.2	34.26	Montclair	Montclair	MT1	2	OB	680	0	42397	1805+56	42439	1812+36	34.26	1808+96								
					MT2			680		42396	1805+56	42406	1812+36	34.26	1808+96								
8	36.9	37.05	Upland	Upland	MT	1	OB	700	0	33088	1952+96	42736	1959+96	37.05	1956+46								
9	42.0	42.12	Rancho Cucamonga	Rancho Cucamonga	MT	2	OB	510	1	43478	2221+41	43487	2226+51	42.12	2223+96	MT1	43472	2221+18	43474	2221+30	12	CONC	
					RANCHO SIDING			680		43453	2217+83	43486	2224+63	42.07	2221+23	SIDING	43475	2221+18	43476	2221+30	12	CONC	
10	45.3	45.33	CA Speedway	CA Speedway	MT1	1	CB	2675	1	43913	2380+30	43987	2407+04	45.33	2393+67	Calabash Ave Ped Xing (SEE TABLE 4 - GRADE CROSSINGS)					45	CONC	
					MT2					43912	2380+30	43986	2407+04	45.33	2393+67						48	CONC	
11	49.0	49.08	Fontana	Fontana	MT	1	OB	680	0	44544	2588+12	44556	2594+92	49.08	2591+52								
12	52.9	52.85	Rialto	Rialto	MT	1	OB	710	0	45110	2786+70	45114	2793+80	52.85	2790+25								
13	56.5	56.44	San Bernardino	San Bernardino	P-1	3	CB	617	1	45977	2977+54	46039	2983+41	56.45	2980+47								
					P-2					45871	2977+24	45912	2983+41	56.45	2980+33	P-2	45865	2977+12	45867	2977+24	12	RUB	
					P-3		CB	587		45816	2977+24	No Pt.	2983+09	56.44	2980+16	P-3	45811	2977+12	45813	2977+24	12	RUB	
					P-4					46289	2977+24	46304	2983+10	56.44	2980+17	P-4	46260	2977+12	46262	2977+24	12	RUB	
					P-5		CB	587		46206	2977+24	46248	2983+11	56.44	2980+17	P-5	46200	2977+12	46205	2977+24	12	RUB	
					P-6					45766	2977+24	45804	2983+11	56.44	2980+17								

Total # of Stations: 13
Total # of Platforms: 19
Total # of Ped xing (Not inlclude Calabash Ave Ped xing): 6
Total Platform Length 13,253 FT

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PTC CLEARANCE SPREADSHEET
MOST RESTRICTIVE VERTICAL AND HORIZONTAL CLEARANCES
AT OVERPASSES, RR THROUGH TRUSS BRIDGES, AND PASSENGER SHEDS/CANOPIES

Data as of: 2009 to 2010
Revised: October 01, 2010

TABLE CL-A: VENTURA SUB **(INCREASING MP TO LAUS)**

No.	Hist. MP	Actual MP	MT STA	Overhead Bridge Location	Horizontal CLR			Vertical CLR		Note/Remarks (on Curve/Tangent Trk)
					Trk	Dist	R/L	MT 1	MT 2/Siding	
1	427.92	28.01	1478+72	Ronald Reagan FWY 118	Main	50'	R	30.34'	N/A	Tangent, 50ft± to earthen berm
2	432.20	32.23	1701+75	Madera Rd	Siding	21.49'	L	26.93'	28.35'	Tangent
3	440.28	40.25	2125+43	Kuehner Dr/Santa Susana Pass Rd	Siding	8.80'	R	23.66'	24.44'	Tangent
4	448.55	48.54	2562+77	Nordhoff Way	Main	18.60'	R	23.10'	N/A	Tangent, Horiz CLR is to fence
5	453.00	52.96	2796+28	Anheuser Busch Ped OP	MT-2	15.01'	R	25.55'	25.30'	Tangent
6	453.52	53.53	2826+22	I-405 San Diego FWY OP	MT-2	9.58'	R	23.65	24.37'	Tangent
7	454.50	54.56	2880+56	Willis Ave Ped Xing	MT-2	15.11'	R	25.40'	24.76'	Tangent

TABLE CL-B: VALLEY SUB **(INCREASING MP TO LANCASTER)**

No.	Hist. M.P.	Actual MP	MT STA	Overhead Bridge Location	Horizontal CLR			Vertical CLR		Note/Remarks (on Curve/Tangent Trk)
					TrK	Dist	R/L	MT 1	MT 2/Siding	
1	4.65	4.67	246+72	2 FWY OP	MT-2	37.89'	L	23.02'	22.95	Curve
2	8.03	8.06	425+61	134 FWY OP	MT-2	35.0'	L	24.07'	23.20'	Tangent
3	9.45	9.46	499+57	Western Ave OP	MT-1	10.85'	R	23.94'	23.81'	Tangent
4	10.37	10.41	549+47	1-5 FWY (Providencia) OP	MT-1	10.06'	L	24.62'	24.21'	Curve
5	10.72	10.73	566+63	Olive Ave OP	MT-2	19.15'	L	28.15	26.21	Curve
6	10.95	10.96	578+86	Magnolia Blvd OP	MT-2	25.92'	L	26.23'	24.98'	Tangent
7	11.37	11.39	601+42	Burbank Blvd OP	Siding	31.85'	R	26.44'	26.18'	Tangent
8	15.85	15.88	838+71	I-5 FWY OP	Siding	20.63'	R	23.30'	24.58'	Curve
9	20.08	20.12	1062+31	118 FWY OP	MAIN	42.52'	L	22.47'	N/A	Tangent
10	24.67	24.68	1302+85	I-5 N I-210 E Connector OP	Siding	20.74'	L	30.16'	30.16'	Tangent
11	24.74	24.80	1309+38	I-5 FWY OP / I-5 S I-210 W Connector OP	Siding	19.58'	L	23.04		Tangent to Curve
12	25.31	25.32	1336+68	Balboa Blvd OP	Siding	26.53'	L	24.92		Turnout
13	25.78	25.84	1364+37	I-5S FWY OP	MAIN	19.44'	L	25.57'	N/A	Curve
14	26.41	26.41	1394+60	Sierra HWY OP	MAIN	8.65'	L	21.71'	N/A	Curve
15	31.30	31.24	1649+46	Via Princessa OP	MAIN	9.92'	R	24.43'	N/A	Curve
16	35.62	35.61	1880+12	Golden Valley Rd OP	MAIN	57'	R	24.54'	N/A	Tangent
17	37.55	37.56	1983+05	Whites Canyon Rd OP	MAIN	52.72'	R	59.25'	N/A	Curve
18	38.41	38.42	2028+66	Sierra HWY OP	MAIN	11.73'	L	25.28'	N/A	Tangent
19	39.18	39.21	2070+10	14 FWY OP	MAIN	19.07'	L	24.55'		Tangent
20	39.52	39.52	2086+76	Lost Canyon Rd OP	MAIN	25.09'	L	24.30'		Curve
21	46.55	46.54	2457+48	Soledad Canyon Rd OP	MAIN	8.33'	L	21.57'	N/A	Tangent
22	52.04	52.03	2747+12	Soledad Canyon Rd OP	MAIN	20'	L	23.50'	N/A	Curve
23	62.36	62.35	3292+11	Angeles Forest HWY OP	MAIN	18.12'	R	24.03	N/A	Curve
24	64.35	64.35	3397+54	Pear Blossom HWY OP	MAIN	13.65'	L	25.13'	N/A	Curve
25	74.05	74.05	3909+69	Avenue L OP	MAIN	9.75'	R	23.04	N/A	Tangent

TABLE CL-C: RIVER SUB - RIVER LINE **(INCREASING MP TO BURBANK)**

No.	Hist. M.P.	Actual MP	MT STA	Overhead Bridge Location	Horizontal CLR			Vertical CLR		Note/Remarks (on Curve/Tangent Trk)
					TrK	Dist	R/L	MT 3	MT 4	
1	1.36	1.36	72+00	N Spring ST OP	MT-3	8.45'	L	23.07'	23.32'	Tangent
2	1.46	1.46	77+21	N Broadway OP	MT-3	26.20'	R	25.34'	32.00'	Curve
3	1.56	1.58	83+18	Metro Gold Line OH	MT-4	17.92'	L	24.11'	24.20'	Tangent
4	2.00	1.98	104+58	Pasadena FWY I-110 S OP	MT-3	10.18'	L	35.80'	35.33'	Curve
5	2.11	2.11	111+15	Riverside Dr OP	MT-4	17.20	L	33.09'	31.86'	Tangent
6	2.21	2.21	116+62	I-5 FWY OP	MT-1	50'	R		28.06'	Curve, Vert. CLR for MT-1=28.66' MT-2= 28.43'

TABLE CL-D: RIVER SUB - WEST BANK LINE **(INCREASING MP TO REDONDO JCT.)**

No.	Hist. M.P.	Actual MP	MT STA	Overhead Bridge Location	Horizontal CLR			Vertical CLR		Note/Remarks (on Curve/Tangent Trk)
					TrK	Dist	R/L	MT 3	MT 4	
1	140.50	140.53	7419+83	Cesar Chavez Ave OP	MT-4	8.30'	R	22.26'	22.21'	Curve to Tangent
2	140.70	140.70	7428+86	US 101 OP	MT-4	9.64'	R	24.42'	24.42'	Curve
3	141.10	141.06	7447+82	1st St OP	MT-3	9.54'	L	22.77'	22.69'	Curve
4	141.50	141.51	7471+85	4th St OP	MT-3	8.43'	L	26.79'	26.36'	Tangent
5	141.70	141.71	7482+16	6th St OP	MT-3	8.40'	L	39.69'	40.23'	Tangent
6	142.00	142.00	7497+60	7th St OP	MT-4	8.57'	R	21.94'	21.87'	Tangent
7	142.40	142.36	7516+79	Santa Monica FWY OP	MT-3	13.71'	L	25.27'	25.61'	Tangent
8	142.70	142.59	7528+69	Olympic Blvd OP	MT-3	8.48'	L	23.13'	23.14'	Tangent

TABLE CL-E: RIVER SUB - EAST BANK LINE **(INCREASING MP TO SOTO ST JCT.)**

No.	Hist. M.P.	Actual MP	MT STA	Overhead Bridge Location	Horizontal CLR			Vertical CLR		Note/Remarks (on Curve/Tangent Trk)
					TrK	Dist	R/L	MT 1	MT 2	
1	480.72	480.73	25382+34	Riverside Dr OP	MT-2	9.50'	L	22.35'	23.60'	Curve
2	481.15	481.14	25404+45	Metro Gold Line OH	MT-2	9.25'	R	24.55'	24.26'	Tangent
3	481.36	481.37	25416+39	N Broadway OP	MT-2	20.90'	R	30.09'	27.20'	Tangent
4	481.44	481.45	25420+35	N Spring ST OP	MT-1	8.46'	L	23.90'	24.15'	Tangent
5	482.59	482.60	25481+38	Cesar Chavez Ave OP	MT-2	7.65'	R	22.91	23.01'	Tangent
6	482.63	482.63	25482+75	Retaining Wall	MT-1	8.33'	L	N/A	N/A	Curve
7	482.74	482.76	25489+59	I-10 101 FWY OP	MT-2	13.45'	R	24.68'	24.75	Tangent to Curve
8	483.10	483.11	25508+15	1st St OP	MT-1	9.25'	L	23.57'	23.95'	Curve
9	483.54	483.55	25531+60	4th St OP	MT-2	8.75'	R	31.37'	27.00'	Tangent
10	483.77	483.77	25543+32	6th St OP	MT-2	8.75'	R	49.20'	47.3	Tangent
11	484.04	484.04	25557+45	7th St OP	MT-1	8.55'	L	23.27'	23.70'	Tangent, Hori. CLR AT MT2=8.55
12	484.40	484.44	25578+18	Santa Monica FWY OP	MT-2	13.93'	R	23.58'	24.01'	Tangent
13	484.67	484.67	25590+72	Olympic Blvd OP	MT-2	8.50'	R	23.33'	23.36'	Tangent, gas pipeline may reduced clearance

PTC CLEARANCE SPREADSHEET
MOST RESTRICTIVE VERTICAL AND HORIZONTAL CLEARANCES
AT OVERPASSES, RR THROUGH TRUSS BRIDGES, AND PASSENGER SHEDS/CANOPIES

Data as of: 2009 to 2010
Revised: October 01, 2010

TABLE CL-F: SAN GABRIEL SUB **(INCREASING MP TO SAN BERNARDINO)**

No.	Hist. M.P.	Actual MP	MT STA	Overhead Bridge Location	Horizontal CLR			Vertical CLR		Note/Remarks (on Curve/Tangent Trk)
					TrK	Dist	R/L	MT 1	MT 2/Siding	
1	1.30	1.27	67+15	UPRR Transportation Center Lamar St OP	MAIN	9.65'	R	25.59'	25.16'	Curve.
2	1.35	1.37	72+25	Mission Rd OP	MAIN	8.73'	R	22.82'	23.11'	Tangent
3	1.79	1.80	94+96	Golden State FWY Ramp	MAIN	8.93'	R	24.66	24.85	Curve
4	1.84	1.86	98+31	Golden State FWY OP	MAIN	9.25'	R	27.91	27.14	Curve
5	2.03	2.03	106+95	State St OP	Siding	10.05'	R	22.98'	23.53'	Tangent
6	2.10	2.09	110+20	Kingston Ave Hospital Ped OP	Siding	16.42'	L	23.32'	24.47'	Tangent
7	2.49	2.50	132+10	Marengo St OP	MAIN	10.88'	R	22.80'	N/A	Turnout
8	2.58	2.60	137+28	Soto St OP	MAIN	29.00'	L	22.66	N/A	Curve
9	2.66	2.67	141+08	San Berndadino FWY On Ramp OP	MAIN	16.42'	R	23.92'	N/A	Curve
10	2.68	2.70	142+42	San Bernadino FWY Off Ramp OP	MAIN	12.95'	R	24.57'	N/A	Tangent
11	3.00	3.01	158+83	Evergreen Ave Ped XING OP	MAIN	9.88'	R	25.17'	N/A	Tangent
12	3.46	3.46	182+66	City Terrace Ped XING OP	MAIN	10.67	L	23.54'	N/A	Curve
13	3.68	3.69	194+95	N. Herbert St OP	MAIN	10.07'	L	23.67'	N/A	Curve
14	4.30	4.32	227+92	Eastern Ave OP	MAIN	9.78'	R	24.55'	N/A	Tangent
15	4.47	4.48	236+43	Campus Rd OP	MAIN	9.48'	R	22.75'	N/A	Curve
16	4.59	4.51	237+94	El Monte Busway OP	MAIN	10.60'	R	26.81'	N/A	Curve
17	4.69	4.67	246+48	University Station Ped XING OP	MAIN	9.74'	L	59.48'	N/A	Tangent
18	4.82	4.81	254+06	I -710 to I-10 NE Connector OP	MAIN	9.94'	R	23.06'	N/A	Tangent
19	5.29	5.29	279+43	Warwick Ave Ped XING OP	MAIN	9.45'	L	23.59'	N/A	Tangent
20	6.53	6.55	345+91	Marguerita Ave Ped Xing OP	MAIN	9.96'	R	22.99'	N/A	Tangent
21	7.74	7.76	409+49	S. Almansor Ave OP	MAIN	8.13'	R	23.57'	N/A	Tangent
22	8.52	8.52	449+95	Jackson Ave OP	MAIN	10.15'	L	22.95'	N/A	Tangent
23	8.63	8.64	456+36	East and West Bound Busway OP	MAIN	10.15'	L	26.38	N/A	Tangent
24	11.40	11.51	607+92	I-10 West OP	MAIN	8.54'	L	22.50'	N/A	Tangent
25	13.59	13.63	719+61	San Bernadino FWY I-10 OP	MAIN	9.43'	R	23.06'	N/A	Tangent
26	14.97	15.00	792+00	San Gabriel River Fwy I-605 OP	MAIN	19.06'	L	23.79'	N/A	Tangent
27	17.20	17.23	909+74	San Bernadino FWY I-10 OP	MAIN	9.87'	R	23.23'	N/A	Tangent
28	27.08	27.11	1431+27	Orange FWY SR-57 OP	MAIN	16.09'	R	22.76'	N/A	Tangent
29	43.00	43.01	2270+78	I-15 OP	MAIN	23.07'	R	22.67'	N/A	Tangent
30	46.09	46.15	2436+67	Cherry Ave OP	Siding	8.61'	R	22.61'	22.97	Multiple track, 3rd Track Vert. CLR=22.77'
31	54.50	54.58	2881+88	UPRR OP	MAIN	14.29'	L	22.95'	N/A	Tangent
32	56.26	56.33	2974+31	Mt. Vernon OP	MAIN	9.78'	L	24.75	22.98	Turnout, most southerly track vertical CLR is 23.70'

TABLE CL-G: ORANGE SUB **(INCREASING MP TO OCEANSIDE)**

No.	Hist. M.P.	Actual MP	MT STA	Overhead Bridge Location	Horizontal CLR			Vertical CLR		Note/Remarks (on Curve/Tangent Trk)
					TrK	Dist	R/L	MT 1	MT 2	
1	166.60	166.59	8796+05	Riverside FWY OP	MT-2	15.60'	R	22,45'	22.32'	Tangent
2	170.80	170.82	9019+51	Hwy 57 Stadium OH	MT-1	12.30'	L	23.10'	23.51'	Curve
3	173.40	173.46	9158+93	HWY 22 So Orange OH Garden Grove FWY	MT-1	9.54'	L	24.34'	24.84'	Curve
94	175.21	175.26	9253+83	Santa Ana Station Ped OP	N/A	N/A		27.83'		Tangent, Platform restricts Horz CLR
95	177.40	177.41	9367+21	South Tustin OP	MT-2	10.79'	R	23.62'	23.82'	
96	179.70	179.71	9488+76	Jamboree OP	MT-2	13.00'	R	22.51'	22.67'	Tangent
97	181.30	181.27	9571+19	Yale Ave OP	MT-1	29.10'	L	24.32'	24.51'	Tangent
98	182.35	182.31	9626+00	Oak Creek Golf Pvt Ped Xing	MT-2	34.60'	R	25.48'	25.64'	Tangent
99	183.30	183.32	9679+21	I-5 Fwy OP	MT-2	15.00'	R	23.66'	23.16'	Tangent
100	183.42	183.45	9686+02	SR 133 South Bound	MT-2	30.05'	R	37.04'	37.19'	Tangent
101	183.46	183.48	9687+80	SR 133 North Bound	MT-2	30.05'	R	37.06'	37.40'	Tangent
102	185.00	184.98	9766+90	Irvine Station Ped OP	N/A	N/A		28.35'		Tangent, Platform restricts HRZ CLR
103	185.82	185.84	9812+28	Alton Pkwy OP	MT-2	23.85'	R	23.03	23.12'	Tangent, Siding Vert. CLR = 23.07'
104	186.50	186.53	9848+67	Bake Pkwy OP	Siding	19.00'	L	23.29'	23.17'	Crossover, Siding Vert. CLR = 23.44'
105	199.10	188.12	9932+85	El Toro Rd. OP	MT-1	11.10'	L	23.19'	22.81	Curve
106	188.60	188.66	9961+03	Los Aliso Blvd OP	MT-2	8.95'	R	24.68'	24.27'	Tangent
107	189.30	189.27	9993+39	Alicia Pkwy OP	MT-1	10.55'	L	22.69'	22.64'	Tangent
108	190.00	190.29	10047+08	La Paz OP	MT-1	12.00'	L	25.02'	24.74'	Curve
109	190.50	190.56	10061+51	San Diego FWY OP	MT-1	12.03'	L	22.88'	22.99	Tangent
110	191.50	191.47	10109+66	El Paseo OP	MT-2	31.03'	R	24.95'	24.56'	Tangent
111	191.66	191.65	10119+26	Oso Pkwy OP	MT-2	19.21'	R	38.83'	38.31'	Tangent, horizontal clar to earth berm
112	193.20	193.13	10197+25	Crown Valley Pkwy OP	SPUR	10.95'	L	24.00'	23.35'	Curve, SPUR Vert. CLR=24.91'
113	193.90	193.86	10235+86	Paseo De Colinas OP	MT-2	12.39'	R	23.22'	23.48'	Turnout
114	194.05	194.06	10246+32	San Joaquin Hills Toll Rd. North Bound	MT-1	14.24'	L	60.76'	58.11'	Curve
115	194.10	194.15	10250+89	San Joaquin Hills Toll Rd. South Bound	MT-1	11.90'	L	38.15'	34.40'	Curve, MT-1 Hori. CLR is to bumper post
116	199.30	199.35	10525+90	Stonehill OP	Siding	18.45'	L	24.27'	24.64'	Tangent, MT-2 IS Siding
117	200.05	200.03	10561+84	Camino Las Ramblas (PCH) OP	MT-1	15.40'	R	23.48'	N/A	Curve
118	200.68	200.66	10594+66	Capistrano Beach Doheny Ped Xing OP	MT-1	31.51'	L	24.79'	N/A	Tangent

*** NO OVERHEAD STRUCTURES FOR OLIVE SUB.**

TABLE CL-H: UMBRELLA SHEDS AND CANOPIES AT LAUS

No.	Hist. MP	Actual MP	Midpoint MT STA	Shed/Canopy location	Horizontal Distance to CL of Track				Vertical Distance to CL of Track			
					North End		South End		North End		South End	
					Track	Dist	Track	Dist	Track	Dist	Track	Dist
119	-	0.08	4+49	Canopy 2	3	3.51	4	3.4	3	16.26	4	16.35
120	-	0.10	5+29	Canopy 3	5	3.43	6	3.45	5	16.15	6	16.26
121	-	0.12	6+08	Canopy 4	7	3.4	8	3.4	7	16.18	8	16.25
122	-	0.14	7+30	Canopy 5	9	3.42	10	3.38	9	16.22	10	16.33
123	-	0.13	6+80	Canopy 6	11	3.46	12	3.39	11	16.18	12	16.11

SUMMARY OF SCRRA RAIL INFRASTRUCTURE ASSETS AND KEY CHARACTERISTICS

Data as of: Sep. 2009
Revised: Febuary 27, 2010

CATEGORY	SEGMENT	MILEPOST LIMITS	SUBDIVISION / BRANCH LINE	ROUTE MILES	SIGNALIZED MAIN TRACK & CONTROLLED SIDING WITH CTC - MILES	SIGNALIZED TERMINAL TRACK WITH CTC - MILES	SIGNALIZED MAIN TRACK WITH TWC AND WITHOUT CTC - MILES	OTHER THAN MAIN TRACK, NON-SIGNALIZED YARDS AND BRANCH LINES - MILES	MAIN TRACK #24 CONCRETE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN TRACK #20 CONCRETE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN TRACK #14 CONCRETE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN TRACK #10 CONCRETE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN TRACK #24 WOOD TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN TRACK #20, #20 EQ WOOD TIE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN TRACK #14 WOOD TIE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN & REV. TERMINAL #10 WOOD TIE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN & REV. TERMINAL #9 WOOD TIE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN & SIGNALIZED REV. TERMINAL #8 & #6 DSS WOOD TIE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN & REV. TERMINAL #7 WOOD TIE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	AT GRADE TRACKS / DIAMOND CROSSINGS	PASSENGER YARD AND SUPPORT TRACKS #10, #9, #8, #7, & 5.5 EQ TURNOUTS (NOT MAIN TRACK OR CONTROL SIDING)	STATIONS	STATION PLATFORMS	PEDESTRIAN AT GRADE CROSSING AT STATIONS	PUBLIC AT-GRADE CROSSINGS	PEDESTRIAN ONLY PUBLIC AT-GRADE CROSSINGS	PRIVATE VEHICULAR & PEDESTRIAN AT-GRADE CROSSINGS (NOT INCLUDE CROSSINGS AT STATIONS)	MAXIMUM AUTHORIZED PASS./FRT. SPEED (MPH)	AVERAGE PASS./FRT. VELOCITY NOT INCLUDING STOPS (MPH)	MAXIMUM % GRADE / MAXIMUM DEGREE OF CURVE	RAILROAD BRIDGES ONLY (NOT INCLUDE STREETS, HIGHWAYS, & PEDESTRIAN UNDERPASSES)	OVERPASSES	HIGHWAYS, STREETS, & PEDESTRIAN UNDERPASSES	TUNNELS	CONTROL POINTS	POWER SWITCH MACHINES AT TURNOUTS AND DERAILS	SIGNAL LOCATIONS - WAYSIDE SIGNAL MASTS, BRIDGES, CANTILEVERS, DWARFS	WIU'S / ANTENNAS AT SIGNAL LOCATIONS	WAYSIDE SIGNAL HOUSES / BUNGALOWS (NOT INCLUDE GRADE CROSSINGS)	GRADE CROSSING SIGNAL HOUSES	TRACK CONNECTIONS FROM CONTROLLED SIDINGS TO MAIN TRACKS WITHOUT DERAILS	TRACK CONNECTIONS TO MAIN TRACK & CONTROLLED SIDINGS WITH HAND THROW TURNOUTS	TRACK CONNECTIONS TO MAIN TRACK & CONTROLLED SIDINGS WITH HAND THROW DERAILS	TRACK CONNECTIONS TO MAIN TRACK & CONTROLLED SIDINGS WITH POWER DERAILS	INDUSTRY, SET OUT AND OTHER SPUR TRACKS WITH DERAILS NOT INTERCONNECTED TO THE SIGNAL SYSTEM	INDUSTRY, SET OUT AND OTHER SPUR TRACK CONNECTIONS TO MAIN TRACK &CONTROLLED SIDINGS WITHOUT DOUBLE POINT DERAILS	TRACK CONNECTIONS TO MAIN TRACK & CONTROLLED SIDING WITHOUT DERAILS
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
SCRRA OPERATED & MAINTAINED SIGNALIZED MAIN TRACK AND CONTROLLED SIDINGS	A	0.00 / 3.67	River	3.67	7.14	3.79	0.00	3.14	0	0	0	0	0	9	16	8	0	37	0	4	11	1	6	0	2	0	1	50/40	38/24	0.93/ 12°58'	5	6	3	0	13	69	82	22/8	12	2	0	1	0	1	0	3	2
	B	3.67 / 76.64	Valley	72.97	93.63	0.00	0.00	2.02	0	0	0	0	5	16	16	19	0	0	0	0	0	10	13	8	51	1	11	79/60	61/20	2.50/ 10°15'	37	34	18	3	26	42	108	50/46	41	56	20	16	8	2	3	19	11
	C	140.09 / 143.67	West Bank	3.58	7.07	0.00	0.00	0.00	0	0	0	0	0	4	6	4	0	1	0	0	0	0	0	0	0	0	0	79/40	54/28	2.99/ 6°17'	1	13	1	0	2	13	12	4/4	3	0	0	2	0	0	0	4	4
	D	480.90 / 485.21	East Bank	4.31	8.79	0.00	0.00	0.00	0	0	0	0	0	0	9	14	3	0	1	5	0	0	0	0	1	0	0	70/30	42/23	1.05/ 8°38'	1	20	1	0	5	31	35	14/10	11	1	1	1	1	3	1	6	3
	E	426.40 / 462.60	Ventura	36.19	52.09	0.00	0.00	0.73	0	0	0	0	0	17	7	16	0	0	0	0	3	6	9	5	32	0	4	79/60	69/46	1.17/ 6°15'	27	9	12	3	12	20	60	26/22	16	32	8	20	10	0	9	17	11
	F	403.10 / 403.50	Montalvo East	0.38	0.38	0.00	0.00	0.00	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	15/10	15/10	0.48/ 10°00'	0	2	0	0	0	0	0	1/1	0	1	0	0	0	0	0	0	0
	G	402.90 / 404.70	Montalvo West	1.73	1.08	0.00	0.92	0.06	0	0	0	0	0	0	0	3	0	0	0	0	0	1	1	0	3	0	2	15/10	15/10	0.48/ NO CRV	1	2	0	0	1	2	4	0/0	1	1	0	2	2	0	2	3	3
	H	0.90 / 57.00	San Gabriel	55.60	72.50	0.29	0.00	1.19	0	0	0	0	0	14	6	44	0	6	4	0	5	13	19	6	78	3	4	79/55	69/39	2.99/ 10°00'	29	31	23	0	22	50	94	43/39	28	85	11	31	30	6	15	36	11
	I	165.50 / 207.40	Orange	43.25	75.39	0.00	0.00	3.05	7	6	6	10	0	24	1	20	0	1	0	2	2	10	16	1	38	7	3	90/55	77/51	1.28 / 7°13'	25	29	24	0	19	61	88	50/34	32	50	8	18	16	7	18	16	3
	J	0.00 / 5.50	Olive	5.71	6.40	0.00	0.00	0.00	0	1	0	1	0	0	0	5	0	0	0	0	0	1	1	0	11	1	0	70/40	58/38	0.80/ 3°43'45"	3	0	1	0	2	1	6	3/3	1	11	1	6	1	0	2	6	3
	SA	SUBTOTAL A to J		227.39	324.47	4.08	0.92	10.19	7	7	6	11	5	84	61	134	3	45	5	11	21	42	65	20	217	12	25	N/A	N/A	N/A	129	146	83	6	102	289	489	213/169	145	239	49	97	68	19	50	110	51
FUTURE SCRRA O&M MT & C. SIDINGS	K	56.50 / 57.70	Redlands First Mile	1.20	2.86	0.00	0.44	0.00	0	0	0	0	0	0	0	11	0	0	0	0	0	1	3	0	3	1	0	30/20	30/20		0	2	0	0	4	11	10		4	3		0	0		0	0	0
	L	0.00 / 21.50	Perris Valley	20.77	0.00	0.00	20.77	0.23	0	0	0	0	0	0	3	6	0	0	0	1	1	4	4	0	19	0	0	90/55	60/29	2.20/ 10°45'	2	9	0	0	6	4	31		4	19		4	4			8	4
	SB	SUBTOTAL K to L		21.97	2.86	0.00	21.21	0.23	0	0	0	0	0	0	3	17	0	0	0	1	1	5	7	0	22	1	0	N/A	N/A	N/A	2	11	0	0	10	15	41		8	22		4	4		0	8	4
	SC	SUBTOTAL SA & SB		249.36	327.33	4.08	22.13	10.42	7	7	6	11	5	84	64	151	3	45	5	12	22	47	72	20	239	13	25	N/A	N/A	N/A	131	157	83	6	112	304	530		153	261		101	72		50	118	55
SCRRA O&M BRANCH LINES	M	124.50 / 105.00	Pasadena	18.80	0.00	0.00	21.61	0.00	0	0	0	0	0	0	0	12	0	8	0	0	0	0	0	0	38	0	3	40/40	40/40	0.61/ 15°00'	40	10	5	0	0	0	21		0	16		25	0		0	25	25
	N	403.50 / 404.70	Rialto	2.33	0.00	0.00	0.00	2.61	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	11	0	0	10/10	10/10	1.54/ 3°00'	0	0	1	0	0	0	0		0	0		3	0		0	3	3
	SD	SUBTOTAL M to N		21.13	0.00	0.00	21.61	2.61	0	0	0	0	0	0	0	12	0	8	0	0	4	0	0	0	49	0	3	N/A	N/A	N/A	40	10	6	0	0	0	21		0	16		28	0		0	28	28
	SE	SUBTOTAL SA, SB, SD		270.49	327.33	4.08	43.74	13.03	7	7	6	11	5	84	64	163	3	53	5	12	26	47	72	20	288	13	28	N/A	N/A	N/A	171	167	89	6	112	304	551		153	277		129	72		50	146	83

Col# Note/Remarks

24 Not include service crossings.
28 When two different type of structure is used to support tracks at the same area, it shall be counted as 2 railraod bridges.
29 Overhead structures are counted by DOT numbers. For example, HWY 110 N and S have the same DOT number, it's counted as ONE overhead structure, Overhead railroad bridges without DOT # should also be counted.
35 WIU's need to be compiled and verified by Signal engineers.
36 Signal houses adjacent to grade crossing to be counted as grade crosing signal houses. Signal Engineers to verify.
39 to 41 These include track connections to main line and also to CTC controls sidings. When a crossover is between a SCRRA main track and other than SCRRA track, and are formed by hand throw turnouts, it shall be counted as a track connection.
42 General assumption: if there is a U5 box installed next to derails, the derails is connected to signal system. For Orange Sub, it is assumed that all derails installed as part of MSEP project are connected to the signal system.

SUMMARY OF SCRRA, BNSF, UPRR, NCTD KEY INFRASTRUCTURE ASSETS AND KEY CHARACTERISTICS

Data as of: Sep. 2009
Revised: October 01, 2010

CATEGORY	SEGMENT	MILEPOST LIMITS	SUBDIVISION / BRANCH LINE	ROUTE MILES	SIGNALIZED MAIN TRACK & CONTROLLED SIDING WITH CTC - MILES	SIGNALIZED TERMINAL TRACK WITH CTC - MILES	SIGNALIZED MAIN TRACK WITH TWC AND WITHOUT CTC - MILES	OTHER THAN MAIN TRACK, NON-SIGNALIZED YARDS AND BRANCH LINES - MILES	MAIN TRACK #24 CONCRETE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN TRACK #20 CONCRETE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN TRACK #14 CONCRETE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN TRACK #10 CONCRETE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN TRACK #24 WOOD TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN TRACK #20. #20 EQ WOOD TIE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN TRACK #14 WOOD TIE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN & REV. TERMINAL #10 WOOD TIE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN & REV. TERMINAL #9 WOOD TIE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	MAIN & SIGNALIZED REV. TERMINAL #8 & #8 DSS WOOD TIE TURNOUTS (INCLUDES TURNOUTS IN CROSSOVERS)	AT GRADE TRACKS / DIAMOND CROSSINGS	PASSENGER YARD AND SUPPORT TRACKS #10, #9, #8, #7, & 5.5 EQ TURNOUTS (NOT MAIN TRACK OR CONTROL SIDING)	STATIONS	STATION PLATFORMS	PEDESTRIAN AT GRADE CROSSING AT STATIONS	PUBLIC AT-GRADE CROSSINGS	PEDESTRIAN ONLY PUBLIC AT-GRADE CROSSINGS	PRIVATE VEHICULAR & PEDESTRIAN AT-GRADE CROSSINGS (NOT INCLUDE CROSSINGS AT STATIONS)	MAXIMUM AUTHORIZED PASS./FRT. SPEED (MPH)	AVERAGE PASS./FRT. VELOCITY NOT INCLUDING STOPS (MPH)	MAXIMUM % GRADE / MAXIMUM DEGREE OF CURVE	RAILROAD BRIDGES ONLY (NOT INCLUDE STREETS, HIGHWAYS, & PEDESTRIAN UNDERPASSES)	OVERPASSES	HIGHWAYS, STREETS, & PEDESTRIAN UNDERPASSES	TUNNELS	CONTROL POINTS	POWER SWITCH MACHINES AT TURNOUTS AND DERAILS	SIGNAL LOCATIONS - WAYSIDE SIGNAL MASTS, BRIDGES, CANTILEVERS, DWARFS	WIUS / ANTENNAS AT SIGNAL LOCATIONS	WAYSIDE SIGNAL HOUSES / BUNGALOWS (NOT INCLUDE GRADE CROSSINGS)	GRADE CROSSING SIGNAL HOUSES	TRACK CONNECTIONS FROM CONTROLLED SIDINGS TO MAIN TRACKS WITHOUT DERAILS	TRACK CONNECTIONS TO MAIN TRACK & CONTROLLED SIDINGS WITH HAND THROW TURNOUTS	TRACK CONNECTIONS TO MAIN TRACK & CONTROLLED SIDINGS WITH HAND THROW DERAILS	TRACK CONNECTIONS TO MAIN TRACK & CONTROLLED SIDINGS WITH POWER DERAILS	INDUSTRY, SET OUT AND OTHER SPUR TRACKS WITH DERAILS NOT INTERCONNECTED TO THE SIGNAL SYSTEM	INDUSTRY, SET OUT AND OTHER SPUR TRACK CONNECTIONS TO MAIN TRACK &CONTROLLED SIDINGS WITHOUT DOUBLE POINT DERAILS	TRACK CONNECTIONS TO MAIN TRACK & CONTROLLED SIDING WITHOUT DERAILS
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
SCRRA OPERATED & MAINTAINED YARD AND OTHER TRACKS	O	2.34 / 3.11	CMF Yard	**1.10**	0.00	0.00	0.00	**9.42**												**35**	0	0	0	0	0	**5**	N/A	N/A	N/A	0	**1**	0	0													
	P	2.20 / 1.00	EMF Yard	**0.93**	0.00	0.00	0.00	**4.04**												**15**	0	0	0	0	0	0	N/A	N/A	N/A	**1**	**1**	0	0													
	Q	140.70 / 140.10	Keller Yard	**0.55**	0.00	0.00	0.00	**1.24**												**4**	0	0	0	0	0	0	N/A	N/A	N/A	0	**2**	0	0													
	R	10.69 / 9.91	Riverside Layover Yard East	**0.46**	0.00	0.00	0.00	**0.65**												**2**	**1**	**1**	0	0	0	0	N/A	N/A	N/A	0	**1**	**1**	0													
	S	10.30 / 9.79	Riverside Layover Yard West	**0.92**	0.00	0.00	0.00	**1.26**												**2**	**1**	**1**	0	**1**	0	0	N/A	N/A	N/A	0	**1**	**1**	0													
	T	56.80 / 57.20	SB - IELF	**0.42**	0.00	0.00	0.00	**0.89**												**4**	0	0	0	0	0	0	N/A	N/A	N/A	0	0	0	0													
	U	21.50 / 21.30	PVL South Perris Yard (Future)	**0.36**	0.00	0.00	0.00	**1.10**												**3**	0	0	0	0	0	0	N/A	N/A	N/A	0	0	0	0													
	SF	**SUBTOTAL O to U**		**4.74**	**0.00**	**0.00**	**0.00**	**18.60**												**65**	**2**	**2**	**0**	**1**	**0**	**5**	N/A	N/A	N/A	**1**	**6**	**2**	**0**													
	SG	**SUBTOTAL A to U**		**275.23**	**327.33**	**4.08**	**43.74**	**31.63**												**91**	**49**	**74**	**72**	**289**	**13**	**33**	N/A	N/A	N/A	**172**	**173**	**91**	**6**													
SCRRA OPERATIONS ON NON-SCRRA SHARED TRACK	V	423.10 / 399.60	UPRR Santa Barb. Sub - Moorpark to	**23.50**	**26.93**	0.00	0.00	0.00													**2**		**3**	**16**	0	**9**	**79/60**	**73/57**	**1.00/ 3°00'**	**7**	**4**	**1**	0													
	W	144.40 / 165.50	BNSF San Bernardino - Redono Jct.	**22.30**	**59.40**	0.00	0.00	0.00													**4**		**7**	**8**	0	**1**	**79/50**	**75/49**	**1.0/ 2°08'**	**5**	**7**	**25**	0													
	X	46.60 / 40.60	BNSF San Bernardino - Fullerton to	**5.00**	**9.90**	0.00	0.00	0.00													0		0	**9**	0	0	**60/50**	**59/50**	**0.71/ 1°06'**	**3**	**1**	**2**	0													
	Y	40.60 / 2.20	BNSF San Bernardino - Adwood to	**38.40**	**88.40**	0.00	0.00	0.00													**4**		**8**	**40**	**2**	**1**	**60/50**	**59/50**	**2.02/ 4°46'**	**12**	**19**	**15**	0													
	Z	2.20 / 0.00	Shortway	**1.86**	**1.86**	0.00	0.00	0.00													0		0	**3**	0	**1**	**30/30**	**26/24**	**0.93/ 11°00'**	**2**	**1**	0	0													
	AA	2.10 / 56.70	UPRR Los Angeles	**55.10**	**100.00**	0.00	0.00	0.00													**5**		**9**	**45**	0	0	**79/65**	**72/61**	**1.01/ 8°25'**	**10**	**17**	**25**	0													
	BB	207.40 / 226.40	County Line to Oceanside	**19.00**	**29.00**	0.00	0.00	0.00													**1**		**2**	**2**	0	0	**90/55**	**86/53**	**1.31/ 3°06'**	**11**	**11**	**4**	0													
	CC	226.40 / 268.00	Oceanside to San Diego	**41.30**	**62.70**	0.00	0.00	0.00													**1**		**13**	**30**	0	**3**	**90/55**	**75/50**	**2.20/ 10°23'**	**22**	**27**	**6**	0													
	SH	**SUBTOTAL V to CC**		**206.46**	**378.19**	**0.00**	**0.00**	**0.00**													**17**		**42**	**153**	**2**	**15**	N/A	N/A	N/A	**72**	**87**	**78**	**0**													
	SI	**SUBTOTAL SA & SH**		**433.85**	**702.66**	**4.08**	**0.92**	**10.19**													**59**		**107**	**370**	**14**	**40**	N/A	N/A	N/A	**201**	**233**	**161**	**6**													
	SJ	**SUBTOTAL SA, SD, & SF**		**253.26**	**324.47**	**4.08**	**22.53**	**31.40**													**44**		**65**	**267**	**12**	**33**	N/A	N/A	N/A	**170**	**162**	**91**	**6**													
	SK	**SUBTOTAL BB & CC**		**60.30**	**91.70**	0.00	0.00	0.00													**2**		**15**	**32**	0	**3**	N/A	N/A	N/A	**33**	**38**	**10**	0													

APPENDIX I

List of Preparers

Acknowledgments:

Los Angeles County Metropolitan Transportation Authority

San Bernardino Associated Governments

Southern California Regional Rail Authority

Prepared by:

HDR Engineering Inc.

In Association with:

BA Inc.

PRE Inc.

RSE Inc.

V&A Inc.

APPENDIX J

DEVELOPMENT OF RIDERSHIP FORECASTS FOR THE SAN BERNARDINO INFRASTRUCTURE IMPROVEMENT STUDY

INTRODUCTION:

This Appendix presents a general description of the analysis method used in forecasting the daily ridership on the San Bernardino commuter rail line under different operating assumptions. Ridership demand was forecast for the years 2020 and 2035 using a set of computer-based supply and demand models, developed and maintained by the Southern California Association of Governments (SCAG). The models account for future study area population, projected employment in the Central Business District and other major activity centers, socio-economic characteristics of study area residents, travel time and cost characteristics of the competing highway and transit modes of travel.

HDR obtained the base year (2008) and forecast year (2020 and 2035) models and related inputs from SCAG staff and applied them to simulate and forecast rail ridership on the San Bernardino line for eight different alternatives. A complete description of these alternatives and the estimated ridership results are also discussed in detail in this Appendix.

BRIEF DESCRIPTION OF THE SCAG MODEL

The SCAG Regional Travel Demand Model provides travel forecasting capabilities for the analysis of SCAG's plans and programs. The model is a trip-based model and was Peer Reviewed in May 2011. The model structure and method of application were found to be consistent with the state-of-the-practice in the transportation planning industry. Currently, this model is the only approved model for regional transportation plans and program analysis within the SCAG region.

The SCAG model set simulates travel on the entire highway and transit system in the counties of Ventura, Los Angeles, Orange, San Bernardino, Riverside and Imperial in southern California. The model contains information on service frequency (i.e. how often trains and buses arrive at any given transit stop), routing, intermodal connections, travel time and transit fares for all transit lines. The highway system includes all express highways and principal arterial roadways as well as minor arterial and some local roadways. Outputs of the model set contain detailed information relating to the transportation system. The highway side of the model provides output data on traffic volumes, congested travel speeds, vehicle miles traveled, and average travel times on the roadway links. The transit side provides output information relating to the average weekday ridership on different transit sub modes (rail, local buses, express buses and commuter buses), station boardings, park-and-ride demand, and peak load volumes.

The SCAG model is one of the most sophisticated travel models in the country. It has several sub models and is fully integrated with land use and demographic forecasting models. Shown in **Figure 1** is SCAG's integrated modeling and forecasting framework. As the framework indicates, the modeling process is set up to account for the interactions between transportation network and land use development.

The SCAG model set is of the same type as those used in most large urban areas in North America. It is based on the traditional **Four-Step, sequential process** known as:

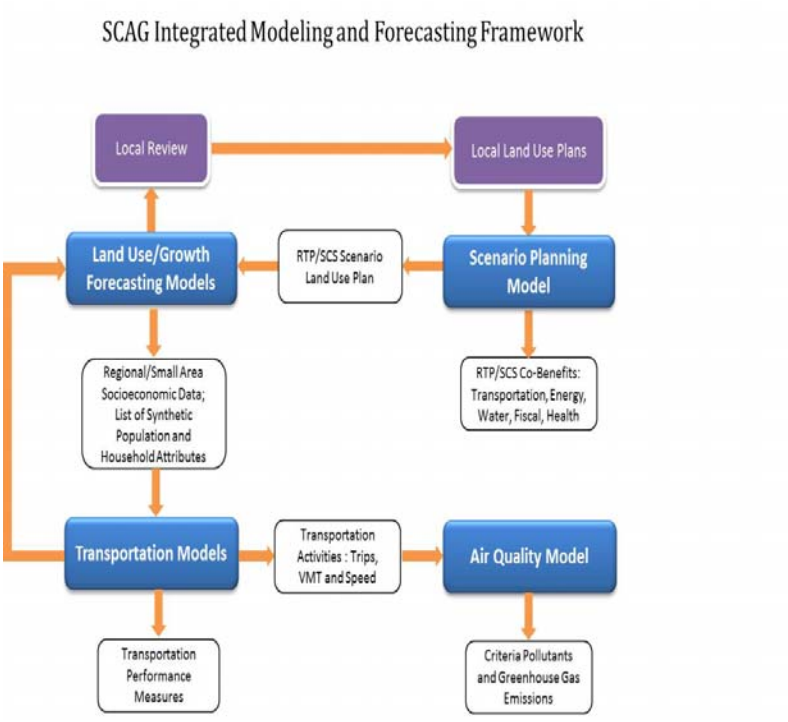
- **Trip Generation;**
- **Trip Distribution;**
- **Mode Choice; and**
- **Trip Assignment.**

This Four Step process is used to estimate the average daily transit ridership, based on the best available population and employment forecasts, projected highway travel conditions (including downtown parking costs) and projected transit service. The geographic area represented in the SCAG model is divided into smaller areas known as **Traffic Analysis Zones (TAZs)**. There are 4,109 Tier 1 TAZs and 11,267 Tier 2 TAZs in the SCAG model. All calculations in the model are performed at the TAZ level. In addition, the model contains 70,000 + street segments, 2000+ transit routes, sufficient information on Seaports (heavy duty trucks), Airports (passenger and cargo trips) and external trips to capture the interaction with other regions and pass-through trips.

The following paragraphs briefly describe the four step process.

Step 1 - Trip Generation: In the first step, the model estimates the number of trips produced in and attracted to each traffic zone. To accomplish this, the model uses estimates of projected population, employment and other socioeconomic and household characteristics of each zone. Trips are divided in to major trip categories such as home-based work trips, home-based non-work trips, social-recreation trips, college /university trips and non-home based trips. A trip generation model run is executed for each trip purpose. The output of the trip generation model feeds into the rest of the model chain.

Figure 1: SCAG's Travel Demand Modeling Process



Step 2 - Trip Distribution: In this step, the distribution model links the trip ends[1] estimated from trip generation to form zonal trip interchanges[2]. The output of the second step is a trip table, a matrix containing the number of trips occurring between every origin-destination zone combination. Trip distribution is performed for each trip purpose. In a system of 4,109 zones, 16.9 million trip origin-destination combinations are possible.

Step 3 - Mode Choice: In this step, the mode choice model allocates the person trips estimated from the trip distribution step to the two primary competing modes; automobile and transit. This allocation estimates the desirability or utility of each choice a traveler faces, based on the attributes of that choice and the characteristics of the individual. The resulting output of the mode choice model is the percentage of trips that use the automobile and transit for each trip interchange.

The transit trips are further divided into two modes of access: walk-access transit trips and drive-access transit trips (park-and-ride trips). The auto trips are further divided into single-occupancy and multiple occupancy trips.

[1] Trip ends represent the point from which the trip is produced or to which it is attracted.
[2] Movements between two zones.

Step 4 - Trip Assignment: In this final step, the model assigns the transit trips to different transit modes such as Local Bus, Express Bus, Commuter Rail etc. The model uses all the available transit paths from one zone to another. This path may involve just one transit mode, such as Local Bus or Commuter Rail or multiple modes, such as Local Bus with a transfer to rail line. Highway trips are assigned to the highway network. Thus, future year traffic volumes on highways and forecasted transit ridership on transit lines can be obtained from the model outputs.

Preparing the Model for Application

Before the model is applied to a specific study, it is first run and adjusted several times until it has replicated the existing highway volumes and transit ridership data at an acceptable level of accuracy. This adjustment is called model **Calibration.** It is done by adjusting several parameters in the model components. For a more specific application such as a transit corridor, additional fine tuning is necessary and that is usually done by modifying how the access[3] to the transit system is represented in the model as well as by adjusting the parameters that determine transit paths. Once the highway and transit components of the model are well calibrated to simulate the current conditions, it is ready for forecasting. The forecast year inputs are then created and the entire model set is run to simulate future year travel.

MODEL APPLICATION METHODOLOGY

By design, the SCAG travel demand model is a regional model. It is well suited to answer questions at the regional and major corridor level. It is also well calibrated to produce transit ridership forecasts at the sub mode level (Local Bus, Express Bus, Commuter Rail). However, the model is not sensitive enough to capture certain types of transit network improvements, such as adding an express train in the peak period, changing an existing train's stop pattern or reducing the travel times between certain segments of the rail alignment. Many of the alternatives that were to be analyzed as part of the San Bernardino study involve such minor network improvements (from a regional context). Therefore, in consultation with SCAG staff, an alternative approach was adopted for this study. In this approach, a two stage process was utilized.

In Stage 1, the future year ridership forecasts for the No Build conditions were determined through the application of the SCAG model. In Stage 2, the impact of subsequent network improvements (i.e. different Build alternatives) were determined by applying elasticity based adjustments to the No Build results.

The elasticity based approach was discussed with SCAG staff in December 2014 and formal approval was obtained prior to conducting the elasticity analysis.

[3] How the passenger gets to the station, either by walking or driving to the park and ride lot.

Definition and Application of Transit Service Elasticity

In economics, price sensitivity to demand is measured using elasticities, defined as the percentage change in consumption resulting from a 1 percent change in price, all else held constant. For example, if the elasticity of transit ridership with respect to transit fares is –0.35, this means that each 1.0 percent increase in transit fares will most likely cause a 0.35 percent reduction in ridership, so a 10 percent fare increase will cause ridership to decline by about 3.5 percent. The converse is also true, i.e., a 10 percent reduction in fares can cause a 3.5 percent increase in ridership. The negative sign indicates the reciprocal behavior of the demand and supply variables.

Similar to fare elasticities, there are **service elasticities** that can be applied to measure the ridership impact of improved or reduced transportation service. For this study, a service elasticity of -0.50 was used to measure the ridership impact of adding express trains and modifying the overall transit times on the San Bernardino rail line. This value falls in the range often seen in the literature[4] and is also quite consistent with empirical observations made in Boston on their commuter rail system.

For each alternative developed in this study, the percent improvement in rail service (headways, travel time improvements) relative to No Build alternative was determined based on the proposed operating plans. Then, the elasticity factor mentioned above was applied to the No Build model results to generate the ridership forecasts for different alternatives.

ALTERNATIVES MODELED

As part of the San Bernardino Infrastructure Improvement Study, eight alternatives were analyzed for their ridership potential. They are:

Alternative A (No Build 2020): The existing Metrolink San Bernardino Line to include the current 42 train schedule in addition to the Downtown San Bernardino Passenger Rail Project (DSBPRP). DSBPRP is the extension to the new San Bernardino Transit Center at E Street. The forecast year is 2020. This alternative essentially represents the No Build condition in 2020. The No Build alternative provides a benchmark against which the ridership potential of all the Build alternatives will be compared and evaluated.

Alternative B: Assumes that the DSBPRP is constructed and one current “all stop” roundtrip local train is converted to full express service that includes stops at the Rancho Cucamonga and Covina Metrolink stations. The forecast year is 2020.

[4] Victoria Transport Policy Institute, Vtpi.org and TCRP Report 95-Transit Cooperative Research Program, Title: Transit Scheduling and Frequency: Traveler Response to Transportation System Changes

Alternative C: Assumes that the DSBPRP is constructed and two current "all stop" roundtrip local trains are converted to full express service that includes stops at the Rancho Cucamonga and Covina Metrolink stations. The forecast year is 2020.

Alternative D: The existing Metrolink San Bernardino Line with the current 42 train schedule that includes the DSBPRP and Redlands Passenger Rail Project (RPRP) extension to University of Redlands in 2020. Service on the RPRP will utilize 30 minute headways in the peak and one hour headways in the off peak. The RPRP will be a stand alone system where only the express trains will traverse from Los Angeles to the Downtown Redlands Station and a transfer between systems will have to occur at the San Bernardino Transit Center (SBTC) for passengers on non-express trains.

Alternative E: Assumes the construction of the Lone Hill Avenue to CP White double track project and includes one additional express round trip train for a total of 44 trains in 2020. The model will include the DSBPRP and RPRP extensions since SANBAG believes both extension projects will be constructed by then.

Alternative F: Assumes the construction of the Lone Hill Avenue to CP White and CP Rancho to CP Lilac Double Track Projects where Metrolink will be running 48 trains. In this alternative, three additional round trip express trains relative to the current train schedule will be added and the model will include the DSBPRP and RPRP. The forecast year is 2020.

Alternative G: Assumes that both double track projects have been constructed and no additional service has been added relative to 2020 operations. The model will include the DSBPRP and RPRP. In other words, this alternative is identical to *Alternative F* except the forecast year is 2035.

Alternative H: Assumes that both double track projects have been constructed and additional service has been accomplished by adding trains during peak and non-peak periods. The total number of trains in this alternative would be 56. The model will include the DSBPRP and RPRP projects. The forecast year is 2035.

RIDERSHIP RESULTS

Base Year (2008) Results

As part of the base year (2008) model calibration, the peak and off-peak headway assumptions and station to station travel times were thoroughly examined and updated in the Base year SCAG model. The base year model with updated inputs generated ridership that was about 22 percent lower than the observed ridership counts on the San Bernardino line. In consultation with SCAG staff, a decision was made to post process the model results by accounting for the model under estimation. This post processing method involves calculating the difference between the passenger boardings estimated

by the model and the observed boardings for each station on the San Bernardino line and applying those differences directly to the model generated numbers for the base year as well as the forecast year. Shown in **Table 1** are the adjusted model results of the base year model. As seen, the total line ridership in the 2008 model was 10,600 boardings.

Table 1: Base Year (2008) Model Results

Station Name	Weekday Boardings estimated by model
San Bernardino Transit Center	0
San Bernardino	475
Rialto	275
Fontana	350
Rancho Cucamonga	1,100
Upland	500
Montclair	450
Clairmont	375
Pomona	400
Covina	925
Baldwin Park	400
El Monte	600
Cal State L.A.	650
LA Union Station	4,100
Total Line Ridership	**10,600**

Source: HDR Engineering

2020 No Build Results (Alternative A)

The calibrated base year model was applied using 2020 model inputs and the same post processing adjustments that were made for the base year results were carried forward for the 2020 model results. Shown in **Table 2** are the 2020 ridership results for the No Build scenario. As seen, the total ridership on the San Bernardino line is projected to increase from 10,600 in 2008 to 15,875 in 2020. This increase may appear somewhat excessive in light of the current ridership on the line but it should be noted that several unanticipated factors such as the economic recession, service cuts, increase in telecommuting and high fluctuations in gas prices have caused a wide variation in demand on this line in recent years. For example, just before the 2008 recession, this line carried nearly 14,000 riders a day. In 2010 and 2011, ridership dropped to 11,000 -12,000 range and in the middle of 2012, it increased to nearly 13,000.

The travel model is not designed to capture the impacts of unanticipated factors such as those mentioned above. It should be noted the ridership estimates produced by the model heavily depends on the population and employment projections, estimated level of future congestion on the highways, downtown parking costs and transit levels of service. Noting that the economic recovery

from the 2008 recession has finally begun and is improving at a healthy rate, it is likely the full ridership impact of the projected population and employment growth will eventually be felt by the forecast year. Of the 15,875 daily boardings projected for the No Build scenario, 875 would be on the Express train and the remaining 15,000 on the local trains.

Table 2: 2020 No Build Ridership Results

Station Name	Weekday Boardings estimated by model	
	Local Train	Express train
San Bernardino Transit Center	750	100
San Bernardino	450	75
Rialto	375	-
Fontana	550	-
Rancho Cucamonga	1,000	250
Upland	650	-
Montclair	575	-
Clairmont	500	-
Pomona	600	-
Covina	975	150
Baldwin Park	625	-
El Monte	1,050	-
Cal State L.A.	1,300	-
LA Union Station	5,600	300
Total	**15,000**	**875**
2020 No Build Total Line Ridership	**15,875**	

Ridership Results for Alternative Scenarios

Alternatives B and C: *Conversion of local service to express service*

For Alternatives B and C, the conversion of local service to express service was modeled using the SCAG model. The ridership results of those two alternatives were found to be reasonable based on the magnitude of ridership diversion from local train to express service. Therefore, no further adjustments using elasticity factor were made to these two alternatives. However, please note SCAG is in the process of updating and recalibrating the commuter rail component of their model. Once those improvements have been incorporated, it may be necessary to update these forecasts by rerunning these alternatives.

In *Alternative B*, one local train service is converted to an express service with stops at the Rancho Cucamonga and Covina Metrolink stations. In *Alternative C,* two local trains are converted to two express trains with stops at the Rancho Cucamonga and Covina Metrolink stations. As presented in **Table 3**, in both these alternatives, the model results indicate the local trains would lose some ridership for two reasons:

- For those passengers currently boarding the local trains at San Bernardino Transit Center, San Bernardino station, Rancho Cucamonga and traveling directly to L.A. Union Station, the increase in express service provides a faster alternative, thus causing some ridership to shift from local to express
- The reduction in local service (one or two less trains) would result in minor ridership loss

The overall results indicate there would be a slight reduction in the total ridership on this line for both *Alternative B* and *C* when compared to the *No Build* alternative. However, the reduction is so minor, it can be considered within the margin of error of the modeling process. Therefore, for all practical purposes, these two alternatives will not result in any ridership changes when compared to the *No Build* alternative.

Alternative D: *42 Train scenario with RPRP in place*
Alternative D is identical to the No Build with one exception. The Redlands Passenger Rail Service is assumed to be in place as a stand alone project. Transfer opportunities are available from RPRP to SB line at the E Street station, although peak headways differ between the services (every 20 minutes for the San Bernardino Line and every 30 minutes for the Redlands service). This alternative also assumes the current express train is interlined with RPRP line. In this case, as shown in **Table 3**, the ridership on the local and express service is projected to increase modestly. The total line ridership would be about 16,300 a day.

Alternatives E and F: *Addition of two and three Express train sets*
Alternative E involves providing one additional express train service using two additional trains. It assumes the double tracking project between Lone Hill Ave and CP White will be completed and the travel time and operational benefits resulting from that improvement will be realized. Both the RPRP project and E Street extension are assumed to be completed. As shown in **Table 4**, our model results indicate this alternative would carry almost 1,000 more riders on the express train when compared to the *No Build* alternative. As seen in the previous alternatives, there would be some diversion of trips from local service to the enhanced express service. The overall line ridership is estimated to be about 16,500.

Alternative F involves adding six additional trains (relative to No Build) and providing three additional express train services. It assumes that both the Lone Hill to CP White and CP Rancho to CP Lilac double tracking projects will be completed with the resulting operational and travel time advantages. Both the RPRP project and E Street extension are assumed to be completed. Our model results indicate this alternative would carry about 1,300 more riders **(Table 4)** on the express train when compared to the *No Build* alternative. As seen in the previous alternatives, there would be some diversion of trips from local service to

the enhanced express service. The overall line ridership is estimated to be about 16,550. It should be noted that one of the three additional express trains operates very early in the morning (@3:45 am) and thus does not really add to the improvement of peak period service. As a result, the ridership increase for this alternative, in comparison to *Alternative E* is negligible.

Although ridership increases for both Alternatives E and F may be interpreted as slight, it is important to note that both infrastructure improvement projects (Lone Hill to CP White and CP Rancho to CP Lilac) are required to be able to operate the 56 daily train service plan needed to support the expected ridership growth on the line by 2035.

Table 3: 2020 Ridership Results for Alternatives B, C and D

	Alternative A No Build 2020		Alternative B Convert 1 local to 1 Exp		Alternative C Convert 2 local to 2 Exp		Alternative D Interline Exp service with RPRP	
Network Assumptions →	No Double tracking E St extension in place		No Double tracking E St extension in place		No Double tracking E St extension in place		No Double tracking E St extension in place RPRP in place Exp train interlined	
No: of trains→	42 Trains		42 Trains		42 Trains		42 Trains	
STATION	Local ridership	Express ridership	Local ridership	Express ridership	Local ridership	Express ridership	Local ridership	Express ridership
San Bernardino Transit Center	750	100	700	150	650	200	875	125
San Bernardino	450	75	425	100	300	150	450	75
Rialto	375	-	350	-	300	-	375	-
Fontana	550	-	550	-	500	-	550	-
Rancho Cucamonga	1,000	250	925	350	850	400	1,000	250
Upland	650	-	625	-	600	-	650	-
Montclair	575	-	550	-	525	-	575	-
Clairmont	500	-	475	-	450	-	500	-
Pomona	600	-	575	-	550	-	600	-
Covina	975	150	925	225	900	350	975	175
Baldwin Park	625	-	600	-	575	-	625	-
El Monte	1,050	-	1,000	-	950	-	1,050	-
Cal State L.A.	1,300	-	1,250	-	1,200	-	1,300	-
LA Union Station	5,600	300	5,350	700	5,200	900	5,600	550
Total	***15,000***	***875***	***14,300***	***1,525***	***13,550***	***2,000***	***15,125***	***1,175***
Line Ridership	**15,875**		**15,825**		**15,550**		**16,300**	
Ridership increase relative to 2020 No Build			**-0.31 %**		**-2.05%**		**2.68%**	

Source: HDR Engineering

Alternatives G and H: *Addition of three Express train sets and off-peak service improvement*

Alternative G is identical to *Alternative F* except for the fact the forecast year is 2035. Our model results indicate the 2035 ridership for *Alternative G* would be about 18,500 boardings a day of which 16,100 would be on the local train service and 2,400 would be on the express train service. In order to asses the incremental performance of *Alternatives G* and *H*, we estimated the ridership projection for the No Build alternative in 2035. As shown in **Table 5**, the No Build[5] alternative is projected to carry a total of 17,800 trips in 2035. When compared to 2035 No Build, *Alternative G* would carry 4 % higher ridership.

Alternative H is identical to *Alternative G* except the off-peak period headways are improved using six additional trains and one of the express trains is interlined with the RPRP, providing a one-seat ride from Redlands University station to LA Union station. In this alternative, a total of 56 trains were assumed to operate. Our model results indicate the ridership on this alternative would be about 20,500 boardings a day, of which 17,850 would be on the local service and 2,650 would be on the express service. The ridership in this alternative is projected to be about 15.3 percent higher than the 2035 No Build.

[5] The 2035 No Build alternative assumes the RPRP would be in place in addition to the E Street extension of the San Bernardino line. It however, does not assume any double tracking improvements.

Table 4: 2020 Ridership Results for Alternatives E and F

	Alternative A No Build 2020		Alternative E Add 1 express train		Alternative F Add 3 express trains	
Network Assumptions →	**No Double tracking E St extension in place**		**Lone Hill Ave to CP White Double tracking in place E St extension in place RPRP in place**		**Lone Hill Ave to CP White & CP Ranch To CP Lilac double tracking in place E St extension in place RPRP in place**	
No: of trains →	**42 Trains**		**44 Trains**		**48 Trains**	
STATION	**Local ridership**	**Express ridership**	**Local ridership**	**Express ridership**	**Local ridership**	**Express ridership**
San Bernardino Transit Center	750	100	650	150	600	175
San Bernardino	450	75	400	100	400	150
Rialto	375	-	400	-	400	-
Fontana	550	-	600	-	600	-
Rancho Cucamonga	1,000	250	950	350	850	500
Upland	650	-	650	-	650	-
Montclair	575	-	600	100	600	100
Clairmont	500	-	500	-	500	-
Pomona	600	-	600	-	600	-
Covina	975	150	950	200	950	200
Baldwin Park	625	-	650	-	650	-
El Monte	1,050	-	1,100	-	1,100	-
Cal State L.A.	1,300	-	1,150	150	1,050	175
LA Union Station	5,600	300	5,500	750	5,450	850
Total	***15,000***	***875***	***14,700***	***1,800***	***14,400***	***2,150***
Line Ridership	**15,875**		**16,500**		**16,550**	
Ridership increase relative to 2020 No Build			**3.94 %**		**4.25%**	

Source: HDR Engineering

Table 5: 2035 Ridership Results for Alternatives G and H

	Alternative A No Build 2035		Alternative G Add 3 express trains		Alternative H Add 3 express trains	
Network Assumptions →	**No Double tracking E St extension in place RPRP in place**		**Lone Hill Ave to CP White Double tracking in place E St extension in place RPRP in place**		**Lone Hill Ave to CP White, CP Ranch To CP Lilac double tracking in place E St extension in place Off-peak service improved RPRP in place. One exp train interlined**	
No: of trains →	**42 Trains**		**48 Trains**		**56 Trains**	
STATION	**Local ridership**	**Express ridership**	**Local ridership**	**Express ridership**	**Local ridership**	**Express ridership**
San Bernardino Transit Center	850	125	725	200	750	225
San Bernardino	500	100	400	150	500	175
Rialto	425	0	450	-	500	-
Fontana	600	0	675	-	750	-
Rancho Cucamonga	1125	275	950	550	1,050	600
Upland	725	0	725	-	800	-
Montclair	650	0	675	100	750	100
Clairmont	550	0	550	-	600	-
Pomona	675	0	675	-	750	-
Covina	1100	175	1,050	250	1,150	275
Baldwin Park	700	0	725	-	800	-
El Monte	1175	0	1,225	-	1,350	-
Cal State L.A.	1450	0	1,175	200	1,300	225
LA Union Station	6275	325	6,100	950	6,800	1,050
Total	***16,800***	***1,000***	***16,100***	***2,400***	***17,850***	***2,650***
Line Ridership	**17,800**		**18,500**		**20,500**	
Ridership increase relative to 2035 No Build			**4 %**		**15.3%**	

Source: HDR Engineering

Sources of Ridership

As discussed earlier, in each alternative, there would be some diversion of trips from local to express as improvements are made in express train service levels. However, the overall increase in line ridership, relative to the No Build scenario would be as a result of diversion from auto mode to transit mode. This is mainly because there is no competing line-haul service to the San Bernardino line. As shown in **Table 6**, the new transit trips (those diverted from auto mode) may vary from 425 to 2,700, depending on the alternative. These new transit trips represent a reduction in auto trips on the highway system. This reduction will translate to some reductions in vehicle miles of travel on the highway system which result in some reductions in air pollution. Since the elasticity-based approach we used in this study does not provide detailed travel statistics such as average trip lengths for auto and trail trips, we have not been able to quantify the reduction in air pollution in this analysis.

Table 6: Trips Diverted from the Highway System (New Transit Trips)

Alternative	Forecast Year	No Build Ridership	Build Ridership	New Trips (diverted from the highway system)
A	2020	15,875	-	-
B	2020	15,875	15,825	0
C	2020	15,875	15,550	0
D	2020	15,875	16,300	425
E	2020	15,875	16,500	625
F	2020	15,875	16,550	675
G	2035	17,800	18,500	700
H	2035	17,800	20,500	2,700

Source: HDR Engineering

Major Conclusions:

The major findings from the ridership analysis are summarized below:

- Based on the projected population & employment forecasts, levels of future highway congestion, transit levels of service, downtown parking costs etc., for the southern California region, the ridership on San Bernardino Line is expected to reach about 15,875 trips a day by 2020.

- Converting one or two local service trains to express is not expected to significantly increase or decrease the overall ridership on San Bernardino line.

- Assuming both the DSBPRP and RPRP projects are in place by 2020, but without double tracking improvements, additional train service and/or the interlining of the current express train with RPRP, the ridership on the San

Bernardino line in 2020 would be around 16,300 passenger trips a day, which represents a 2.7 percent increase from the 2020 No Build scenario.

- Assuming that the DSBPRP and RPRP projects and the Lone Hill to CP White double tracking improvements are in place by 2020, and adding one express train service (44 train scenario), the ridership on San Bernardino line in 2020 would be around 16,500 passenger trips a day, which represents about 3.8 percent increase from the 2020 No Build scenario.

- Assuming that the DSBPRP and RPRP projects, the Lone Hill to CP White and CP Rancho to CP Lilac double tracking improvements are all in place by 2020, and adding three express train services (48 train scenario), the ridership on San Bernardino line in 2020 would be around 16,550 passenger trips a day which represents about a 4.0 percent increase from the 2020 No Build scenario.
  In 2035, the projected ridership in this scenario would be around 18,500 passenger trips a day, which represents about a 4.0 percent increase from the 2035 No Build scenario.

- Assuming that the DSBPRP and RPRP projects, the Lone Hill to CP White and CP Rancho to CP Lilac double tracking improvements are all in place by 2035, and adding three express train service (one of which is interlined with RPRP) and improving off-peak headways (56 train scenario), the ridership on San Bernardino line in 2035 is expected to reach around 20,500 passenger trips a day, which represents about a 15.3 percent increase from the 2035 No Build scenario..