Addendum No. 3

to

Final Environmental Impact Report for Metro Gold Line Foothill Extension - Azusa to Montclair (SCH 2010121069)

Evaluating Minor Design Changes of the Project Azusa to Montclair

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Metro Gold Line Foothill Extension Construction Authority
March 2016

Chapter 1 – Introduction

1.1 ROLE OF THE ADDENDUM

The Metro Gold Line Foothill Extension Construction Authority (Authority) certified a Final Environmental Impact Report (2013 FEIR) for the Metro Gold Line Foothill Extension - Azusa to Montclair Project (Approved Project) in March 2013 in accordance with the requirements of the California Environmental Quality Act (CEQA). Addendum No. 1 to the 2013 FEIR addressed project refinements associated with grade separation of Garey Avenue in Pomona was adopted by the Authority Board in May 2014. Addendum No. 2 to the 2013 FEIR addressing project refinements associated with construction of the Project in two phases and minor technical changes to the engineering design was adopted by the Authority Board in December, 2014.

The Authority is an independent transportation planning, design and construction agency created in 1998 by the California State Legislature, SB 1847 (later updated in 2011-AB706 and 2012-AB 1600). The agency was created to immediately resume design, contracting and construction of the Los Angeles to Pasadena Metro Gold Line (formerly the Pasadena Blue Line) which had been suspended by the Los Angeles County Metropolitan Transportation Authority (Metro) earlier that same year. The same legislation that created the Authority also dictated its role to plan, design and construct any "fixed mass transit guide way eastward to Montclair." The Authority is therefore responsible for managing the design and construction of the project. Metro will have certain oversight regarding the design and construction in conjunction with the Authority, and operate the Gold Line. In March 2013 Authority Board of Directors also approved a preferred alternative for the Project. The 2013 FEIR is available for review on the Authority's website at http://foothillgoldline.org.

The Authority proposes to approve minor technical changes to the engineering design of the Project. Pursuant to CEQA (Public Resources Section 21166) and CEQA Guidelines Section 15164, this Addendum documents the proposed changes to the Project.

This Addendum No. 3 evaluates whether implementation of the proposed changes to the Project would result in new significant impacts or an increase in the severity of previously identified significant environmental effects, or would otherwise require the preparation of a supplemental or subsequent EIR under CEQA. CEQA provides, in Public Resources Code Section 21166, that once an EIR has been prepared for a project, no subsequent or supplemental EIR is to be prepared unless one of the following circumstances occurs:

> a) Substantial changes are proposed in the project that will require major revisions to the environmental impact report;
>
> b) Substantial changes have occurred with respect to the circumstances under which the project is being undertaken, which will require major revisions to the environmental impact report; or
>
> c) New information, which was not known and could not have been known at the time the environmental impact report was certified as complete, has become available.

CEQA Guidelines Sections 15162 and 15163 further clarify the requirements for evaluating proposed changes to a project. Generally, the guidelines state that, once an EIR has been certified, no further EIRs will be prepared unless there are substantial changes in the project, substantial changes in circumstances, or new information of substantial importance, all of which indicate that there will be either a new significant adverse environmental impact or a substantially more severe adverse environmental impact than previously identified.

The CEQA Guidelines Section 15164 also indicate that the addendum need not to be circulated for public review, but "can be included in, or attached to the final EIR", and that "the decision making body shall consider the addendum with the final EIR prior to making a decision on the project". This Addendum No.

3 is an informational document presenting an evaluation of potential environmental impacts of the proposed project changes to be used by decision makers. The Authority, as the Lead Agency under CEQA, will consider the information provided in this Addendum No. 3 prior to making a decision whether or not to approve the proposed modifications to the Approved Document.

1.2 ORGANIZATION OF THE ADDENDUM

The information in this Addendum is organized as follows:

Chapter 1: Introduction, which identifies the role and organization of the Addendum.

Chapter 2: Proposed Project Modifications, which describes the Project design refinements.

Chapter 3: Environmental Evaluation, which presents the evaluation of potential environmental impacts of the proposed design refinements.

Chapter 4: List of Preparers, which identifies the lead personnel involved in preparing the Addendum.

Appendices

Appendix A: Plan and Profiles Set (February 2016)

Appendix B: Updates to the Foothill Gold Line Extension Azusa to Montclair Noise and Vibration Assessment (February 2016)

Chapter 2 - Project Modifications

2.1 APPROVED PROJECT

The Approved Project is a 12.3-mile extension of the Metro Gold Line Light-Rail Transit (LRT) alignment to the east, with service from the Azusa-Citrus Station to the Montclair Transcenter. It is a dual track system with overhead catenary lines for power. The project includes six stations: Glendora, San Dimas, La Verne, Pomona, Claremont, and Montclair as depicted on Figure 1. Each station includes parking facilities (surface or structures) for riders arriving by car. The LRT track would be generally at-grade and would be generally within the existing Authority right-of-way in a corridor that is shared with Burlington Northern Santa Fe (BNSF) and, in part, Metrolink trains. East of the City of Pomona, the LRT tracks would be placed adjacent to tracks currently used by BNSF Railway freight trains and Metrolink commuter trains.

There are 28 existing at-grade road crossings in the corridor. New grade separations are proposed at five locations including two new flyover structures, one at Lone Hill Avenue in Glendora and one at Towne Avenue in Pomona, and three new bridges, one at Route 66 in Glendora (new LRT bridge and BNSF freight replacement bridge) one at Monte Vista Avenue in Montclair (new LRT bridge at an existing grade separated crossing), and one LRT bridge over Garey Avenue in Pomona.

In addition, the Authority proposes to pursue funding for two potential grade separations that were included as at-grade crossings in the Approved Project (Foothill Boulevard and Grand Avenue in Glendora and South Indian Hill Boulevard in Claremont). These modifications would be implemented only if funding is secured and if the two grade separations are requested by the municipalities in which they are located. If funding is not obtained for the two potential grade separations, or if the municipalities do not request the modifications, the crossing will be constructed at grade as described in the Approved Project.

Station parking would be provided at six parking facilities, five of which would be new parking structures:

- Glendora Station - new parking structure: 420 spaces
- San Dimas Station - new parking structure: 450 spaces
- La Verne Station - new parking structure: 600 spaces
- Pomona Station - new parking structure: 750 new spaces
- Claremont Station - new parking structure: 1,260 spaces
- Montclair Station - existing surface lot: 1,600 spaces

Station parking facilities in Glendora, San Dimas, La Verne, and Pomona would require land acquisitions as described in the 2013 FEIR.

Figure 1: Approved Build Alternative

2.2 PROPOSED PROJECT MODIFICATIONS

The Authority has identified design modifications that are necessary for specific elements of the Approved Project (Project Modifications), including LRT track geometry and features such as track crossover locations. The minor changes from the Approved Project include the following:

- Modifying access along Ada Avenue in Glendora. The west leg of Ada Avenue will be closed and access will be revised on the east. An illustration of the closure and revised access is provided in Figure 2.

- Modifying the La Verne parking structure from a six-level structure approximately 55 feet above grade to a three-level structure approximately 40 feet above grade. The total number of available parking spaces would remain the same as in the FEIR at 600. Pedestrian access from the parking structure to the La Verne LRT station would be via a pedestrian underpass instead of at grade over the LRT tracks as described in the FEIR. Vehicular access to the parking structure would continue to be provided from Arrow Highway at the same access location as indicated in the 2013 FEIR. The revised site plan for the La Verne parking structure and station access is provided in Figures 3a and 3b.

- Modifying access for Los Angeles Department of Water and Power (LADWP) to existing electrical transmission lines that run east-west on the south side of I-210 north of the San Dimas Wash. An alternate access point will be provided for LADWP via the access road around the Louie Pompei Memorial Sports Complex and a new bridge approximately 75 feet in length over the San Dimas Wash. The bridge would clear the flood control right-of-way associated with the wash and stay within City of Glendora property. Project refinement in the area will also include relocating a TPSS from the east side of the right-of-way to the west side of the right-of-way as illustrated in Figure 4.

- Modifying the alignment in various locations (including relocation of associated TPSS locations), as summarized in Table 1 below. All of the alignment shifts (to maximize the desired 30 foot track separation between LRT and freight and to improve ride-ability of the roadway grade crossings) are illustrated on the advanced conceptual engineering plans provided as Appendix A. As a result of alignment modifications, the Glendora Station will be rotated slightly to accommodate these shifts. Alignment modifications that move project features closer to noise and/or vibration-sensitive receptors will include one or more additional design features such as special trackwork (low impact frogs), sound insulation, sound walls or enclosures, ballast mats, and/or floating slabs as necessary to reduce noise and vibration effects so that no new or increased significant impacts will occur.

- Relocating eight crossover locations, described below, and the addition of a maintenance-of-way (MOW) siding between White Avenue and Fulton Road in La Verne. The MOW siding will be added south of the LRT tracks within the Approved Project right-of-way. The MOW siding will be used only on an as-needed basis when required for operational necessity. All of the relocated crossover locations are illustrated on the advanced conceptual engineering plans provided as Appendix A. Where crossovers are located close to noise and/or vibration-sensitive receptors, designs will include special trackwork (low impact frogs), sound insulation, sound walls, ballast mats, and/or floating slabs, as necessary to reduce noise and vibration effects so that no new or increased significant impacts will occur. Crossover locations would be as follows:

    - Crossover Location #1: between station 1490 and 1496
    - Crossover Location #2: between station 1579 and 1585
    - Crossover Location #3: between station 1708 and 1714
    - Crossover Location #4: between station 1796 and 1802
    - Crossover Location #5: between station 1871 and 1885
    - Crossover Location #6: between station 1988 and 1990
    - Crossover Location #7 (double crossover): between station 2066 and 2072
    - Crossover Location #8 (double crossover): between station 2078 and 2082

- Modifying the Claremont LRT station by shifting it approximately 300 feet to the east and converting it to a center platform station. Modifying the previously proposed Metrolink station platform from side platforms to a center platform. Constructing a pedestrian underpass to provide direct station access from the Claremont parking structure to the Metrolink platform.

In addition to the minor changes described above, the Authority plans to pursue funding for two potential grade separations that were included as at-grade crossings in the Approved Project. These changes would only be constructed if funding can be secured and if they are requested by the municipalities in which they are located. These additional changes would include:

- Modifying the previous at-grade crossing at Foothill Boulevard and Grand Avenue in Glendora to a grade separated crossing with the LRT being on a bridge structure over the intersection and the freight tracks relocated to the south and remaining at grade. The grade-separated structure would be approximately 30 feet tall from the ground to the top of the bridge, providing at least 16.5 feet of clearance under the bridge. Walls on either side of the intersection would be built to support the structure and transition the tracks from the original ground to the bridge structure. The new bridge structure would span a distance of approximately 250 feet across the intersection. Graphic illustration of the new bridge is provided in Figure 5. Detailed information on the alignment and profile is included on the advanced conceptual engineering plans included as Appendix A.

- Modifying the previous at-grade crossing at South Indian Hill Boulevard in Claremont to a grade separated crossing. The grade-separated bridge structure would be approximately 30 feet tall from the ground to the top of the bridge, providing at least 16.5 feet of clearance under the bridge. Walls on either side of Indian Hill Boulevard would be built to support the structure. The new bridge structure would span a distance of approximately 150 feet across South Indian Hill Boulevard. Graphic illustration of the new bridge is provided in Figure 6. Detailed information on the alignment and profile is included on the advanced conceptual engineering plans included as Appendix A.

All other features of the Approved Project would remain the same as described in the 2013 FEIR and subsequent Addenda. Addendum No. 3 evaluates the impacts of the Approved Project modifications identified above. None of the modifications constitute substantial changes to the Approved Project, would result in new significant impacts, or contribute to previously identified significant impacts that would be substantially more severe than shown in the 2013 FEIR. Accordingly, the Authority finds that the preparation of an Addendum pursuant to CEQA Guidelines Section 15164 is appropriate, and that the proposed changes do not trigger a requirement to prepare a supplemental or subsequent EIR.

Figure 2: Ada Avenue Intersection

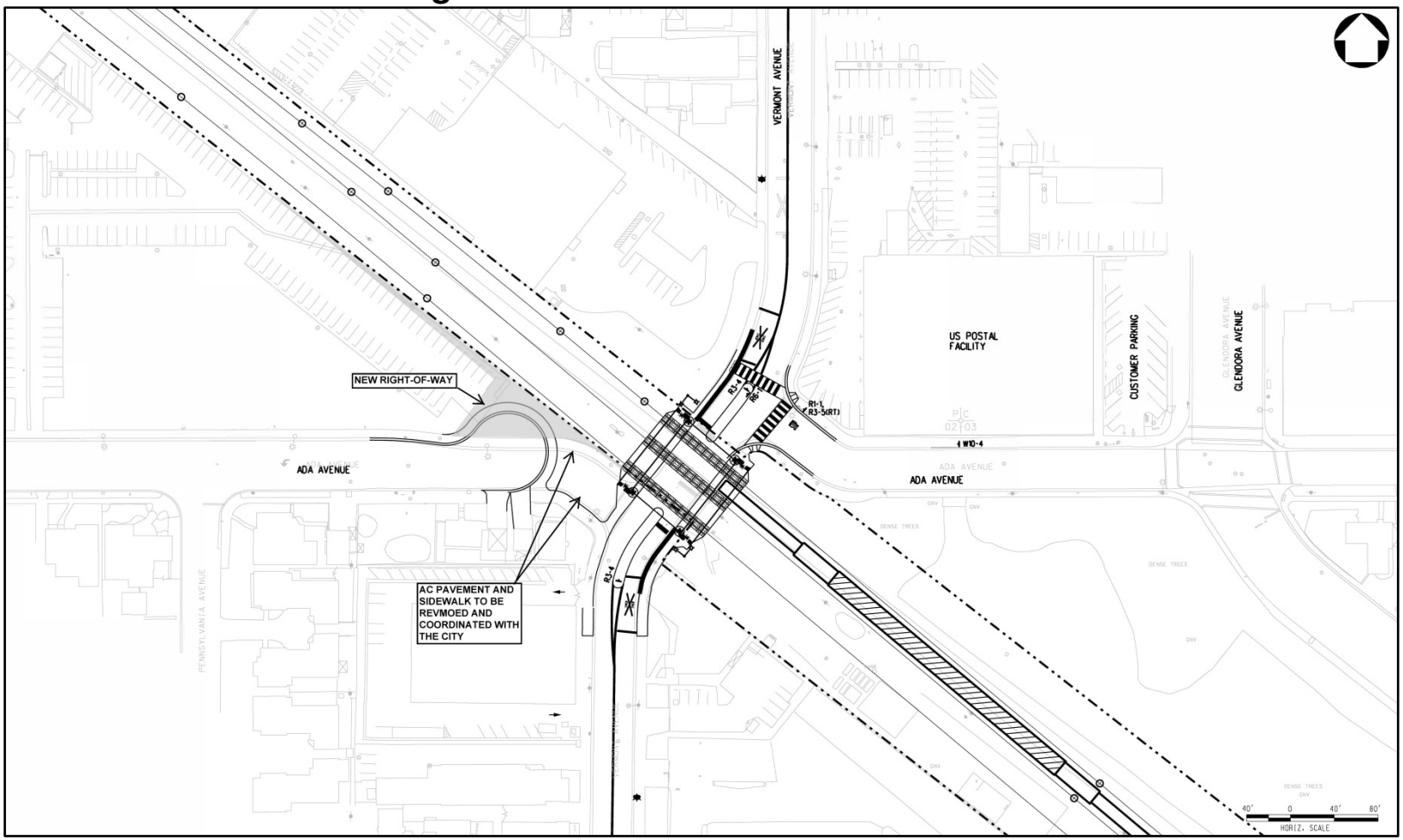


Figure 3a: La Verne Parking Structure (overview)

GROUND FLOOR (NOT INCLUDING RAMP)	89
GENERAL ADA PARKING SPACES: 10	
ADA VAN PARKING SPACES: 2	
2ND LEVEL INCLUDING RAMP UP	179
3RD LEVEL INCLUDING RAMP UP	179
ROOF DECK (INCLUDING RAMP UP TO ROOF)	146
TOTAL PARKING STRUCTURE SPACES	593
KISS AND RIDE SPACES	7
TOTAL PARKING SPACES	600

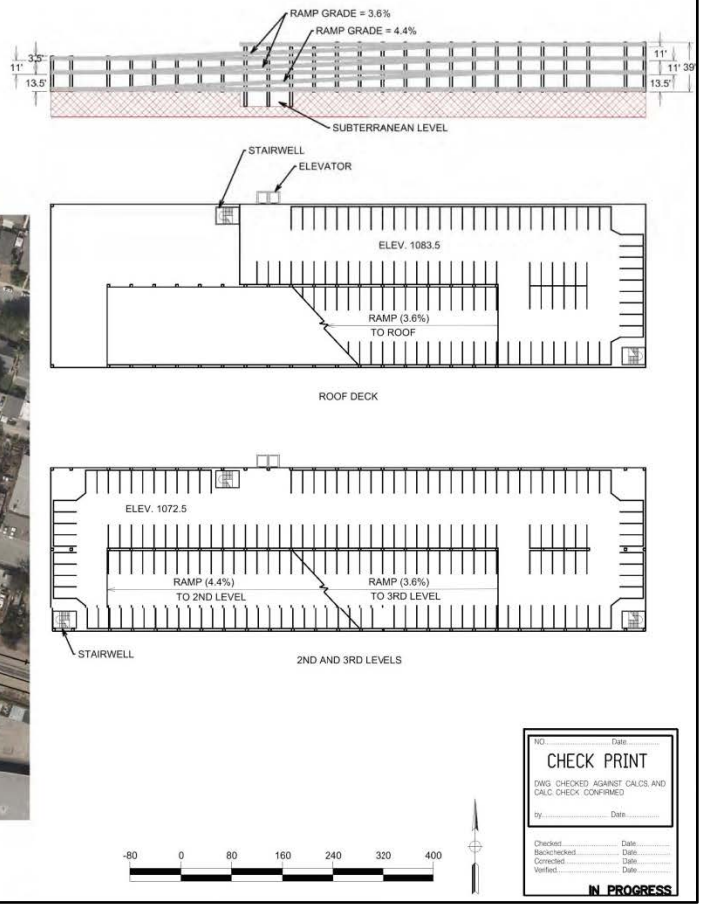


Figure 3b: La Verne Parking Structure (pedestrian undercrossing)

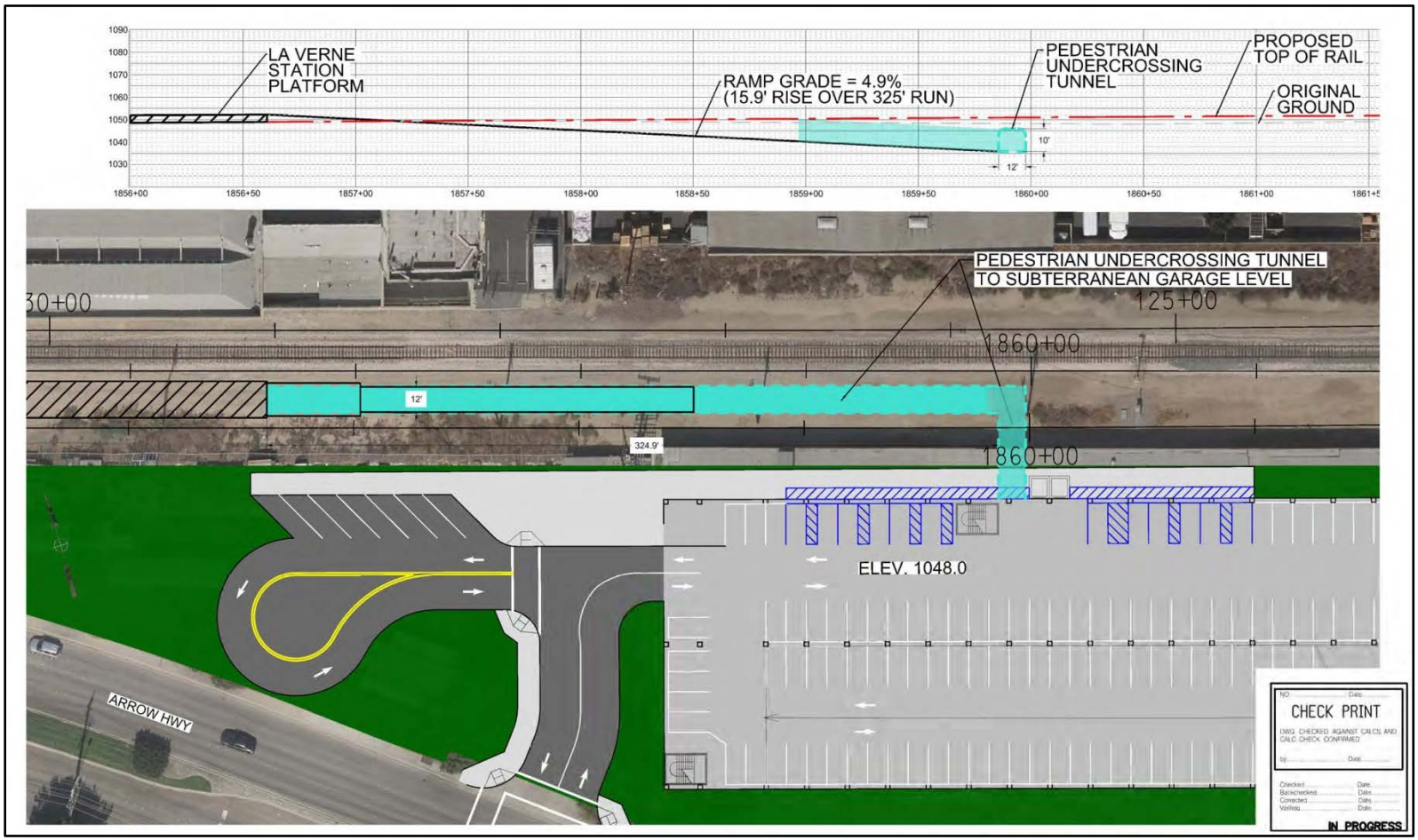


Figure 4: TPSS Location near San Dimas Wash

Table 1: Summary of Alignment Shifts

City	Stationing (Approximate)	Cross Streets	Description of Shift
Glendora	1440 to 1501	West of Barranca Avenue to Vermont Avenue	Freight and LRT shifted north
Glendora	1505 to 1567	Vermont Avenue to Lorraine Avenue	Freight and LRT shifted south
Glendora	1568 to 1610	Lorraine Avenue to Route 66	Freight and LRT shifted north
San Dimas	1667 to 1680	Gladstone Street to 57 Freeway	Freight and LRT shifted south
San Dimas	1700 to 1750	Eucla Avenue to Walnut Avenue	Freight and LRT shifted south
San Dimas	1770 to 1775	San Dimas Canyon Road	Freight and LRT shifted north
La Verne	1780 to 1835	East of San Dimas Canyon	Freight and LRT shifted north
La Verne	1815 to 1835	Wheeler Avenue to B Street	LRT shifted north
La Verne	1870 to 1883	White Avenue to west of Fulton Avenue	LRT shifted north. New LRT siding track added
La Verne	1885 to 1894	Fulton Avenue	LRT shifted south
Pomona	1905 to 1936	West of Garey Avenue to west of Towne Avenue	Realignment of freight and siding track
Pomona	1925 to 1955	East of Garey Avenue to Towne Avenue	LRT shifted south
Claremont	2045 to 2047	Claremont Boulevard	LRT shifted south

SOURCE: ATS Consulting Noise and Vibration Technical Memo (2016).

Figure 5: Foothill Boulevard and Grand Avenue Grade Separated Crossing

Vantage Point: south of existing ROW, looking north on North Grand Avenue.

Figure 6: South Indian Hill Boulevard Grade Crossing

Vantage Point: south of existing ROW, looking north on South Indian Hill Boulevard.

Chapter 3 – Environmental Evaluation

To evaluate the impacts of the Project Modifications, further transportation, noise and vibration, and visual quality studies were conducted. Summaries of the environmental evaluations are discussed in the following sections. Detailed analysis of noise and vibration effects are provided in Appendix B. Additional environmental areas identified in the FEIR were also reviewed and discussed under Section 3.4 Other Environmental Impacts.

3.1 TRANSPORTATION

3.1.1 Parking

The Project Modifications would change the La Verne parking structure from a six-level structure, approximately 55 feet above grade, to a three-level structure approximately 40 feet above grade. The total number of available parking spaces would remain the same as in the FEIR at 600. The transportation impacts include modified pedestrian access from the parking structure to the La Verne LRT station, which would be via a pedestrian underpass instead of at-grade over the LRT tracks as described in the FEIR. The primary access/egress point for vehicular traffic off of Arrow Highway will remain the same. The revised site plan for the La Verne parking structure and station access is provided in Figures 3a and 3b above.

Since the Project Modifications will not substantially change the physical characteristics of the stations or the capacity of the planned parking structures described in the 2013 FEIR, they would not result in new significant transportation impacts, or contribute to previously identified significant impacts that would be substantially more severe than shown in the 2013 FEIR. Furthermore, the modification for pedestrian access from the parking structure to the La Verne Station is anticipated to result in a safety benefit since it will eliminate the need for pedestrians to cross LRT tracks.

3.1.2 Traffic

Ada Avenue

As part of the Project Modifications, the connection of West Ada Avenue to Vermont Avenue will be closed in order to accommodate the grade crossing at Vermont Avenue. Analysis of traffic operations was completed to assess four alternatives to determine the preferred traffic circulation to mitigate impacts from the closure. The recommended Project Modifications on East Ada Avenue would restrict westbound movements to right-turn only and prohibit southbound left-turn movements from Vermont Avenue onto East Ada Avenue. Due to the lower traffic volumes on West Ada Avenue, a level of service (LOS) analysis demonstrates that the closure and other proposed modifications are not anticipated to produce any new significant impacts at the associated intersections. Table 2 and 3 below provide the LOS and delay analysis conducted for the intersection at Vermont Avenue and Ada Avenue, for the AM and PM peak hour periods, respectively.

Table 2: LOS Analysis for Ada Avenue (AM Peak Hour)

AM PEAK HOUR	Existing (2015)		Project Modification		Change in Delay	Significant Impact
Intersections	Delay (sec)	LOS	Delay (sec)	LOS		
Vermont Ave & East Ada Ave	11.2	B	9.0	A	-2.2	No
Vermont Ave & West Ada Ave	10.9	B	N/A			

Table 3: LOS Analysis for Ada Avenue (PM Peak Hour)

PM PEAK HOUR	Existing (2015)		Project Modification		Change in Delay	Significant Impact
Intersections	Delay (sec)	LOS	Delay (sec)	LOS		
Vermont Ave & East Ada Ave	11.7	B	9.1	A	-2.6	No
Vermont Ave & West Ada Ave	11.1	B	N/A			

As indicated within this analysis, the LOS and anticipated delay at the intersection of Vermont Avenue and Ada Avenue is reduced, as the traffic configurations improve circulation at the intersection despite the closure of the West leg of Ada Avenue. As part of the recommended treatments at the intersection, a raised median on Vermont Avenue would be installed through the intersection, which would enhance safety by discouraging motorists from attempting to drive around the crossing gates.

Project Modifications would not result in any new or increased significant traffic impacts on roadway or intersection LOS.

Foothill Boulevard/Grand Avenue and South Indian Hill Boulevard Grade Separations

As mentioned above, the Authority plans to pursue funding for two additional potential grade separations that were included as at-grade crossings in the Approved Project. These modifications would only be constructed if funding is secured and if they are requested by the municipalities in which they are located. If these changes are approved, traffic would move with fewer interruptions, thereby improving traffic compared to the Approved Project. If the grade separations are not approved, the intersections will be designed per the Approved Project as described in the 2013 FEIR.

3.1.3 Special Issues

Claremont Station Access

As a result of the grade separation of the alignment at South Indian Hill Boulevard, the Claremont Station will be moved 300 feet east. With the station platform now closer to College Avenue, this modification allows for direct access to the station from both Harvard Avenue and College Avenue. In addition, the station will be reconfigured with a center platform. To facilitate access to the Metrolink platform, a pedestrian underpass will be constructed to provide a direct connection from the Claremont parking structure. Overall, these Project Modifications are anticipated to result in improved pedestrian safety and multi-modal access to the Gold Line and Metrolink stations, as the reconfigurations place the Gold Line station closer to the parking area and in closer proximity to adjacent arterial streets and direct connection to the Metrolink station does not require that pedestrians cross tracks at grade.

LADWP Access

In order to facilitate access to the LADWP electrical transmission lines, an alternate access point will be provided via the access road around the Louie Pompei Memorial Sports Complex and a new bridge approximately 75 feet in length over the San Dimas Wash. This new access point is proposed in lieu of tunneling under the alignment, which would have been required in order to maintain the original entry point. This access will also serve a relocated TPSS, which has moved from the east side of the right-of-way to the west side of the right-of-way (see Figure 4 above). As this new access point makes use of an existing road, and will be used primarily for the purposes of ongoing inspections and maintenance by LADWP and Metro staff, the Project Modifications would not result in new significant impacts, or contribute to previously identified significant impacts that would be substantially more severe than shown in the 2013 FEIR.

3.1.4 Mitigation Measures and Recommendations

All short-term construction mitigation measures would remain unchanged from the 2013 FEIR. Long-term mitigation measures would also be maintained from the 2013 FEIR, along with all updates included in Addendum No. 2.

As a result of the Level of Service (LOS) and queuing analysis completed in the 2013 FEIR for the intersections at Foothill/Grand and South Indian Hill Boulevard, the determination to grade-separate the alignment at these locations serve as mitigation measures themselves. The closure of the west leg of Ada Avenue is anticipated to result in no impact to queuing and LOS; therefore, no mitigation measures will be required.

3.1.5 Level of Impact After Mitigation

As the Project Modifications will not substantially change the physical characteristics of the stations or the capacity of the planned parking structures described in the 2013 FEIR, it would not result in new significant impacts, or contribute to previously identified significant impacts that would be substantially more severe than shown in the 2013 FEIR. Several of Project Modifications, including pedestrian access to the La Verne Station and the parking structure, the grade separations at Foothill/Grand and South Indian Hill, and Claremont Station access are anticipated to reduce impacts from the Approved Project.

3.2 NOISE AND VIBRATION

Project Modifications will result in changes to the locations where noise and vibration effects will occur. Project Modifications are not anticipated to result in changes to project construction techniques or the associated noise and vibration effects that are expected during construction activities. Mitigation measures N-1 and N-2 from the 2013 FEIR are adequate to address construction noise and vibration effects that would be associated with construction activities.

Alignment shifts and relocated track crossover locations will result in reduced noise and vibration levels at some receptors and higher noise and vibration levels at other receptors. Mitigation measures to reduce the noise and vibration effects of the project are the same as those identified in the 2013 FEIR, however, in some cases, the locations proposed for specific mitigation measures have changed based on the Project Modifications. As identified in Section 2.2 of this Addendum, the design of the Project Modifications will include measures to mitigate new and/or increased noise and vibration effects at sensitive receptor locations.

Appendix B provides the complete technical memorandum prepared to evaluate noise and vibration effects based on the proposed Project Modifications.

3.2.1 Noise

Alignment shifts and revised crossover locations were evaluated to determine the potential for noise impacts at adjacent receivers. Crossovers can increase noise levels by up to six decibels compared with

standard track. Changes in track alignment not associated with crossovers generally resulted in changes in predicted noise levels of only one to two decibels. Table 4 presents a comparison of predicted noise levels at residential units from the 2013 FEIR to the predicted impacts from the proposed Project Modifications before mitigation measures are applied. The results are listed in the number of residential units that may experience moderate or severe impacts before mitigation measures are incorporated.

Table 4: Predicted Noise Impacts to Residential Units as a Result of Project Modifications (Before Mitigation)

City	2013 FEIR (# of dwelling units)	Project Modifications (+/- # of dwelling units from FEIR)
Glendora		
Moderate	76	+12
Severe	235	-3
Total	**311**	**+9**
San Dimas		
Moderate	29	+9
Severe	23	0
Total	**52**	**+9**
La Verne		
Moderate	38[a]	-23
Severe	0	+18
Total	**38**	**-5**
Pomona		
Moderate	6	+8
Severe	0	0
Total	**6**	**+8**
Claremont		
Moderate	0	+8
Severe	56	+43
Total	**56**	**+51**

[a]: The 2013 FEIR included a minor typo regarding the number of moderate impacts in the City of La Verne. It reported a total of 33 moderate impacts, when there were 38 moderate impacts.
SOURCE: 2013 FEIR and ATS Consulting Noise and Vibration Technical Memo (2016).

A new crossover near the Foothill Presbyterian Hospital, increases the predicted noise level by 1.6 decibels for this institutional land use. Because of this increase, this location would experience a "moderate" noise impact. There are no other changes to the predicted institutional land use impact locations compared to the 2013 Final EIR.

The only ancillary equipment expected to have the potential of causing noise impacts are the TPSS units. The primary noise source from the TPSS units is from the transformer hum and the cooling system. On most modern TPSS units, the transformer hum is minimal so most noise is generated by the ventilation and cooling system.

Some of the proposed TPSS sites have been relocated since the completion of the 2013 FEIR. Updated predicted TPSS noise levels are provided for the new TPSS locations in Appendix B. In addition, the revised predictions include updated reference noise levels for TPSS units based on measurements completed in March 2015 at two units on the Exposition Phase 1 line. The measured noise level at the Exposition TPSS units was 58 dBA at 50 feet, higher than what was assumed in the 2013 FEIR analysis.

Before mitigation, moderate noise impacts from TPSS sites are identified at six noise receiver locations in Glendora, San Dimas, La Verne, and Claremont. One severe noise impact from a TPSS site is anticipated at a receiver location in Glendora.

3.2.2. Vibration

Alignment shifts and revised crossover locations were evaluated to determine the potential for vibration impacts at adjacent receivers. Crossovers can increase vibration levels by up to ten decibels compared with standard track. Changes in track alignment not associated with crossovers generally resulted in changes in predicted vibration levels of only one to two decibels. Table 5 presents a comparison of predicted vibration levels at residential units from the 2013 FEIR to the predicted impacts from the proposed Project Modifications before mitigation measures are applied. The results are listed in the number of residential units that may experience impacts before mitigation measures are incorporated.

Table 5: Predicted Vibration Impacts to Residential Units as a Result of Project Modifications (Before Mitigation)

City	2013 FEIR (# of dwelling units)	Project Modifications (+/- # of dwelling units from FEIR)
Glendora	249	+28
San Dimas	23	0
La Verne	0	0
Pomona	6	0
Claremont	20	+40
Claremont – Metrolink Vibration	9	0
SOURCE: 2013 FEIR and ATS Consulting Noise and Vibration Technical Memo (2016).		

A new crossover near the Foothill Presbyterian Hospital increases the predicted vibration level by 10 decibels for this institutional land use. Because of this increase, this location would be expected to experience vibration impact. There are no other changes to the predicted institutional land use impact locations compared to the 2013 Final EIR.

3.2.3 Mitigation Measures and Recommendations

Noise

The updated noise analysis identified noise sensitive receivers where there is potential for future noise levels to exceed the applicable FTA noise impact threshold. The design of Project Modifications will include incorporation of mitigation measure features to reduce noise to levels that are less than significant. Table 6 provides specific details and locations for all noise barrier locations to be included in the project design.

Sound insulation will be incorporated into the Project Modifications for second story receiver locations associated with clusters EB B in Glendora and WB 1 in Pomona. Low-impact frogs will also be included to reduce future noise levels at specific locations as identified in Appendix B.

TPSS Units will be constructed and placed in accordance with the following guidelines in order to ensure that noise levels are reduced below the level of significant impact.

- Include a noise limit in the purchase specifications for TPSS units. The recommended limit is a maximum level of 50 dBA at a distance of 50 feet from any part of the TPSS unit. Locate the unit within the parcel as far from the sensitive receivers as feasible. If possible, orient the cooling fans away from sensitive receivers avoiding direct line-of-sight from the cooling fans to the sensitive receivers.
- If the fans cannot be oriented away from the receivers, build an enclosure around the TPSS unit.

Table 6: Locations for Noise Barriers

City	Wall No.	Direction [1]	Eng. Station		Length (ft)	Height [2] (ft)	Clusters Mitigated	Design Refinement
			Start	End				
Glendora	1	WB	1452+00	1454+50	250	6	WB 1	--
Glendora	2	WB	1455+50	1483+00	2,750	***6***	WB 1a, 1b, 1c, 1d	Wall height decreased (LRT moved away)
Glendora	***2a***	***WB***	***1492+00***	***1497+00***	***500***	***8***	***WB 2***	***New wall at crossover***
Glendora	3	WB	1506+50	1517+00	1,050	***6***	WB 3a	Wall height decreased (LRT moved away)
Glendora	4	WB	1518+00	1528+50	1,050	8	WB 4,5	--
Glendora	5	WB	1529+00	1550+50	2,150	8	WB 6, 7, 8	--
Glendora	6	WB	1550+50	1556+50	600	8	WB 9, 10	--
Glendora	7	WB	1557+75	1570+00	1,225	***8***	WB 11, 12, 13	Decrease in wall height (LRT moved away)
Glendora	8	WB	1570+00	1579+00	900	6	WB 14, 15	--
Glendora	9	WB	1583+00	1601+50	1,850	6	WB 16, 17, 18	--
Glendora	10	WB	1611+00	1622+50	1,150	***6***	WB 19	Wall height adjusted
			1622+50	1632+50	1,000	***8***	WB 20	
Glendora	11	EB	1430+00	1448+00	1,800	6	EB 1, 2	--
Glendora	12	EB	1449+50	1454+00	450	12	EB 3	--
Glendora	13	EB	1455+50	1463+25	775	12	EB 4,5	--
Glendora	14	EB	1468+75	1479+75	1,100	12	EB 5a	--
Glendora	15	EB	1502+50	1504+25	175	12	EB 6	--
Glendora	16	EB	1537+00	1539+00	200	6	EB 7	--
Glendora	17	EB	1541+00	1543+50	250	6	EB 8	--
Glendora	18	EB	1586+50	1589+00	250	6	EB 9	--
Glendora	19	EB	1604+50	1612+50	800	6	EB 10	--
Glendora	20	EB	1623+50	1628+50	500	8	EB 11	--
Total Length, Glendora (ft)					**20,775**			
San Dimas	1	WB	1668+00	1671+00	300	12	WB 1	--
San Dimas	2	WB	1679+00	1685+00	600	6	WB 2, 3	--
San Dimas	3	WB	1764+50	1772+00	750	***10***	WB 7, 8	Increase wall height (tracks moved closer)
San Dimas	4	EB	1684+00	1689+00	500	6	EB 1	--
San Dimas	5	EB	1704+00	1706+50	250	6	EB 3	--
San Dimas	6	EB	1722+00	1726+00	400	6	EB 3a	--
Total Length, San Dimas (ft)					**2,800**			

La Verne	1	WB	1816+00	1827+75	1,175	***12***	WB 2, 3, 4	Increase wall height (tracks moved closer)
La Verne	2	WB	1828+50	1834+50	600	6	WB 5, 6	--
La Verne	3	WB	1447+25	1452+25	500	14	WB 7, F (Cat. 3)	--
Total Length, La Verne (ft)					**2,275**			
Pomona	1	WB	1961+50	1970+50	900	8	WB 1, 2	--
Total Length, Pomona (ft)					**900**			
Claremont	1	WB	1976+00	1978+50	250	8	WB 3	--
Claremont	2	WB	1980+25	1997+50	1,725	8	WB 4, 5	Crossover closer to WB5
Claremont	3	WB	2047+50	2050+50	300	8	WB 6	
Claremont	4	EB	1972+00	1979+50	850	12	EB 2, 3	--
Claremont	5	EB	2006+50	2010+00	350	6	EB 4	Wall height adjusted
Claremont	6	EB	2034+00	2045+00	1,100	12	EB 5, 6	--
Claremont	7	EB	2046+50	2050+00	350	12	EB 7	--
Total Length, Claremont (ft)					**5,125**			
Total Length, All Cities (ft)					**32,100**			

Source: ATS Consulting, 2016
Notes:
Heights and lengths of the sound walls are subject to further design refinements. Heights may be significantly altered if quiet zones waivers are granted for at-grade crossings.
[1] EB = towards Montclair (south side of tracks); WB = towards Azusa (north side of tracks)
[2] Height above the top-of-rail

Vibration

The updated vibration analysis identified vibration sensitive receivers where there is potential for future vibration levels to exceed the applicable FTA vibration impact threshold. The design of Project Modifications will include incorporation of mitigation measure features to reduce vibration to levels that are less than significant. Table 7 provides specific details and locations for all vibration areas where mitigation features will be included in the project design.

Table 7: Locations for Vibration Reduction

City	Eng. Station		Length (ft)	Mitigation Type	Clusters Mitigated	Design Refinement Resulting in Change
	Start	End				
Glendora	1430+00	1465+00	3,500	Ballast Mat/TDA	EB 1, 2, 3, 4, 5	--
Glendora	1468+00	1480+00	1,200	Ballast Mat/TDA	EB 5a	Shorter length to reflect extents of new development
Glendora	1490+00	1496+00	600	Floating Slab	WB 2 B (Category 3)	Crossover relocated to this area
Glendora	1518+00	1524+50	700	Ballast Mat/TDA	WB 4; EB 6a	LRT shifted away from receivers
Glendora	1524+50	1535+00	1,050	Floating Slab	WB 5, 6	--

Glendora	1535+00	1543+75	875	Ballast Mat/TDA	WB 7; EB 7, 8	LRT shifted away from receivers
Glendora	1543+75	1550+50	650	Floating Slab	WB 8	--
Glendora	1550+50	1556+50	600	Ballast Mat/TDA	WB 9, 10	LRT shifted away from receivers
Glendora	1556+50	1561+00	450	Floating Slab	WB 11	--
Glendora	1561+00	1578+50	1,750	Ballast Mat/TDA	WB 12, 13, 14, 15	LRT shifted away from receivers
Glendora	1578+50	1584+00	550	Floating Slab	Crossover by WB 15, 16	--
Glendora	1584+00	1601+50	1,750	Ballast Mat/TDA	WB 16, 17, 18; EB 9	--
Glendora	1612+00	1632+500	2,050	Ballast Mat/TDA	WB 19-20, EB 11	--
Total Length Glendora (ft)			15,725			
San Dimas	1683+00	1689+00	600	Floating Slab	EB 1	--
Total Length San Dimas (ft)			600			
La Verne	1846+50	1848+00	150	Ballast Mat/TDA	F (Category 3)	--
Total Length La Verne (ft)			150			
Claremont	1975+00	1980+00	500	Ballast Mat/TDA	WB 3	--
Claremont	1987+00	1997+00	1,000	Ballast Mat/TDA	WB 5	--
Claremont	2047+00	2050+00	300	Ballast Mat/TDA	WB 6	--
Total Length Claremont (ft)			1,800			
Total Ballast Mat/TDA (all cities):			14,325			
Total Floating Slab (all cities):			3,900			

Source: ATS Consulting, 2016
Notes: It is assumed that mitigation will be placed under both near and far tracks.
The "design refinement resulting in change" column identifies mitigation recommendations that represent a change from the 2013 Final EIR recommendations.

The Final EIR also included vibration mitigation recommendations from the relocation of the Metrolink tracks in Claremont. There is no change to the vibration mitigation recommendations in the 2013 Final EIR for the Metrolink tracks as a result of the design refinements assessed in this Addendum.

Low-impact frogs will also be included to reduce future vibration levels at specific locations as identified in Appendix B.

3.2.4 Level of Impact After Mitigation

Noise

Based on the mitigation measures identified above, Table 8 presents the recommended measures to be incorporated into the design to reduce the predicted noise levels to below the impact threshold, as well as the predicted noise level with the mitigation measure incorporated into the design. All predicted increases after mitigation are within the FTA impact thresholds. Therefore, no new or increased significant impacts would occur.

Table 8: Recommendations to Reduce Predicted Noise Levels

Receiver	Recommended Mitigation Measure	Predicted Noise Level After Mitigation	Predicted Increase over Existing After Mitigation[1]	FTA Moderate Impact Threshold Allowable Increase
Glendora EB B	Low impact frog	63.4 dBA Leq(1 hour)	2.4 dB	4.3 dB
La Verne WB 2	Increase height of sound wall to 12 ft	57 dBA Ldn	- 5 dB	1.7 dB
La Verne WB 3	Increase height of sound wall to 12 ft	56 dBA Ldn	- 4 dB	1.7 dB
La Verne WB 4	Increase height of sound wall to 12 ft	59 dBA Ldn	- 3 dB	1.7 dB
Pomona WB 1	Low impact frog and sound wall	52 dBA	-10 dB	1.7 dB

Source: ATS Consulting, 2016
[1]Where the predicted increase is negative, the future predicted noise levels are less than the predicted existing noise level. This will happen where the mitigation measure will reduce the existing BNSF and/or Metrolink noise, in addition to the LRT noise.

Table 9 shows the predicted noise level at the TPSS sites assuming the units are specified to have a sound level of 50 dBA at 50 feet. If the units meet the specification, the predicted noise level is reduced to below the noise impact threshold at all but one TPSS site where the unit would be located within 20 feet of the nearest sensitive receiver. At that site, the TPSS noise can be reduced to below the impact threshold by building an enclosure or wall blocking the line-of-sight from the fans to the sensitive receiver. Therefore, with these mitigation measures, no new or increased significant impacts would occur.

Table 9: Predicted TPSS Noise Levels with Mitigation

TPSS	Distance[1], ft	Nearest Sensitive Receiver	Estimated TPSS Noise with Spec[2], Ldn , dBA	Estimated TPSS Noise with Spec and Enclosure[3], Ldn, dBA	FTA Mod. Criteria[4], Ldn dBA
B-1 -Alt	No noise sensitive receivers near this TPSS location				
B-1	88	WB 2	52	--	57
B-2 -Alt	19	WB11	65	55	56
B-2	82	WB 11	52	--	56
B-3	No noise sensitive receivers near this TPSS location				
B-4	65	EB 1	54	--	58
B-5 -Alt	No noise sensitive receivers near this TPSS location				
B-5	90	EB 3a	51	--	58
B-6	78	WB 1	53	--	58
B-7	No noise sensitive receivers near this TPSS location				
B-8	116	EB 1	49	--	59
B-9	50	EB 3	56	--	59
B-10	No noise sensitive receivers near this TPSS location				

TPSS	Distance[1], ft	Nearest Sensitive Receiver	Estimated TPSS Noise with Spec[2], Ldn , dBA	Estimated TPSS Noise with Spec and Enclosure[3], Ldn, dBA	FTA Mod. Criteria[4], Ldn dBA
B-11	No noise sensitive receivers near this TPSS location				

Source: ATS Consulting, 2016
Notes:
[1]The distance in feet from the closest sensitive receiver in the cluster to the proposed TPSS location.
[2]The estimated TPSS noise level assuming the units are specified to have a noise level of 50 dBA at 50 ft
[3]The estimated TPSS noise level assuming the units are specified to have a noise level of 50 dBA at 50 ft and have an enclosure or wall that provides 10 dB of attenuation.
[4] The FTA moderate noise impact criteria, based on the existing noise level at the receiver.

Vibration

Based on the mitigation measures identified above, Table 10 presents the recommended measures to be incorporated into the design to reduce the predicted vibration levels to below the impact threshold where vibration impacts were predicted as a result of design refinements. All predicted increases after mitigation are within the FTA impact thresholds. Therefore, no new or increased significant impacts would occur.

Table 10: Recommendations to Reduce Predicted Vibration Levels

Receiver	Recommended Mitigation Measure	Predicted Level after Mitigation	FTA Impact Threshold
Glendora WB 3a	Ballast mat/TDA[1]	67 VdB at 31.5 Hz	72 VdB
Glendora EB 8	Ballast mat/TDA	67 VdB at 31.5 Hz	72 VdB
Glendora EB B	Low impact frog and floating slab (note floating slab is primarily recommended for receiver WB 2 located closer to the tracks)	66 VdB at 31.5 Hz	75 VdB
Claremont EB4	Low impact frog	70 VdB at 50 Hz	72 VdB

[1]The predicted level without mitigation at Glendora WB 3a is equal to the impact thresholds. Further study (i.e. site specific measurements) may show that vibration mitigation is not warranted.

The 2013 FEIR recommends that vibration recommendations at affected locations be revisited during final design to ensure that the appropriate level of vibration mitigation is applied. Additional study of all vibration impacts and mitigation measures, including those identified in association with the Project Modifications, will be conducted during final design to ensure appropriate mitigation.

Appendix B lists the sensitive receiver clusters that are recommended for further study, and the current predicted vibration level. Further study could include site specific vibration propagation tests to refine assumptions and/or assessment of alternative mitigation measures, such as thicker ballast mat or sound walls with a large foundation that may provide the necessary vibration reduction without resorting to a floating slab.

3.3 VISUAL QUALITY

La Verne Station Parking Structure Design Modifications

As noted in the FEIR on page 3.13-18, the residential and commercial buildings north of the Approved Project La Verne station location, between E Street and White Avenue, are largely buffered from the right-of-way by industrial buildings along 1st Street. Existing trees in the City of La Verne were identified in the FEIR (p.p. 3.13-6 and 3.13-18) as attractive and distinctive trees which are a unique visual feature within the Approved Project alignment. The Approved Project would remove some trees from the railroad right-of-way during construction, causing a significant and unavoidable impact. However, no unique or distinctive trees are identified within the footprint of the La Verne Station. The location where the La Verne Station parking structure would be constructed is currently developed as an industrial site. The majority of the land around the station location is also developed with industrial uses. One residence is located adjacent to the right-of-way, south of 1st Street and just west of White Avenue.

The proposed La Verne Station parking structure modifications would lower the overall height of the structure while extending its horizontal footprint eastward. The parking structure would, therefore, be relatively closer to the residences along 1st Street near White Avenue than the Approved Project, but would be lower in scale than the current Approved Project. In addition, the location where the parking structure would be located is currently developed as a large industrial building, and the parking structure would be further away from the residences than existing development. These residences do not have any scenic views looking southward which would be blocked by the garage, and the parking structure would not change the existing railroad and industrial character of the area. The parking structure would be lower than the Approved Project, would be lower than the maximum allowable height permitted by the City of La Verne, and would blend in with future development envisioned for the area.

Residences located west of Fairplex Drive/E Street and having north-facing views towards the mountains would be the same distance from the proposed Project Modifications to the parking structure as under the Approved Project. In addition, the proposed Project Modifications would lower the parking structure, thereby reducing the visibility of the parking structure from residences, including those at Fairplex Drive and Walnut Street. Residences east of White Avenue would also have reduced views of the parking structure compared to the Approved Project. Thus, the parking structure would not block mountain views from the residential areas to the west or east of the parking structure location. These residences would be buffered from any lighting, glare, and shadow by existing industrial uses.

The industrial buildings along 1st Street would buffer residences from shadows from the parking structure, and lighting would be shielded in accordance with FEIR Mitigation Measure VIS-5, which reduces lighting spillover and directs lighting away from residences at parking facilities. Construction of the modified parking structure would not create any new impacts to unique or distinctive trees. The proposed Project Modifications would not remove additional trees compared to the Approved Project, and the impact to deodar cedar trees would not increase.

LADWP Flood Control Access Road

Access for LADWP flood control and transmission lines would be modified through construction of a proposed access bridge across the San Dimas Wash, from the northern edge of Louie Pompei Memorial Sports Park across to the transmission line corridor located between San Dimas Wash and the I-210 freeway (see Figure 4 above). The transmission corridor contains existing dirt roads and is defined by public utility use. The proposed access bridge across San Dimas Wash would provide LADWP access to existing transmission lines. In addition, new roads would be constructed at-grade, with some minor cut and fill required.

Since the area is already a utility corridor, with an elevated freeway to the north, the proposed access bridge would not change the visual character of the site. While the proposed bridge would be higher than the existing topography, introducing a new vertical element, it would be lower than the elevated I-210 freeway approximately 215 feet north of the bridge. At this location, the I-210 freeway is roughly 50 feet high. Therefore, the proposed access bridge would not interfere with any northward views from the park

to the mountains, and would not cause any new shadow, lighting, or glare effects. The closest residences are 0.25 miles from the proposed access bridge location and the Project Modifications would not cause new view, visual character, light, glare, or shadow effects on these residences.

The TPSS currently planned for the east side of the right-of-way would be moved to the west side of the right-of-way. The TPSS would remain the same in size and scale, and would not affect views from the Louie Pompei Memorial Sports Park. The TPSS would be located outside of the Approved Project right-of-way but would be consistent with the public utility character created by the transmission corridor.

Therefore, no new or increased significant impacts on visual resources would occur with the Proposed Project refinements at the LADWP Flood Control Access Road and Bridge and TPSS Relocation site.

Foothill Boulevard and Grand Avenue Grade Separation

The proposed bridge over the intersection of the east-west running Foothill Boulevard and the north-south running Grand Avenue would be a new visual element in the City of Glendora. The Approved Project right-of-way travels diagonally through the Foothill/Grand intersection from northwest to southeast. As noted in the FEIR on page 3.13-5, no scenic trails or highways have been identified near the Approved Project in the City of Glendora; the closest scenic trails are approximately three miles away from the Approved Project corridor, in the Angeles National Forest foothills. Preservation of neighborhood character through achievement of better design compatibility between existing and new development, as well as preservation of street trees, are important themes in local policies.

The area surrounding the Foothill/Grand intersection is an urban environment and the visual character surrounding it is diverse and not unified due to the mix of uses, including park, residential, commercial, office, and automotive uses, in the area surrounding the proposed bridge location. Southwest of the Foothill/Grand intersection, between Little Dalton Wash and Grand Avenue, is a single-story residential neighborhood, with homes located on and south of Calder Avenue. These residences are approximately 225 feet from the right-of-way and have partial north-facing views of the mountains, as shown in Figure 7. While views of the foothills are available from residences, these vistas are not prominent and are substantially disrupted and obstructed by existing development, such as, solid masonry walls around the residences and existing buildings, trees, traffic signals, power transmission lines, and other urban elements constrain views of the mountains. The neighborhood has a residential character, but this character changes to commercial upon reaching the boundaries of Little Dalton Wash and Grand Avenue.

Figure 7: View from Calder Avenue Residential Property

Vantage Point: Grand Avenue, south of Foothill looking north/northeast

Northwest of the Foothill/Grand intersection and south of the right-of-way, a new neighborhood known as The Foothill Collection, comprised of two- and three-story townhomes, is under construction. These homes would be buffered from the right-of-way by proposed internal roads, parking, and recreational uses (City Ventures, 2016). Once constructed, these multi-story units would have some views of the mountains to the north; however, views would be constrained by other units on the property, residences to the north of the right-of-way, and trees adjacent the right-of-way near the intersection. In addition, it is anticipated that a solid wall would be constructed between The Foothill Collection and the right-of-way, further blocking views from lower levels of residences. Proposed units onsite would have views constrained by

the masonry wall, development within the site, existing trees, and development to the north. The Foothill Collection, once built, will have unified residential visual character.

North of the right-of-way is the existing Arboreta neighborhood, a gated residential development. This neighborhood is buffered from the right-of-way by the Arboreta linear park. The closest residence in this neighborhood is approximately 100 feet away from the right-of-way. The Arboreta neighborhood also has unified residential visual character. However, the right-of-way separates this neighborhood from The Foothill Collection, and the strong visual character of the railroad creates an existing visual separation between uses on either side of the right-of-way.

The Arboreta linear park runs northwest-southeast between the northern side of the right-of-way and the southern side of the Arboreta neighborhood. A masonry wall separates the park from the right-of-way. Directly northwest of the Foothill/Grand intersection, the park has a 500 foot-long row of tall trees, as shown in Figure 8. The Arboreta linear park was approved by the City of Glendora in the Arboreta Specific Plan for the purposes of avoidance of significant noise and vibration impacts from the Gold Line on adjacent development and creation of walking and biking connections to the Gold Line station (City of Glendora, 2007).

As with all Approved Project components, construction of the proposed bridge would involve the temporary presence of construction equipment and activities along the right-of-way. Construction of the proposed bridge would primarily occur within the previously approved right-of-way. As with the LRT Bridge over Route 66, described in the FEIR on page 3.13-32, construction of this proposed bridge would require trenching, scaffolding, and falsework, as well as related stockpiling of construction materials. Construction would potentially temporarily constrain mountain views from residences to the south of the right-of-way. However, existing urban infrastructure such as walls, buildings, landscaping, and utility poles currently partially obstructs views, and any constraints caused by construction would be temporary.

As described in the FEIR, implementation of Mitigation Measure VIS-2 would result in screening of temporary construction areas, where appropriate, from roadways, residences, and businesses. Construction hours are not expected to extend into the night; therefore, use of lights would be minimal. As identified in the FEIR, if the use of lights is necessary, an adequate buffer and screening will be provided to avoid light spill (Mitigation Measure VIS-3). Therefore, this temporary impact would be less than significant and would not cause a significant increase in visual impacts identified in the FEIR.

Figure 8: View of Trees along right-of-way

Vantage Point: Southeast corner of Foothill/Grand intersection, looking northwest towards right-of-way.

The design and aesthetic features of the proposed bridge over the Foothill/Grand intersection would be coordinated with the City of Glendora. The proposed bridge would rise approximately 30 feet from ground level to top of the bridge, providing at least 16.5 feet of clearance under the bridge. Some LRT track components, such as catenary poles, would extend above the top of rail, with the highest elements reaching 20 feet above the top of rail. However, the LRT catenary system would not be of sufficient mass

to create substantial shade or shadow impacts or to substantially constrain views. Figures 9 and 10, respectively, present views looking northward on Grand Avenue of the existing crossing and of the proposed bridge.

Figure 9: Existing View of Rail Crossing without Proposed Bridge

Vantage Point: south of existing right-of-way, looking north on Grand Boulevard.

As noted in the FEIR on page 3.13-37, the Approved Project would be constructed primarily along and within an existing railroad right-of-way with a surrounding setting that has historically included rail, industrial, and commercial uses. While the proposed bridge would change the existing visual character through creation of a new structure, it would not be substantially degraded as visual character would be consistent with the current mix of uses, including railroad uses, which are present around the Foothill/Grand intersection. In addition, as described in the FEIR on page 3.13-42, Mitigation Measure VIS-5 would require the abutment walls of the proposed bridge to be screened or designed to improve appearance and reduce visual intrusion. Elements such as landscaping and surface treatments would be applied, consistent with Metro Rail Design Criteria and Metro would work closely with the City of Glendora on the architectural and aesthetic design for the bridge and abutment walls. Existing walls and trees would also provide screening of the proposed bridge from residences.

Figure 10: Simulation of Proposed Bridge

Vantage Point: south of existing right-of-way, looking north on Grand Boulevard.

The views of the mountains from residences located south of the right-of-way would potentially be affected by the proposed bridge. The townhomes under construction at The Foothill Collection site will be two- and three-story residences and are generally set back from the right-of-way. In addition, existing views of the mountains are constrained by development, trees, and walls to the north. Residences on Calder Avenue have partial mountain views, already substantially constrained by walls, single-story commercial development, and trees, with background views of the mountains not being prominent. The proposed bridge may further constrain these views by introducing a new visual element; however, these residences are 225 feet away from the proposed bridge at their closest point, and would retain some mountain views both under and over the bridge structure, which would span the Foothill/Grand intersection without piers. In addition, existing views are substantially disrupted and obstructed by existing development. Therefore, no new or increased significant impacts would occur due to the proposed Project Modifications.

Residences and the Arboreta linear park north of the right-of-way would potentially be affected by shadows cast by the proposed bridge. Residences within the Arboreta development are as close as 100 feet away from the proposed bridge location. Shadows generally would not reach the closest residence, but during the winter, shadows may reach this residence for less than two hours at that time of year. The shadows cast by the proposed bridge on Arboreta linear park would be present to varying degrees throughout the day during the winter. Figure 11 simulates the potential shadows which the proposed bridge would cast.

Figure 11: Simulation of Shadows Cast by Proposed Bridge

***Left**: 10:00am, December 21.* ***Right**: 3:00pm, December 21*

Vantage Point: isometric view looking southwest
Note: This is a simulated image intended to show the approximate massing of and shadows cast by the proposed bridge, and does not show actual design, which would be refined in final engineering and design. Shadows from existing elements such as trees and development are not depicted.

While the proposed bridge would cast shadows on the Arboreta linear park, the existing trees in Arboreta linear park are taller than the proposed bridge, and therefore cast longer shadows than the proposed bridge. While the proposed bridge would be longer than the row of trees, a substantial portion of Arboreta linear park, where the tallest portion of the proposed bridge would be located, is already shaded under existing conditions because of these trees. The Authority would make every effort to keep existing trees intact, trimming where necessary. Should removal of trees be necessary for construction, they would be replaced at a ratio of 2 to 1, per the Authority's policy. In addition, the Arboreta linear park was developed in part to buffer adjacent development, including the Arboreta neighborhood, from impacts related to the Gold Line.

Grand Avenue, north of the Foothill/Grand intersection, and Foothill Boulevard, west of the Foothill/Grand intersection are identified as bike routes. While cyclists on Foothill Boulevard approaching the intersection from the west would see the proposed bridge, the existing partial background views of the mountains would be minimally affected and cyclists would continually change position, resulting in only a minor change in visual character. The recreational function of the bikeways would not be impacted by the bridge.

Therefore, no new or increased significant impacts would occur due to the Project Modifications.

South Indian Hill Boulevard Grade Separation

The proposed bridge over South Indian Hill Boulevard would be a new visual element in the City of Claremont. Claremont Village borders the right-of-way to the north. As noted on page 3.13-25 of the FEIR, Claremont Village is an area of vivid design character and high aesthetic quality; however, there are no designated or proposed scenic highways, view corridors, or scenic vistas, with views of the San Gabriel Mountains occurring only intermittently. The proposed bridge location is at the intersection of three different City of Claremont neighborhoods: Village to the north, Vista to the southwest, and Oakmont to the southeast (City of Claremont, 2005). The area around the intersection of the right-of-way at South Indian Hill Boulevard is included in the City of Claremont's Bicycle Priority Zone (Cycle Claremont, 2012).

Industrial uses are present south of the Approved Project alignment, along the western side of South Indian Hill Boulevard. On the eastern side of South Indian Hill Boulevard, south of Santa Fe Street, is the Claremont Villas Senior Apartments housing development, a two- to three-story residential development with internal circulation and landscaping. These residences are approximately 75 feet south of the right-of-way, and have a direct line of sight northward towards the Approved Project alignment. While village,

industrial, and residential character are the predominant visual characters in Claremont Village, the existing right-of-way is also a visual element with its own distinct character, and separates these neighborhoods.

Within the Claremont Villas, only the residences on Santa Fe Street have views looking towards the right-of-way. Most residences along Santa Fe Street have north-facing views blocked immediately north of the right-of-way by an existing three-story office building. However, the westernmost two buildings fronting Santa Fe Street, the leasing office and one two-story residential building, are not blocked by this building and have northward views into Claremont Village. This northward view is dominated by tall trees, several of which are taller than nearby structures, and the Village. Due to these elements and existing trees on the Claremont Villas property, there are only limited views of the San Gabriel Mountains, as shown in Figures 12 and 13. In addition, the Approved Project recommends 12 foot high sound walls along the right-of-way at this location.

There are also three-story residences located to the west of South Indian Hill Boulevard and directly north of the right-of-way. These residences are bounded on the north by First Street, on the west by Berkeley Avenue, and on the east by Cornell Avenue. These residences have a visual character consistent with the Claremont Village. However, the right-of-way separates this visual character from the open and institutional areas south of the right-of-way. A masonry wall, the same height as the first story of these residences, separates the structures from the right-of-way, as well as some existing vegetation. As described above, there are no scenic views looking southward. While the residences have windows which face southward, they are oriented in north-south lines, and therefore the majority of windows face east-west rather than south or north. East of these residences, and west of Indian Hill Boulevard, is the historic College Heights Lemon Packinghouse. As noted in the FEIR on page 3.13-25, the Packinghouse has been converted to a combination of a gallery and retail/restaurant uses. The Packinghouse is oriented toward 1st Street and has no windows or views southward towards the right-of-way.

As with all Approved Project components, construction of the proposed bridge would involve the temporary presence of construction equipment and activities along the right-of-way. Construction of the proposed bridge would primarily occur within the Approved Project right-of-way. However, the right-of-way would be expanded slightly to the south. The expanded right-of-way would remove slightly more landscaping than the Approved Project (refer to Appendix A p. 36); however, as noted in the FEIR on page 3.13-35, development in this area is of recent date, and no significant visual resources such as mature trees and landscaping or architectural/historical resources are present within, or adjacent to, the proposed Project Modifications right-of-way. Construction of this proposed bridge would likely require trenching, scaffolding, and falsework, as well as related stockpiling of construction materials.

Figure 12: View from Claremont Villas residence

Vantage Point: looking north towards ROW from Santa Fe Street.

Figure 13: View of Vegetation at Claremont Villas

Vantage Point: looking south from the north side of Santa Fe Street.

Construction would occur within 75 feet of residences, but as north-facing views of the mountains from Claremont Villas are very limited, construction would not substantially affect these views. As described in the FEIR, implementation of Mitigation Measure VIS-2 would result in screening of temporary construction areas, where appropriate, from roadways, residences, and businesses. Construction hours are not expected to extend into the night; therefore, use of lights would be minimal. As identified in the Final EIR, if the use of lights is necessary, an adequate buffer and screening will be provided to avoid light spill (Mitigation Measures VIS-3). Therefore, this temporary impact would be less than significant and would not cause a significant increase in visual impacts identified in the FEIR.

The proposed bridge over South Indian Hill Boulevard would be similar in design and aesthetic features to the Metro Gold Line bridge at Santa Anita Avenue in the City of Arcadia, with a height of approximately 30 feet, providing at least 16.5 feet of clearance under the bridge. The Approved Project included a 12 foot sound wall at this location that will be reduced to 6 feet in height based on the revised noise and vibration assessment. Some LRT track components, such as catenary poles, would extend above the top of rail with the highest elements reaching 20 feet above the top of rail. However, the LRT catenary system would not be of sufficient mass to create substantial shade or shadow impacts or substantially constrain views. Figures 14 and 15 present views looking northward on South Indian Hill Boulevard of the Approved Project right-of-way crossing and proposed bridge.

The Claremont Villas would have a direct view of the proposed bridge east of South Indian Hill Boulevard. The presence of this new bridge would have the potential to change the visual character. As described above, the right-of-way has its own distinct visual character at this location. The proposed bridge would change the visual character by adding a new structure; however, it would remain consistent with the railroad's existing visual character. In addition, the design and aesthetic features of the proposed bridge would be developed in coordination with the City of Claremont and, as described in the FEIR on page 3.13-42, Mitigation Measure VIS-5 would require screening or incorporation of design features to improve appearance and reduce visual intrusion pursuant to the standards established by in the Metro Rail Design Criteria.

Figure 14: Existing View of Rail Crossing without Proposed Bridge

Vantage Point: south of existing ROW, looking north on South Indian Hill Boulevard.

Figure 15: Simulation of Proposed Bridge

Vantage Point: south of existing ROW, looking north on South Indian Hill Boulevard.

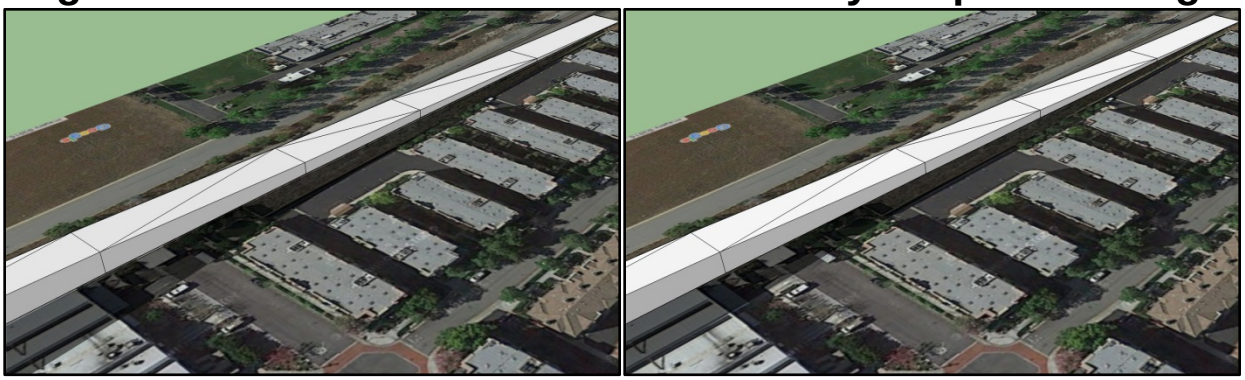
The presence of the proposed bridge would also have the potential to affect north-facing views from the Claremont Villas. However, the majority of residences have existing views only of the right-of-way and the three-story office building directly to the north of the right-of-way. The leasing office and one two-story residential building would have views north of the right-of-way blocked. A 6 foot sound wall would be constructed north of the Claremont Villas. The existing views of the San Gabriel Mountains are already limited due to trees located directly in front of and to the north of the Claremont Villas. While the proposed bridge would be taller than the approved 6 foot sound wall, the change in views from those which would occur under the Proposed Project would not be substantial and would not have a substantial adverse effect to scenic views.

In addition, as described in the FEIR on page 3.13-42, Mitigation Measure VIS-5 would require the abutment walls of the proposed bridge to be screened or designed to improve appearance and reduce visual intrusion. Elements such as landscaping and surface treatments would be applied, consistent with Metro Rail Design Criteria and Metro would work closely with the City of Claremont on the architectural and aesthetic design for the bridge and abutment walls. As the existing visual character of the right-of-way is dominated by the railroad, and the right-of-way serves as an existing boundary between neighborhoods of different visual character, the proposed bridge would not substantially change the visual character of Claremont Village, the Claremont Villas, or industrial uses on the west side.

The proposed bridge would begin to ascend above-grade near the western end of the residences located on First Street as the LRT alignment travels towards South Indian Hill Boulevard. The proposed bridge would constrain some southward views as it rises, particularly near the western end of the residences, but would not block any scenic vistas as there are no scenic views to the south. While the proposed bridge would also change vertical character of the area by introducing this new vertical element, it would not change the existing railroad character, and therefore would not substantially degrade visual character.

The proposed bridge would not cast shadows on the residences during the summer; however, shadows would be cast in the wintertime (Figure 16). Shadows would reach residences in the early morning and late afternoon, but would not reach residences during the majority of the day. The proposed bridge would be a similar height to and cast shadows on the Packinghouse; however, as described above, the Packinghouse is oriented toward 1st Street to the north, has no windows which would be affected by shadow to the south. Thus, shadows would be cast on residences by the proposed bridge, but the effect would not be substantial, and therefore, no new or increased significant impacts would occur.

Figure 16: Simulation of Shadows Cast by Proposed Bridge



Left: 8:30am, December 21. **Right**: 3:30pm, December 21.

Vantage Point: isometric view looking southwest
Note: This is a simulated image intended to show the approximate massing of and shadows cast by the proposed bridge, and does not show actual design, which would be refined in final engineering and design. Shadows from existing elements such as trees and development are not depicted.

Cyclists traveling northbound on South Indian Hill Boulevard have limited mountain views, as shown in Figure 14. While cyclists on South Indian Hill Boulevard approaching from the south would see the

proposed bridge, the existing partial background views of the mountains would be minimally affected and cyclists would continually change position, resulting in only a minor change in visual character. Shadows from the proposed bridge would be cast northward towards commercial uses, and would not impact the Claremont Villas.

Therefore, no new or increased significant impacts would occur due to the Project Modifications.

Other Proposed Project Modifications

The additional proposed Project Modifications described in Chapter 2.2 include: modification of access along Ada Avenue in Glendora; shifting the location of the Claremont LRT station and modification of the Claremont Metrolink station; and the addition of eight crossovers and an MOW track. These proposed Project Modifications would not change the vertical profile of the Approved Project alignment, stations, or parking structures or create new substantial vertical elements which would affect views, visual character, lighting, shade, or glare. Minor changes outside the right-of-way would occur in relation to the proposed Project Modifications at Ada Avenue, the LADWP access bridge location, the San Dimas Wash TPSS location, and the Claremont LRT station (as described above in the analysis of the proposed bridge over South Indian Hill Boulevard). However, these changes would be minor as Ada Ave would be modified with a low cul-de-sac, restriping, and typical street signage. Right-of-way modifications near the Claremont LRT Station would involve minor expansion of the right-of-way to the south and would not affect any visual resources, as described above.

Therefore, no new or increased significant impacts on visual resources would occur with the Project Modifications described above.

3.3.1 Mitigation Measures and Recommendations

As discussed above, Mitigation Measures VIS 2, 3, and 5 would be incorporated from the 2013 FEIR. Adherence to these mitigation measures would ensure that the Project Modifications would not result in a new or increased impact on visual resources, and no additional mitigation is required.

3.3.2 Level of Impact After Mitigation

The above listed mitigation measures will reduce impacts on visual resources from the Project Modifications to less than significant.

3.4 OTHER ENVIRONMENTAL IMPACTS

In addition to the detailed analysis conducted for transportation, noise and vibration, visual quality, and air quality impacts, other environmental areas identified in the 2013 FEIR were also qualitatively assessed. The following presents a summary of other potential impacts.

3.4.1 Air Quality and Greenhouse Gases (GHG)

Phased construction of the Project Modifications will not change types of construction or regional air quality conditions related to GHG emissions. All air quality mitigation measures in the 2013 FEIR are still applicable to the Project Modifications.

Two potential areas that are expected to produce air quality improvements are the grade separations at Foothill/Grand and South Indian Hill. As a result of reducing prolonged queuing at these intersections that resulted from a previously proposed at-grade crossing, grade separating the alignment at these intersections will serve to alleviate congestion and, therefore, reduce air quality impacts in those locations.

Additionally, since intersection level of service will not change as a result of the Project Modifications, no HOT SPOT analysis is necessary.

3.4.2 Biological Resources

As described in both Addendum Number 2 and the 2013 FEIR, several short-term construction impacts to biological resources were identified, along with mitigation measures to reduce those impacts to a less than significant level. Similar short-term construction impacts are anticipated in association with the proposed modified access to the LADWP utility easement between the San Dimas Wash and I-210 in Glendora. The proposed changes would include construction of a new bridge over the Wash and connecting access roads on land not included in the evaluation area for the 2013 FEIR. The new bridge across the San Dimas Wash would completely span the floodway areas associated with the San Dimas Wash. The bridge structures would be placed within property under the ownership and jurisdiction of the City of Glendora. The bridge and connecting access road would provide a new access location to existing disturbed utility easements and a revised TPSS location. It would not remove any trees or interfere with any sensitive biological resources. Even though the span bridge would avoid any direct structures located within Federal or State jurisdictional areas, there may be the need for authorization through the California Fish and Game Code. However, implementation of mitigation measure B-1 from the 2013 FEIR will ensure compliance.

All areas in the vicinity of project changes are disturbed and contain only low-quality biological resources. With compliance of the local, state, and federal regulations as evaluated in the 2013 FEIR, as well as implementation of mitigation measures (B-1 through B-6) during construction, the Project Modifications' potential impacts would continue to be reduced to a less than significant level and no new or increased impacts would occur.

3.4.3 Climate Change

As identified in the 2013 FEIR, to address short-term GHG emissions during construction, a Climate Action and Adaptation Plan would be prepared which includes construction mitigation measures for the use of newer, more energy-efficient equipment that would minimize the idle times of construction equipment to reduce emissions (See 2013 FEIR Chapter 3, Section 3.3, Climate Change).

As the Project Modifications will not substantially change the physical characteristics of the stations or the capacity of the planned parking structures described in the 2013 FEIR, it would not result in new significant impacts, or contribute to previously-identified significant impacts that would be substantially more severe than shown in the 2013 FEIR.

3.4.4 Communities, Population, and Housing

Modified access along Ada Avenue in Glendora, including closure of West Ada Avenue, will require partial acquisition (approximately 5,000 square feet) of the property located north of Ada Avenue, south of the railroad right-of-way, and west of Vermont Avenue (see Figure 2). The property is identified as Assessor Parcel Number (APN) 8639-001-026. It is zoned as commercial and is used as a parking lot. The portion to be acquired contains only limited landscaping. The area will be redesigned with a cul-de-sac while maintaining access to existing driveways and all adjacent properties.

While the modification to the La Verne parking structure would not require acquisition of new land, the footprint of the structure would be larger than identified in Figure 1-16 in the Project Description of the 2013 FEIR. More of the land previously identified as available for commercial development would be used by the parking structure. This land is zoned for mixed-use and is within the Old Town La Verne Specific Plan. Figure 6.3 in the Specific Plan identifies this area as a parking structure serving the Gold Line and/or adjacent mixed-use development.

The LADWP access to the electrical transmission lines via a new bridge across the San Dimas Wash would require a permanent easement with the City of Glendora, as the city owns the property just north of the San Dimas Wash (APN 8642-018-002). No property acquisition would occur and no new or increased significant impacts are anticipated.

Additional minor adjustments to the right-of-way may also require minimal property acquisition throughout the corridor as identified in Section 2.2 and reflected in the design plans included in Appendix A. Most alignment modifications occur within existing right-of-way and would not affect surrounding properties. Alignment modifications that require changes to property acquisition would be partial acquisitions that would be less than significant impacts.

The full and partial property acquisitions discussed above would not physically divide an established community or conflict with an applicable land use plan, policy, or regulation. Additionally, as stated in the 2013 FEIR, there are no habitat conversation plans or natural community conservation plans within the study area of the Approved Project. All acquisitions would be conducted following the provisions of the California Relocation Assistance Act. All real property acquired by the Authority would be appraised to determine its fair market value. Just compensation, which would not be less than the approved appraisal made to each property owner, would be offered by the Authority. Therefore, Project Modifications would not result in a new or increased significant impact on the community, housing, and population.

3.4.5 Community Facilities and Parklands

The Project Modifications will not substantially change the physical characteristics of the stations or the capacity of the planned parking structures described in the 2013 FEIR. Project Modifications are not anticipated to result in any changes to impacts for Police Protection, Fire Protection, Schools, Government Centers or Hospitals. Consistent with the Approved Project, the Project Modifications would be required to address the intermittent traffic disruptions during construction with mitigation measures requiring a traffic management plan (TMP) (see 2013 FEIR Chapter 2).

Parkland

The Louie Pompei Memorial Sports Complex is located just south of the San Dimas Wash in the City of Glendora. This is a 51-acre public park that includes baseball and multipurpose fields, a picnic area, and playground. The park's current parking is located directly west of the proposed new bridge across the San Dimas Wash. The Project Modifications would involve the use of the access road around the Louie Pompei Memorial Sports Complex for vehicles that will access the LADWP utility easement and the revised TPSS location north of the Wash. The use of the access road after construction for the LADWP's purpose of accessing the electrical transmission lines, or LA Metro's purpose of accessing the TPSS site, will be infrequent (approximately once per month) and would not result in a new or increased significant impacts on this adjacent parkland.

As discussed in Chapter 3 of the FEIR, the parks adjacent to the alignment would experience temporary construction impacts, which could result in periodic noise, vibration, air quality and visual impacts that would indirectly impact these facilities. However, due to the limited scope and timeframe for construction, the existing mitigation measures to reduce construction impacts would ensure no new or increased significant impacts would result from the Project Modifications. Therefore, these Project Modifications would not result in new significant impacts to any community facilities or parklands or contribute to previously identified impacts that would be significantly more severe than shown in the 2013 FEIR.

3.4.6 Cultural Resources

As with the Approved Project, the construction and long-term operation of the Project Modifications would include implementation of mitigation measures (CR-1 and CR-2) and would continue to result in a less than significant impact on cultural resources as identified in the 2013 FEIR.

An area of notable improvement due to the Project Modifications would result from the grade separation of the alignment at South Indian Hill Boulevard. A grade-separated crossing would require the Claremont Station to be moved closer to College Avenue, allowing for direct access to the station from both Harvard Avenue and College Avenue. As a result of the slight relocation of the Claremont Station, the visual impacts on the Santa Fe Depot (an identified cultural resource) would be reduced, as the station and its access points will not directly impede views from the plaza of the Santa Fe Depot.

3.4.7 Energy

With the implementation of mitigation measures outlined in the FEIR (see Section 3.7.6), the Project Modifications would not result in wasteful, inefficient, or unnecessary use of energy or in a substantial increase of energy demand during construction. Therefore, the impacts would continue to be less than significant.

3.4.8 Geologic Hazards

Consistent with the Approved Project, the Project Modifications would be constructed in strict compliance with local, state, and federal regulations, as well as permits as outlined in the 2013 FEIR that have been developed by regulatory agencies to manage geologic and seismic concerns during construction. Therefore, no new or increased impact would result. With this mandatory compliance with current seismic safety and geotechnical safety requirements and regulations, including safety design standards, the Project Modifications would continue to result in less than significant impacts related to geologic and seismic issues.

3.4.9 Hazardous Materials

Since the Project Modifications will not substantially change the physical characteristics of the stations, the capacity of the planned parking structures, or the planned operation of the Approved Project as described in the 2013 FEIR, no new or increased impacts are anticipated. With the implementation of mitigation measures (HW-1 through HW-6) during construction, the Project Modifications' potential impacts would continue to be reduced to a less than significant level.

3.4.10 Land Use and Planning

The Claremont LRT station will be modified by shifting it approximately 300 feet to the east and will also require the modification of the existing Metrolink station platform from its current location west of College Avenue on the north side of the right-of-way to a center station platform located on the south side of the right-of-way approximately 600 feet east of College Avenue. These modifications will take place within the existing right-of-way.

Additionally, as discussed in Section 3.4.4 above, there are a couple of elements of the Project Modifications that will require minor land acquisition. The closure of the west leg of Ada Avenue will require additional land acquisition. The LADWP access point will require a permanent easement with the City of Glendora. The minor alignment modifications may also require some additional right-of-way.

These Project Modifications would not result in new significant impacts to land use and planning or contribute to previously identified impacts that would be significantly more severe than shown in the 2013 FEIR.

3.4.11 Safety and Security

Since the Project Modifications will not significantly change the alignment right-of-way, physical characteristics of the stations, or the capacity of the planning parking structures as described in the 2013 FEIR, they would not result in new safety or security impacts, or contribute to previously identified significant impacts that would be substantially more severe than shown in the 2013 FEIR.

The Project Modifications include two anticipated safety improvements, which would result from the grade separations at Foothill Boulevard/Grand Avenue and South Indian Hill Boulevard. By grade-separating the alignment across these two locations, it is anticipated that the Project Modifications will enhance safety by eliminating potential traffic and collision impacts that would have resulted from at-grade crossings.

Project Modifications at the La Verne parking structure will incorporate a pedestrian underpass connection between the parking structure and the station. The underpass will eliminate the need for

pedestrians to cross the LRT tracks at-grade, therefore creating safer and more secure access for patrons. The underpass will be designed based on LA Metro standards and in coordination with the City of La Verne.

Project Modifications at the Claremont Station will also incorporate a pedestrian underpass connection between the parking structure and the Metrolink platform to facilitate a safe and secure access point for patrons.

Additionally, the Authority will prepare a Threat and Vulnerability analysis to assess safety and security at all stations and other locations prior to construction of the project. With this analysis and the implementation of the 2013 FEIR mitigation measures (SS-1 through SS-6), the Project Modifications' potential impacts would continue to be reduced to a less than significant level and no new or increased impacts would occur.

3.4.12 Water Quality

Consistent with the Approved Project, the Project Modifications would be constructed in strict compliance with local, state, and federal regulations and requirements. This would eliminate or reduce impacts on water resources by establishing project controls through formalized processes, agreements, and permits.

As such, the Project Modifications would minimize surface and groundwater quality impacts to less than significant levels. No new or increased impacts would occur.

3.4.13 Growth-Inducing Impacts

The Project Modifications would pose no potential to induce growth beyond that already identified for the Approved Project in the 2013 FEIR. Consistent with the Approved Project, the Project Modifications could potentially attract new transit-oriented development (TOD) around the LRT stations.

The Project Modifications are not anticipated to directly or indirectly attract growth beyond that already envisioned in SCAG's 2012-2035 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). The corridor Cities' land use plans recognize and account for the project, and any future new development would be consistent with each City's land use plans and regulations. As such, no new or increased significant impacts would occur.

3.4.14 Cumulative Impacts

The Project Modifications have potential to result in only minor modifications to the project's right-of-way, and will not result in significant changes to station footprints, construction, or operation. As identified in the 2013 FEIR, the Approved Project may result in significant cumulative impacts during construction by (1) contributing to regional cumulative air quality impacts when added to other transportation projects and improvements within the entire SCAG region that may be under construction simultaneously, and (2) if unknown buried cultural resources are discovered during construction of the project, then the project would contribute to the significant cumulative impacts related to discovery of unknown materials at a regional scale as identified in the 2012-2035 RTP/SCS EIR. Following mitigation, no new or increased significant cumulative impacts would occur as a result of the Project Modifications.

3.5 FINDINGS OF NO NEW OR INCREASED SIGNIFICANT IMPACT

Based on the evaluation of environmental impacts of the Project Modifications, none of the proposed modifications constitute substantial changes to the Approved Project, nor would result in new significant impacts following mitigation or contribute to previously identified significant impacts that would be substantially more severe than shown in the 2013 FEIR following mitigation. Accordingly, the Authority finds that the preparation of an Addendum pursuant to CEQA Guidelines 15164 is appropriate, and that the Project Modifications to the Approved Project do not instigate a requirement to prepare a supplemental of subsequent EIR.

Chapter 4 – List of Preparers

4.1 LEAD AGENCY

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Phone: (626) 305-7007
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4.2 CONSULTANTS TO THE LEAD AGENCY

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- Ray Sosa, Associate Vice President (Project Manager)
- Robert Hertz, Associate Vice President (Chapter 1 Introduction, Chapter 2 Project Modifications, Chapter 3 Environmental Evaluation, Chapter 4 List of Preparers)
- Steve Greene, Associate Vice President (Transportation)
- David DeRosa, Senior Urban Planner (Chapter 1 Introduction, Chapter 2 Project Modifications, Chapter 3 Environmental Evaluation)
- Carley Markovitz, Transportation Planner III, (Chapter 1 Introduction, Chapter 2 Project Modifications, Chapter 3 Environmental Evaluation)
- Vamshi Akkinepally, Senior Transportation Planner (Transportation)
- J. Andy Olson, Urban and Environmental Planner (Visual and Aesthetic)
- Erik Larsen, Scientist IV (Biological Resources)
- Yara Jasso, Transportation Planner (GIS)

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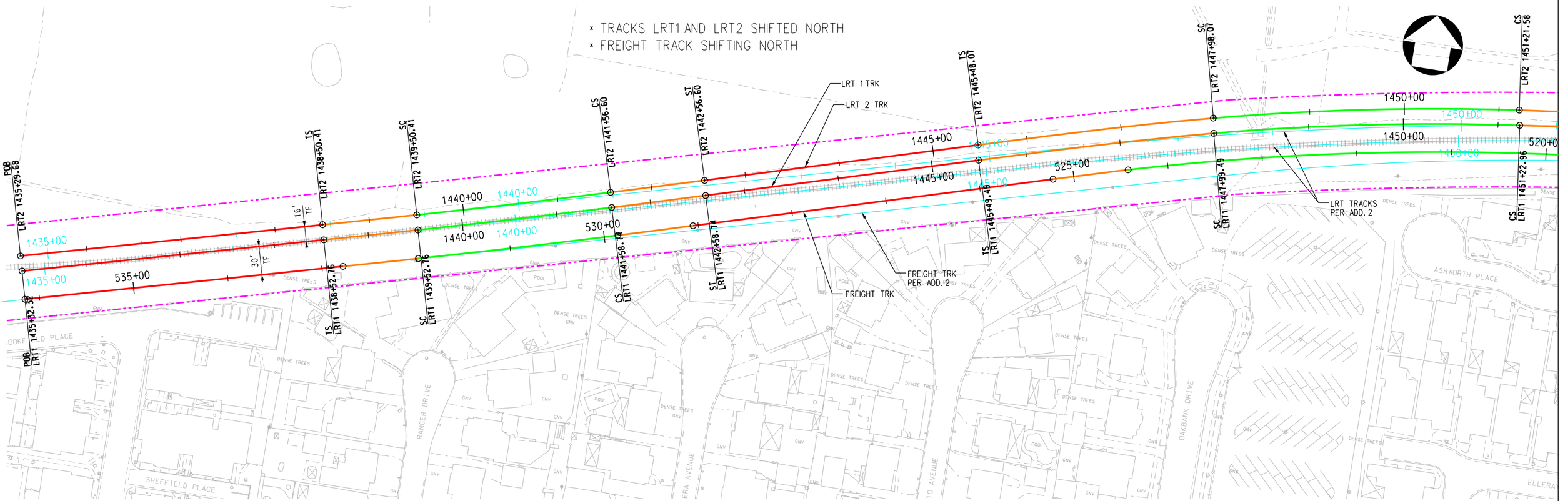
Pasadena, CA 91101

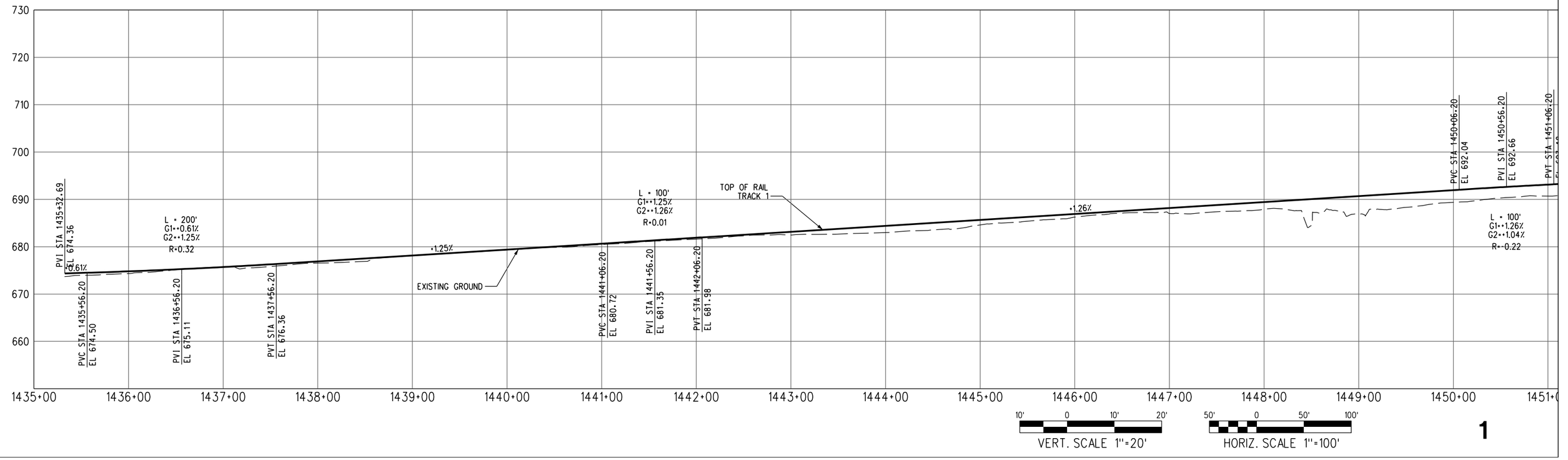
- Shannon McKenna, Associate (Noise and Vibration)
- Hugh Saurenmen, PhD, President (Noise and Vibration)

Appendix A

Plan and Profiles Set (February 2016)

- TRACKS LRT1 AND LRT2 SHIFTED NORTH
- FREIGHT TRACK SHIFTING NORTH





1

- TRACKS LRT1 AND LRT2 SHIFTED NORTH
- FREIGHT TRACK SHIFTING NORTH

PARKVIEW AVE.

BUCKEYE PL

BARRANCA AVE

ST LRT2 1453+71.58

TS LRT2 1455+87.22

SC LRT2 1458+37.22

ST LRT1 1453+72.96

TS LRT1 1455+80.65

SC LRT1 1458+30.65

1455+00

515+00

1460+00

510+00

1465+00

505+00

LRT 1 TRK

LRT 2 TRK

LRT TRACKS PER ADD. 2

FREIGHT TRK

FREIGHT TRK PER ADD. 2

PARKVIEW AVENUE

WINDERMERE LANE

ARGYLE AVENUE

DENSE TREES

POOL

GNV

730
720
710
700
690
680
670
660

EL 693.16

TOP OF RAIL TRACK 1

+1.04%

STA 1454+96.25
EL 697.23

EXISTING GROUND

PVC STA 1457+06.20
EL 699.41

PVI STA 1457+56.20
EL 699.93

PVT STA 1458+06.20
EL 700.48

L = 100'
G1=+1.04%
G2=+1.11%
R=0.08

+1.11%

PVC STA 1462+06.20
EL 704.94

PVI STA 1462+56.20
EL 705.49

PVT STA 1463+06.20
EL 706.04

L = 100'
G1=+1.11%
G2=+1.09%
R=-0.02

+1.09%

EXISTING GROUND

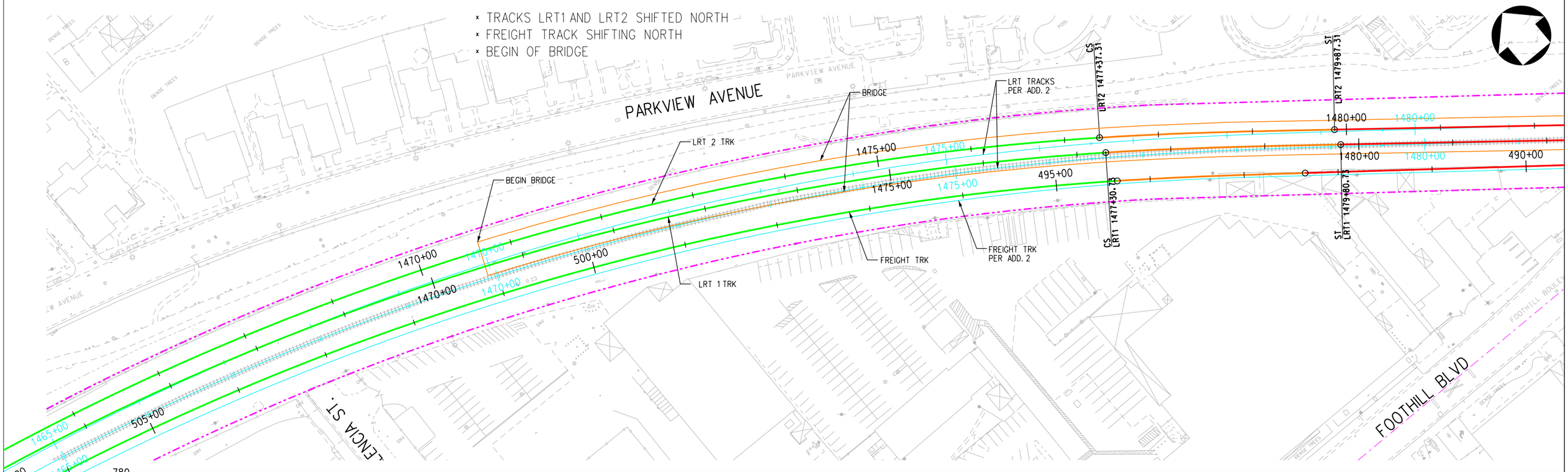
1452+00 1453+00 1454+00 1455+00 1456+00 1457+00 1458+00 1459+00 1460+00 1461+00 1462+00 1463+00 1464+00 1465+00 1466+00 1467+00

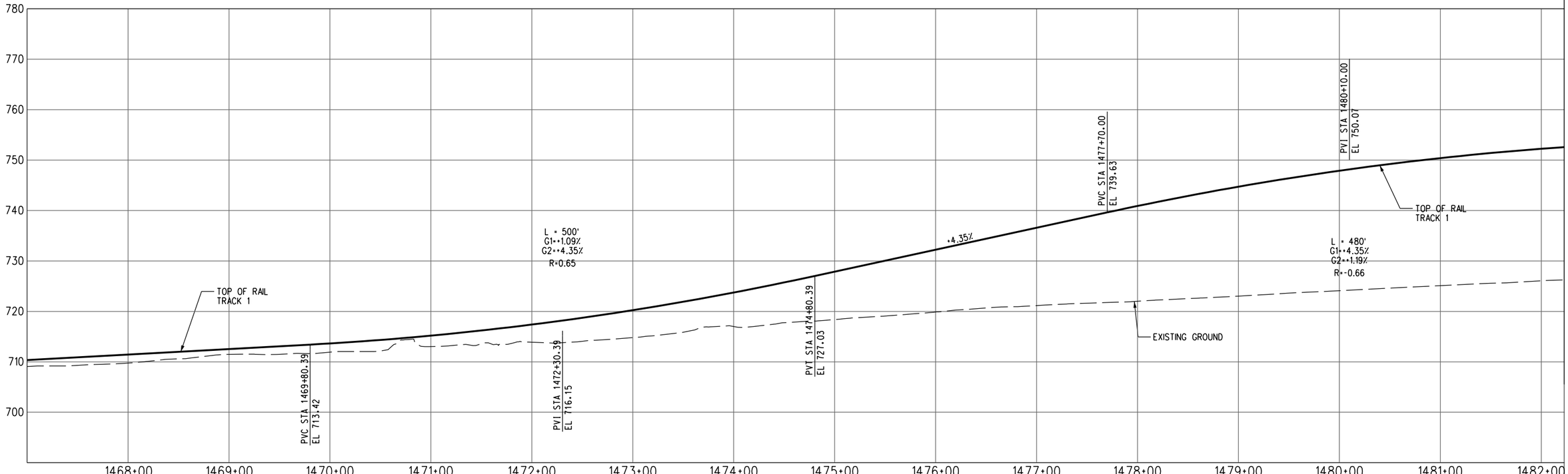
10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

2

- TRACKS LRT1 AND LRT2 SHIFTED NORTH
- FREIGHT TRACK SHIFTING NORTH
- BEGIN OF BRIDGE





10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- GRADE SEPARATE FOOTHILL BLVD AND GRAND AVE
- TRACKS LRT1 AND LRT2 SHIFTED
- FREIGHT TRACK SHIFTING NORTH
- ADDED 2 NEW #20 CROSSOVERS
- END OF BRIDGE
- ALT LOCATION FOR TPSS SITE

GRAND AVE.
FOOTHILL BLVD
CARROLL AVE.
CARROLL AVE.
NEW GRADE CROSSING
PC LRT2 1486+24.15
LRT TRACKS PER ADD. 2
PT LRT2 1488+24.84
TPSS B-1-ALT (STA. 1488+30)
BRIDGE
LRT 2 TRK
NEW #20 CROSSOVER
NEW #20 CROSSOVER
PC LRT2 1495+09.85
PT LRT2 1496+10.22
TPSS SITE PER ADD. 2
TPSS B-1 (STA. 1496+10)
END OF BRIDGE
PC LRT1 1486+11.30
PT LRT1 1488+12.00
LRT 1 TRK
FREIGHT TRK
FREIGHT TRK PER ADD. 2
TS LRT1 1496+07.08
SC LRT1 1497+07.08
1485+00
1485+00
1485+00
485+00
1490+00
1490+00
1490+00
480+00
1495+00
1495+00
1495+00
475+00

PVT STA 1482+50.00
EL 753.08
PVT STA 1482+63.53
EL 753.08
STA 1483+91.01
EL 754.60
+1.19%
STA 1485+33.53
EL 756.30
PVC STA 1485+56.77
EL 756.57
PVI STA 1487+66.77
EL 759.07
L = 420'
G1=+1.19%
G2=-1.50%
R=-0.64
PVT STA 1489+76.77
EL 755.92
STA 1490+56.13
EL 754.73
-1.50%
TOP OF RAIL TRACK 1
STA 1495+51.34
EL 747.30
PVC STA 1495+94.11
EL 746.66
EXISTING GROUND
PVI STA 1497+94.11
EL 743.66
L = 400'
G1=-1.50%
G2=+0.98%
R=0.62

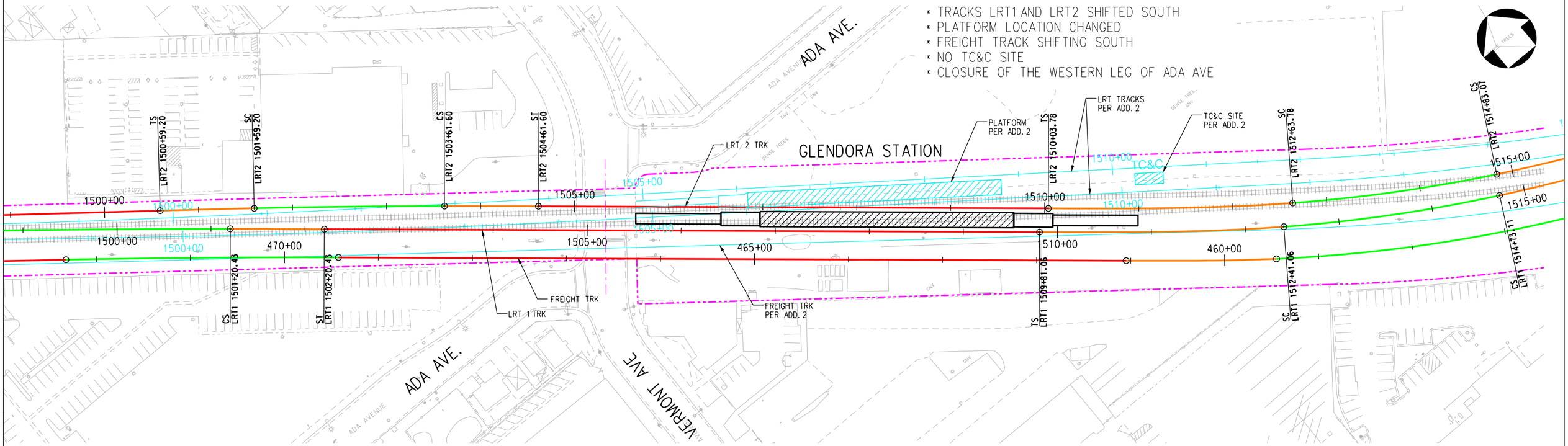
770
760
750
740
730
720
710
700

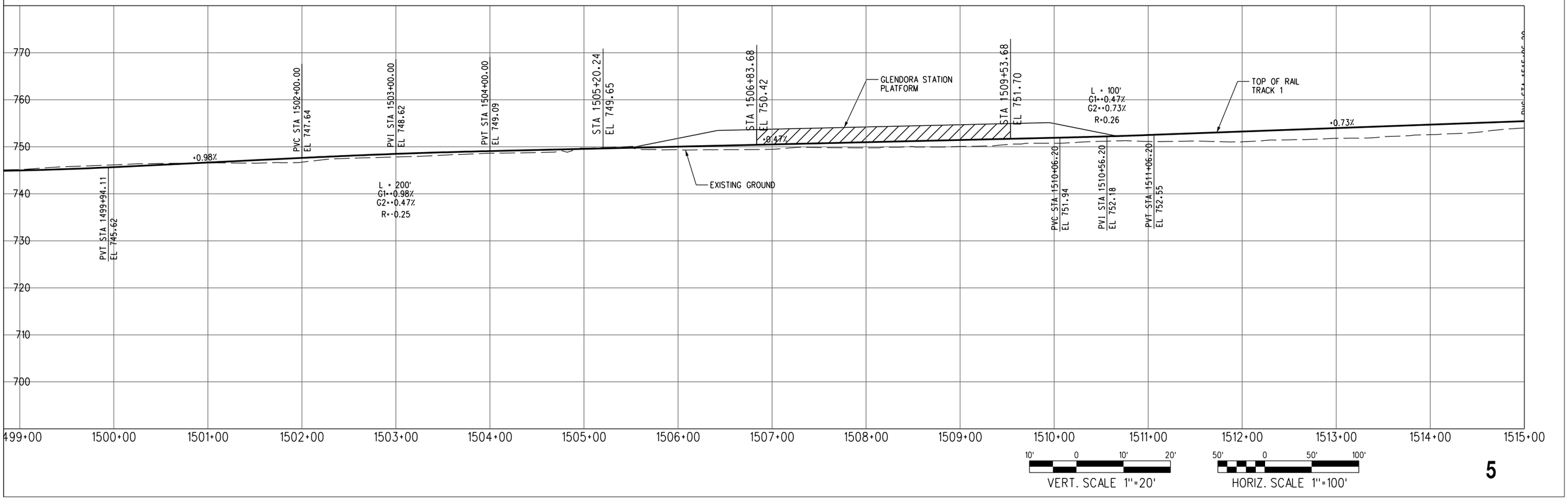
1483+00 1484+00 1485+00 1486+00 1487+00 1488+00 1489+00 1490+00 1491+00 1492+00 1493+00 1494+00 1495+00 1496+00 1497+00 1498+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 SHIFTED SOUTH
- PLATFORM LOCATION CHANGED
- FREIGHT TRACK SHIFTING SOUTH
- NO TC&C SITE
- CLOSURE OF THE WESTERN LEG OF ADA AVE





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50' 0 50' 100'
HORIZ. SCALE 1"=100'

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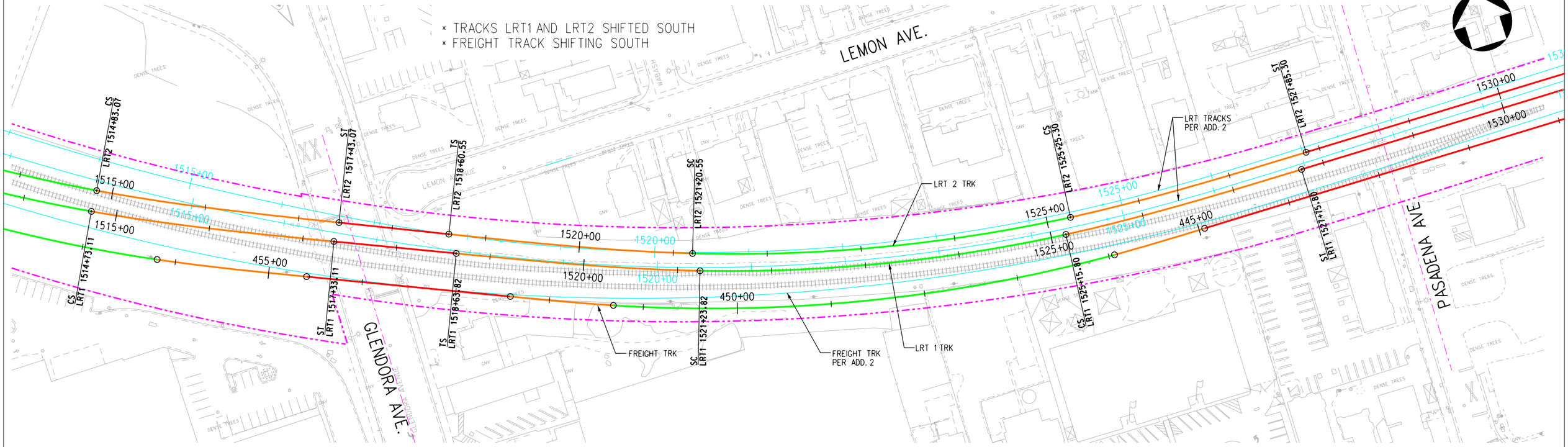
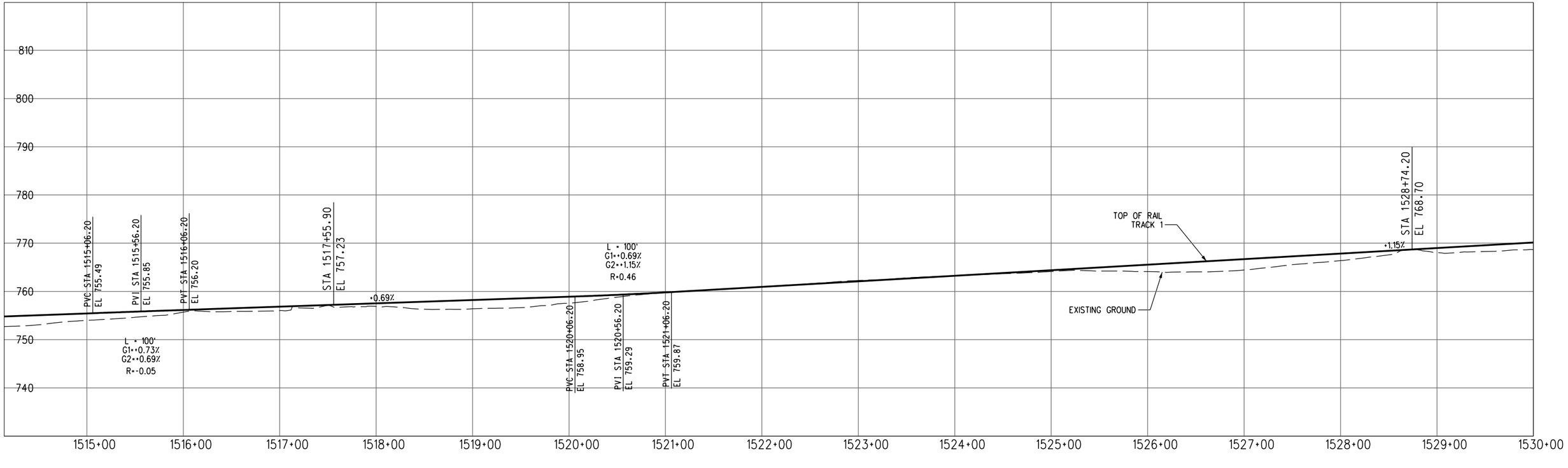
- FREIGHT TRACK SHIFTING SOUTH





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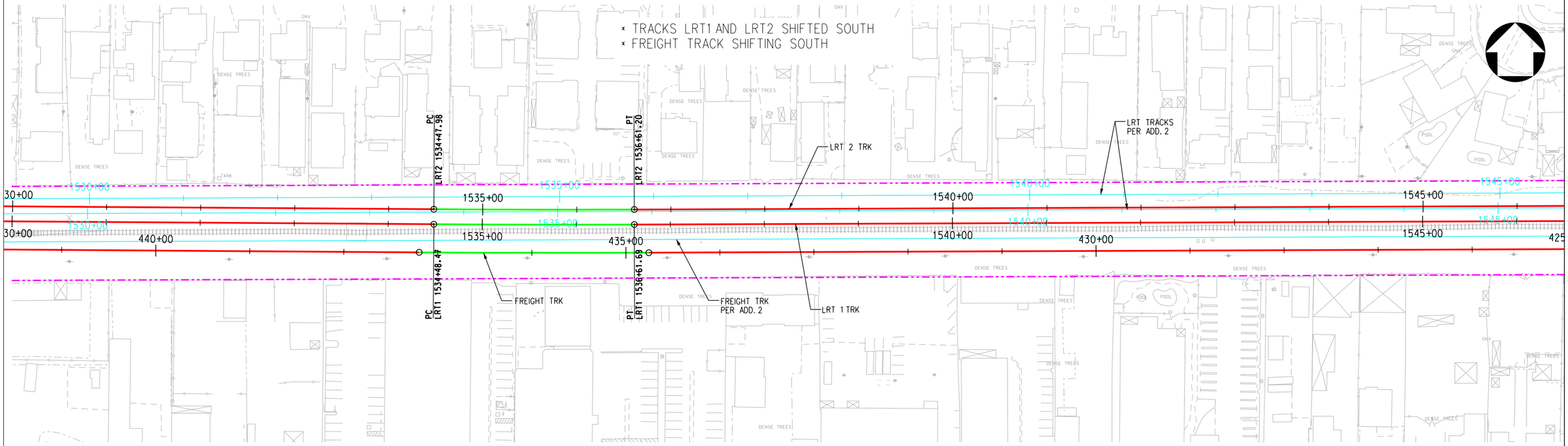
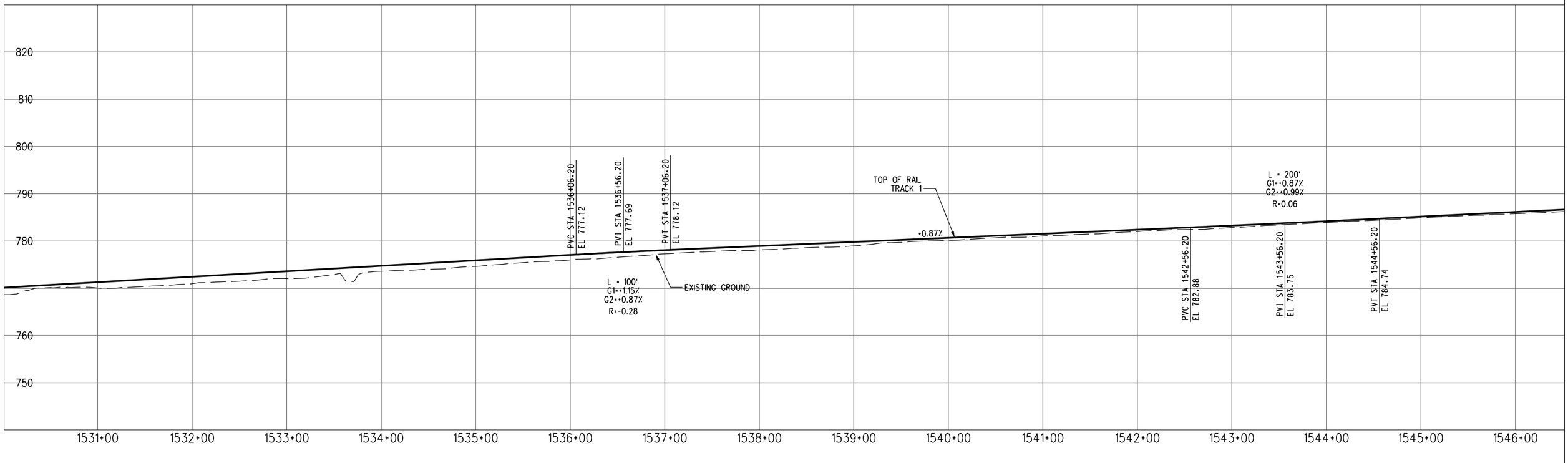
50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 SHIFTED SOUTH
- FREIGHT TRACK SHIFTING SOUTH





10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 SHIFTED SOUTH
- FREIGHT TRACK SHIFTING SOUTH
- ALT LOCATION FOR TPSS SITE

LEMON AVE.

GLENWOOD AVE.

ELWOOD AVE.

LRT 2 TRK

LRT TRACKS PER ADD. 2

TPSS B-2-ALT (STA. 1557+20)

PC LRT2 1558+62.91

PT LRT2 1560+90.58

PC LRT1 1558+63.25

PT LRT1 1560+90.76

TPSS B-2 (STA. 1559+75)

TPSS SITE PER ADD. 2

TPSS SITE

FREIGHT TRK

FREIGHT TRK PER ADD. 2

LRT 1 TRK

+00

1550+00

1555+00

1560+00

420+00

415+00

410+00

STA 1550+96.04
EL 791.06

STA 1557+44.87
EL 797.47

TOP OF RAIL TRACK 1

+0.99%

EXISTING GROUND

L = 100'
G1=-0.99%
G2=+1.07%
R=0.08

PVC STA 1561+06.20
EL 801.05

PVI STA 1561+56.20
EL 801.54

PVT STA 1562+06.20
EL 802.07

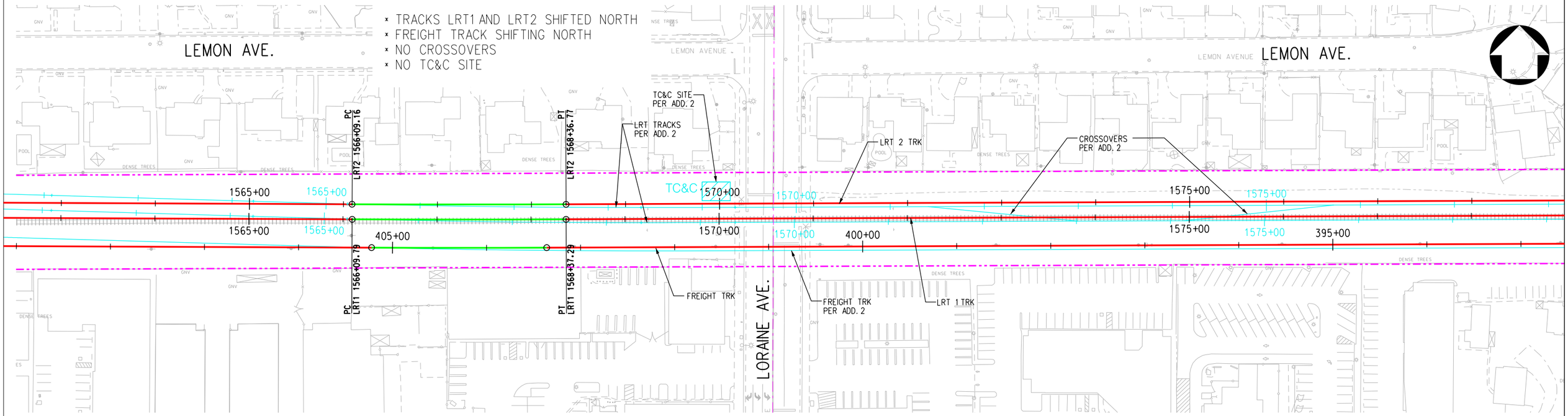
820
810
800
790
780
770
760
750

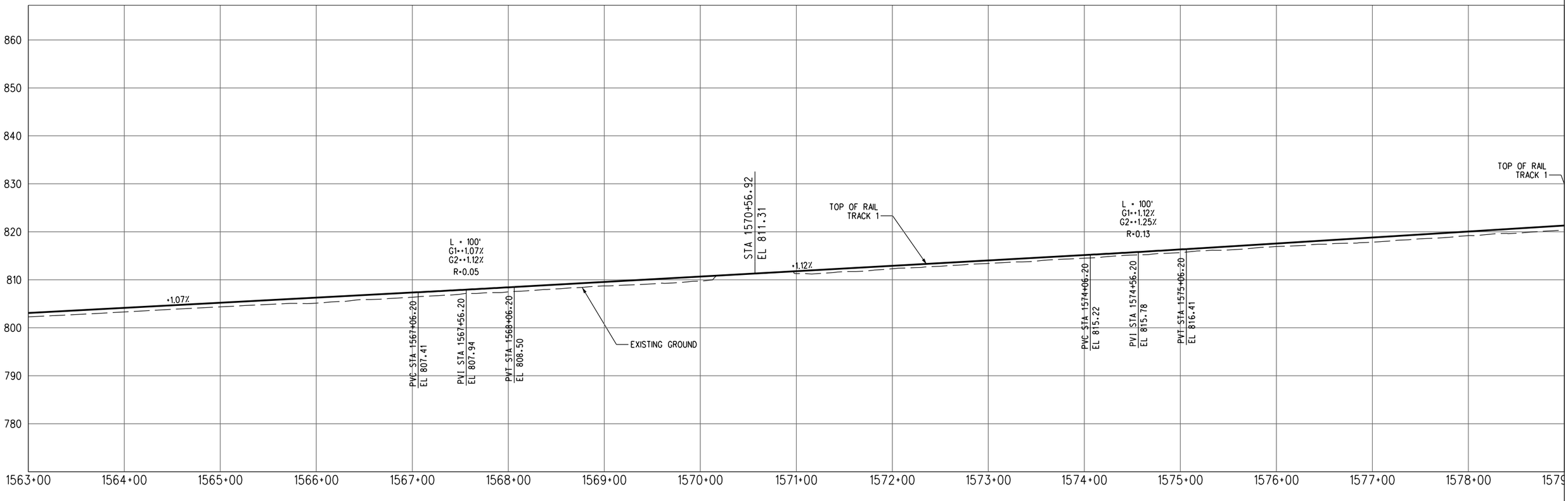
1547+00 1548+00 1549+00 1550+00 1551+00 1552+00 1553+00 1554+00 1555+00 1556+00 1557+00 1558+00 1559+00 1560+00 1561+00 1562+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 SHIFTED NORTH
- FREIGHT TRACK SHIFTING NORTH
- NO CROSSOVERS
- NO TC&C SITE

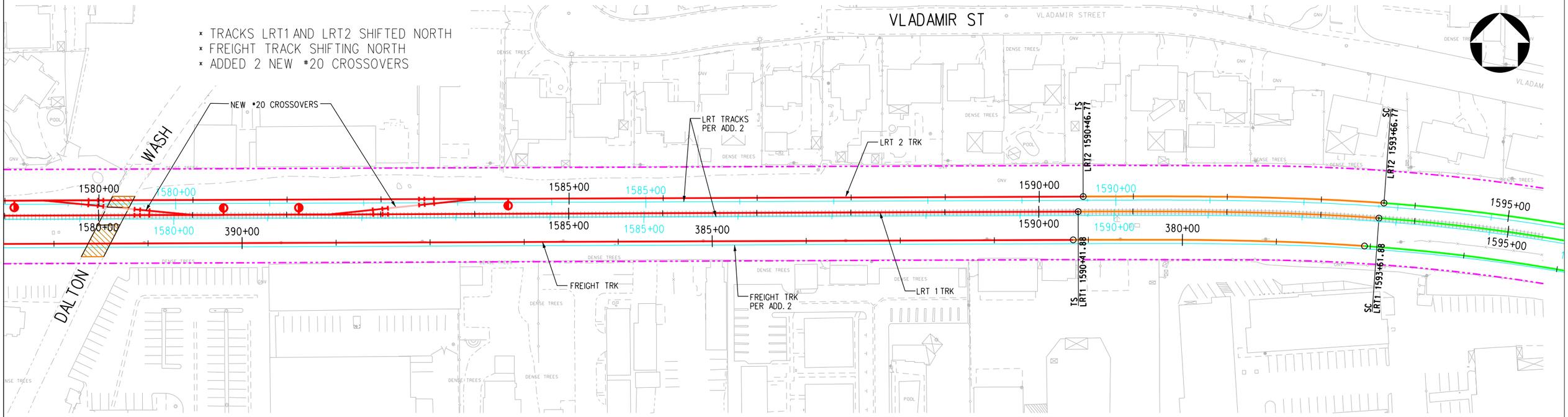


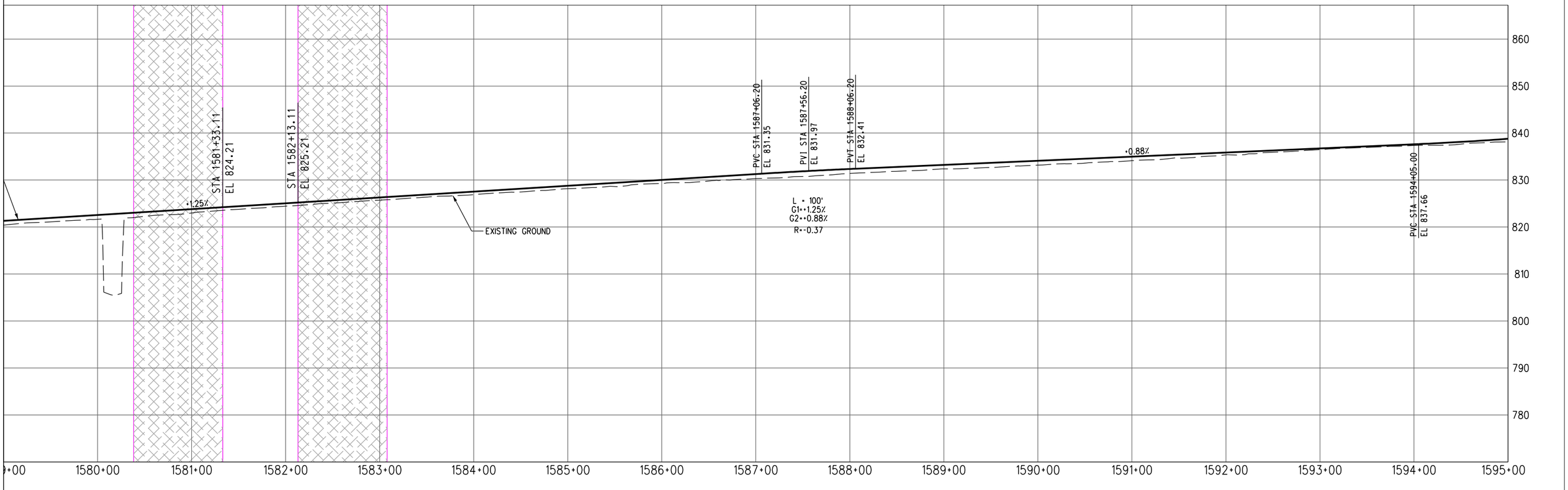


10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 SHIFTED NORTH
- FREIGHT TRACK SHIFTING NORTH
- ADDED 2 NEW #20 CROSSOVERS



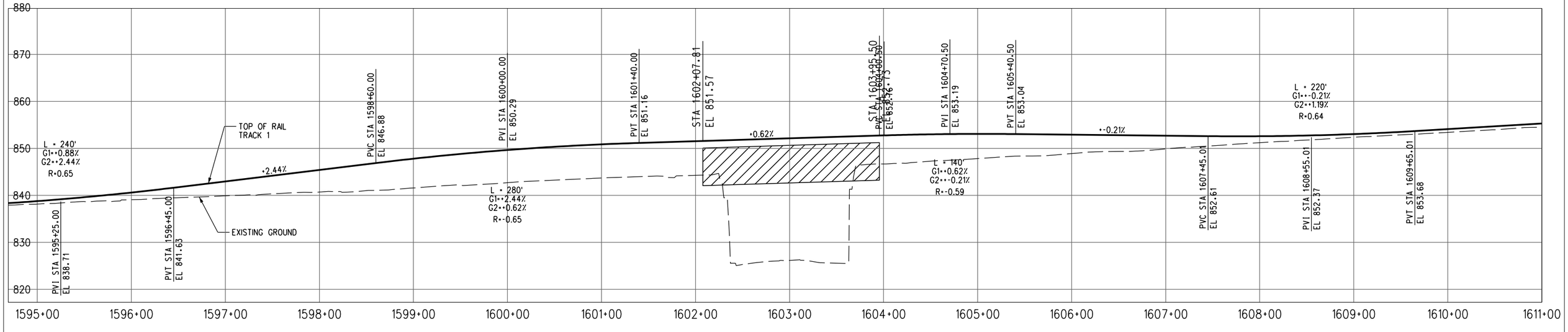


10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 SHIFTED NORTH
- FREIGHT TRACK SHIFTING NORTH
- WIDER BRIDGE FOR HISTORIC ROUTE 66

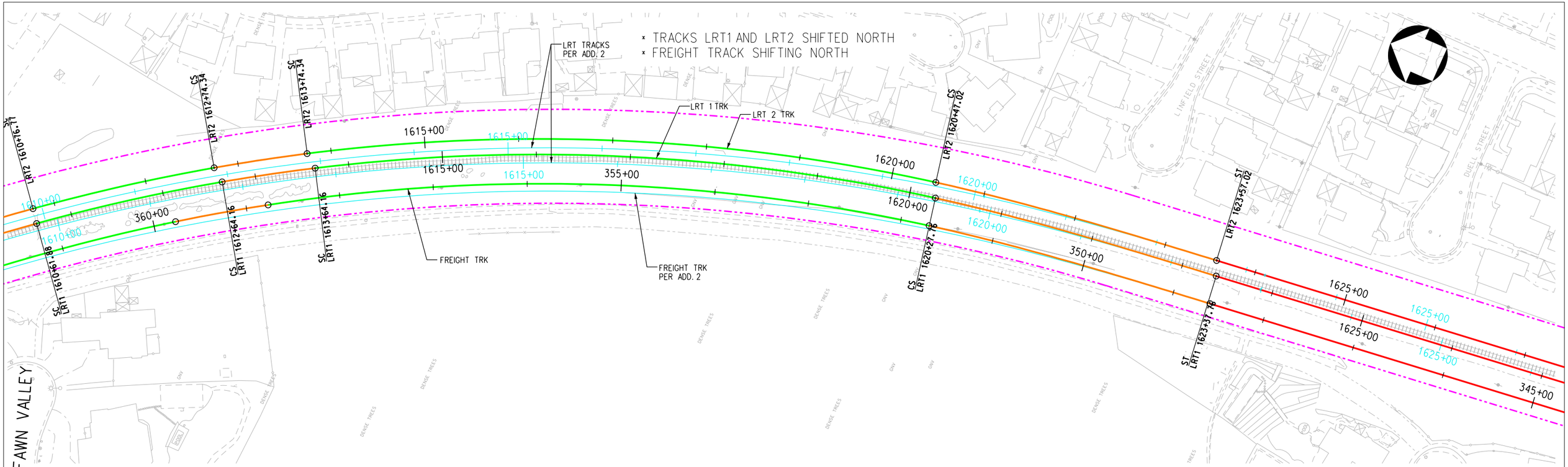
COMPROMISE LINE RD.
COMPROMISE LINE ROAD
VLADAMIR STREET
HISTORIC ROUTE 66
ROUTE 66
LRT TRACKS PER ADD. 2
WIDER BRIDGE
LRT 1 TRK
LRT 2 TRK
FREIGHT TRK
BRIDGE PER ADD. 2
FREIGHT TRK PER ADD. 2
1595+00
1600+00
1605+00
1610+00
370+00
375+00
365+00
LRT2 1608+76.77 CS
LRT1 1608+61.88 CS
LRT2 1610+76.77 SC
LRT1 1610+61.88 SC

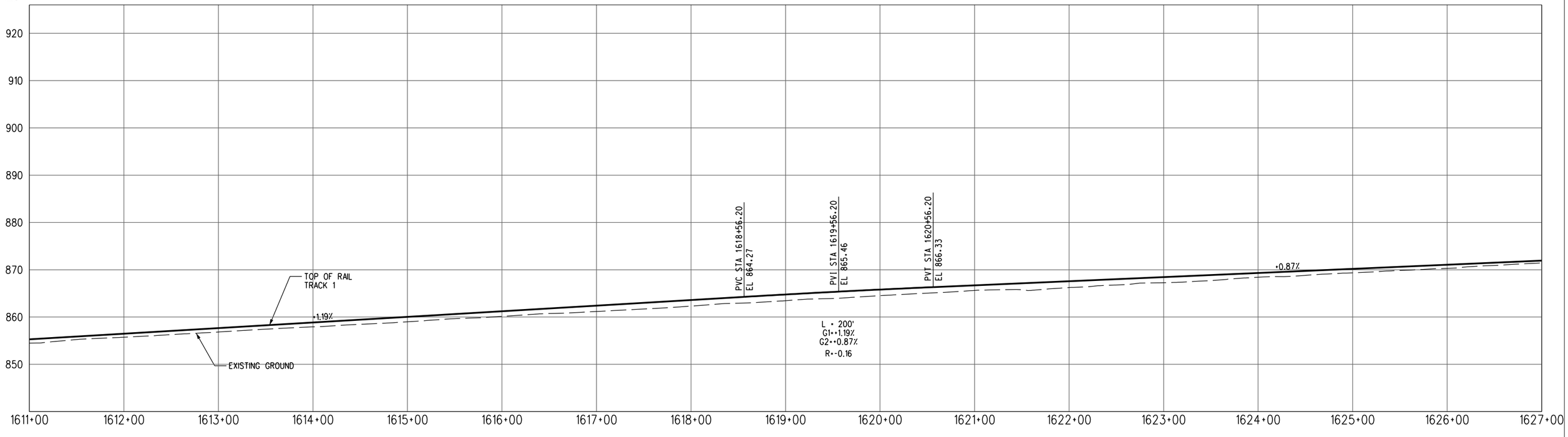


10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 SHIFTED NORTH
- FREIGHT TRACK SHIFTING NORTH





10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- ALL TRACKS SHIFTED SLIGHTLY
- NEW TPSS LOCATION

I-210 FWY WB ON-RAMP
I-210 FWY WB
I-210 FWY EB
I-210 FWY EB OFF-RAMP
FOOTHILL FREEWAY
LONE HILL AVE
DENSE TREES
DENSE BRUSH
POOL

345+00
1630+00
340+00
1635+00
335+00
1640+00
330+00

LRT2 1627+84.96 TS
LRT1 1627+65.08 TS
LRT2 1630+24.96 SC
LRT1 1630+05.08 SC
LRT2 1641+66.34 CS
LRT1 1641+46.46 CS

LRT 1 TRK
LRT 2 TRK
FREIGHT TRK
LRT TRACKS PER ADD. 2
BRIDGE PER ADD. 2
BEGIN BRIDGE
FREIGHT TRK PER ADD. 2

TPSS B-3 (STA. 1640+00)
TPSS B-3 (STA. 1639+70) NEW LOCATION
EXISTING ELECTRICAL OVER-HEAD

920
910
900
890
880
870
860
850

PVC STA 1628+06.20 EL 872.86
PVI STA 1628+56.20 EL 873.30
PVT STA 1629+06.20 EL 873.47
L = 100' G1 = -0.87% G2 = -0.36% R = -0.52
EXISTING GROUND
+0.36%
TOP OF RAIL TRACK 1
PVC STA 1632+06.20 EL 874.54
PVI STA 1632+56.20 EL 874.72
PVT STA 1633+06.20 EL 875.15
L = 100' G1 = 0.36% G2 = 0.86% R = 0.50
STA 1633+53.00 EL 875.55
STA 1633+91.02 EL 875.87
STA 1634+99.63 EL 876.80
+0.86%
TOP OF RAIL TRACK 1
STA 1636+91.13 EL 878.44
STA 1637+89.22 EL 879.28
PVC STA 1638+20.13 EL 879.54
STA 1638+45.48 EL 879.79
L = 430' G1 = 0.86% G2 = 4.80% R = 0.92
PVI STA 1640+35.13 EL 881.38
STA 1641+68.22 EL 888.08
STA 1642+23.34 EL 890.45
PVT STA 1642+50.13 EL 891.70

1627+00
1628+00
1629+00
1630+00
1631+00
1632+00
1633+00
1634+00
1635+00
1636+00
1637+00
1638+00
1639+00
1640+00
1641+00
1642+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

x ALL TRACKS SHIFTED SLIGHTLY

SAN DIMAS WASH

LONE HILL AVE.

AUTO CENTRE DR.

EXISTING ELECTRICAL OVER-HEAD

LRT TRACKS PER ADD. 2

LRT 1 TRK

LRT 2 TRK

FREIGHT TRK

BRIDGE

FREIGHT TRK PER ADD. 2

BRIDGE PER ADD. 2

ST LRT2 1644+06.34

PC LRT2 1648+56.67

PT LRT2 1650+51.82

IS LRT2 1655+02.08

SC LRT2 1656+02.08

CS LRT2 1658+08.36

ST LRT1 1643+86.41

PC LRT1 1648+40.63

PT LRT1 1650+35.77

TS LRT1 1654+85.81

SC LRT1 1655+85.81

CS LRT1 1657+92.09

1645+00 1645+00 1645+00 325+00 1650+00 1650+00 1650+00 320+00 1655+00 1655+00 315+00

STA 1642+23.34
EL 890.45

PVT STA 1642+50.13
EL 891.70

+4.80%

PVC STA 1647+62.03
EL 916.27

STA 1649+29.84
EL 923.05

PVI STA 1652+87.03
EL 941.47

TOP OF RAIL TRACK 1

STA 1656+09.95
EL 924.44

PVT STA 1658+12.03
EL 916.78

L = 1050'
G1=+4.80%
G2=-4.70%
R=-0.90

EXISTING GROUND

EXISTING GROUND

950 940 930 920 910 900 890 880

2+00 1643+00 1644+00 1645+00 1646+00 1647+00 1648+00 1649+00 1650+00 1651+00 1652+00 1653+00 1654+00 1655+00 1656+00 1657+00 1658+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

* ALL TRACKS SHIFTED
* NO TPSS SITE

END BRIDGE PER ADD. 2

END BRIDGE

GLADSTONE ST.

FREIGHT TRK

FREIGHT TRK PER ADD. 2

LRT 2 TRK

LRT 1 TRK

LRT TRACKS PER ADD. 2

TPSS SITE PER ADD. 2

CITY OF GLENDORA

CITY OF SAN DIMAS (APPROX.)

ST LRT2 1659+08.36

TS LRT2 1661+06.44

SC LRT2 1662+06.44

CS LRT2 1664+18.99

ST LRT2 1665+18.99

TS LRT2 1667+18.88

SC LRT2 1669+18.88

CS LRT2 1675+33.98

ST LRT1 1658+92.09

TS LRT1 1660+95.97

SC LRT1 1661+95.97

CS LRT1 1663+96.71

ST LRT1 1664+96.71

TS LRT1 1666+96.71

SC LRT1 1668+96.71

1660+00 1660+00 1660+00 310+00 1665+00 1665+00 1665+00 305+00 1670+00 1670+00 1670+00 300+00 1675+00 1675+00

DENSE TREES DENSE BRUSH GLADSTONE STREET

-4.70%

L = 510'
G1 = -4.70%
G2 = 0.00%
R = 0.92

PVC STA 1660+99.69
EL 903.26

PVI STA 1663+54.69
EL 891.27

STA 1666+23.22
EL 891.27

STA 1666+67.17
EL 891.27

PVT STA 1666+09.69
EL 891.27

0.00%

EXISTING GROUND

TOP OF RAIL TRACK 1

L = 200'
G1 = 0.00%
G2 = 1.09%
R = 0.54

PVC STA 1671+85.47
EL 891.27

PVI STA 1672+85.47
EL 891.27

PVT STA 1673+85.47
EL 892.35

950 940 930 920 910 900 890 880

1659+00 1660+00 1661+00 1662+00 1663+00 1664+00 1665+00 1666+00 1667+00 1668+00 1669+00 1670+00 1671+00 1672+00 1673+00 1674+00 1675+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- CHANGE IN LRT TRACKS ALIGNMENT
- NO CHANGE TO TPSS SITE
- FREIGHT TRACK SHIFTED SLIGHTLY

HIGHLAND PL.

CS LRT2 1675+33.98

ST LRT2 1677+33.98

TS LRT2 1679+28.98

SC LRT2 1680+98.98

CS LRT2 1685+09.92

SC LRT2 1686+09.92

CS LRT1 1676+24.43

SC LRT1 1681+74.43

1675+00 | 295+00 | 1680+00 | 290+00 | 1685+00 | 285+00 | 1690+00

LRT TRACKS PER ADD. 2

LRT 1 TRK

LRT 2 TRK

57 FWY SB

57 FWY NB

FREIGHT TRK

FREIGHT TRK PER ADD. 2

TPSS B-4 (STA. 1682+65)

TPSS B-4 (STA. 1682+63)

TPSS SITE PER ADD. 2

950 940 930 920 910 900 890 880

EL 892.35

STA 1677+19.40
EL 895.98

STA 1680+11.61
EL 899.16

+1.09%

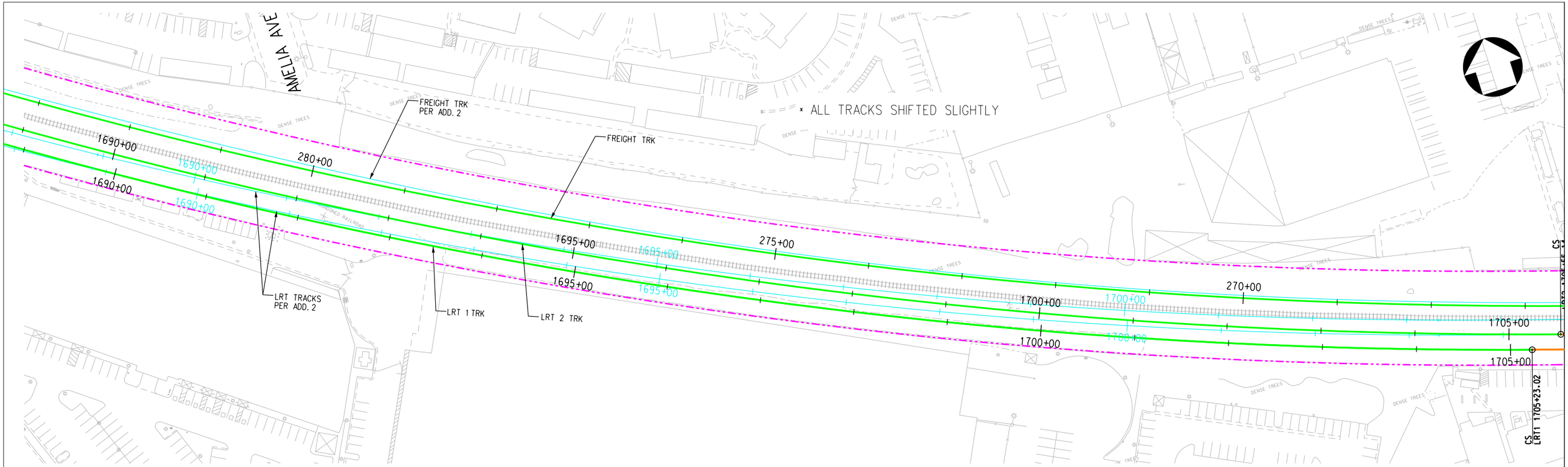
TOP OF RAIL TRACK 1

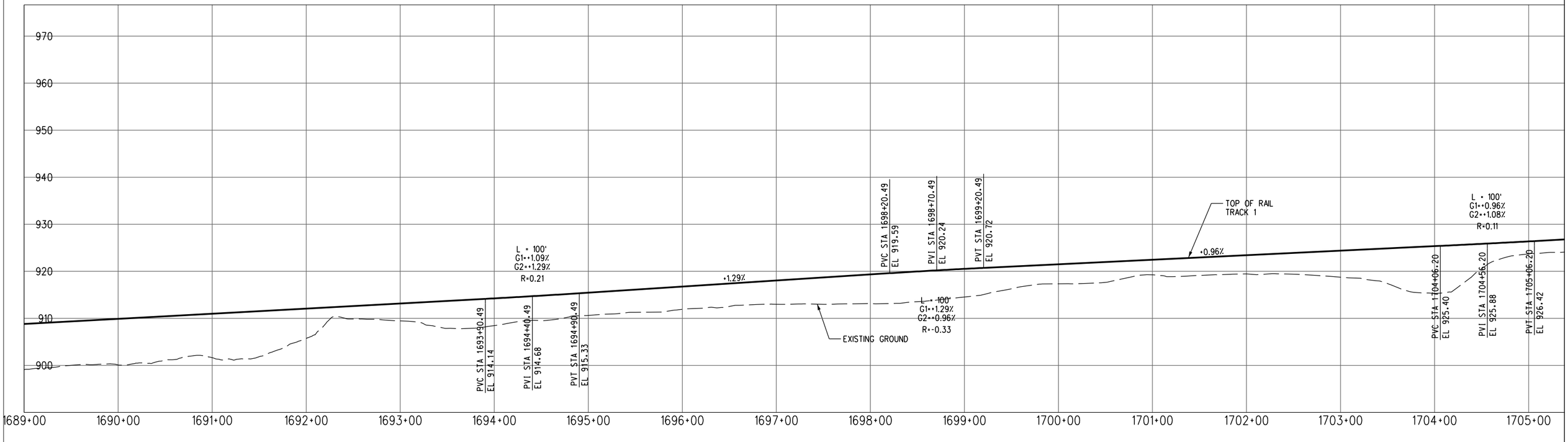
EXISTING GROUND

1674+00 1675+00 1676+00 1677+00 1678+00 1679+00 1680+00 1681+00 1682+00 1683+00 1684+00 1685+00 1686+00 1687+00 1688+00 1689+00 1690+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'





10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- LRT 2 TRACK SHIFTED SOUTH
- FREIGHT TRACK SHIFTED SOUTH
- ADDED 2 NEW #20 CROSSOVERS
- AN ALT LOCATION FOR A TPSS SITE

EUCLA AVENUE

NORTH ACACIA STREET

1ST STREET

ACACIA AVE.

BONITA AVENUE

BONITA AVE.

CATARACT AVE

LRT TRACKS PER ADD. 2

FREIGHT TRK PER ADD. 2

FREIGHT TRK

LRT 2 TRK

LRT 1 TRK

NEW #20 CROSSOVER

NEW #20 CROSSOVER

TPSS B-5-ALT (STA. 1717+70)

SI LRT2 1706+55.14

SI LRT1 1706+23.02

1705+00

1710+00

1715+00

1720+00

250

TOP OF RAIL TRACK 1

EXISTING GROUND

STA 1706+73.38
EL 928.23

STA 1708+33.87
EL 929.96

PVC STA 1710+71.27
EL 932.52

PVI STA 1711+41.27
EL 933.27

PVT STA 1712+11.27
EL 933.80

STA 1713+59.07
EL 934.93

PVC STA 1715+06.20
EL 936.05

PVI STA 1715+56.20
EL 936.43

PVT STA 1716+06.20
EL 937.08

STA 1718+83.63
EL 940.69

STA 1720+51.79
EL 942.87

PVC STA 1721+56.22
EL 944.23

+1.08%

L = 140'
G1 = -1.08%
G2 = 0.76%
R = -0.23

+0.76%

L = 100'
G1 = 0.76%
G2 = 1.30%
R = 0.54

+1.30%

970 960 950 940 930 920 910 900

1706+00 1707+00 1708+00 1709+00 1710+00 1711+00 1712+00 1713+00 1714+00 1715+00 1716+00 1717+00 1718+00 1719+00 1720+00 1721+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 SHIFTED SOUTH
- TPSS SITE SHIFTED SLIGHTLY SOUTH
- PLATFORM SHIFTED

BONITA AVE.
BOTH WAY AVENUE

MONTE VISTA AVE.

SAN DIMAS AVENUE

SAN DIMAS AVE

PC
LRT2 1722+59.68

PT
LRT2 1725+77.67

PC
LRT2 1730+77.42

PT
LRT2 1733+95.42

LRT TRACKS
PER ADD. 2

FREIGHT TRK
PER ADD. 2

FREIGHT TRK

PLATFORM
PER ADD. 2

+00

1725+00

1725+00

1725+00

245+00

1730+00

1730+00

240+00

1730+00

1735+00

1735+00

1735+00

235+00

1735+00

LRT 2 TRK

LRT 1 TRK

TPSS SITE
PER ADD. 2

NEW TPSS SITE

TPSS B-5
(STA. 1725 + 40)

NEW PLATFORM

SAN DIMAS STATION

PVT STA 1722+06.22
EL 944.88

PVT STA 1722+56.22
EL 945.02

STA 1727+30.25
EL 946.33

L = 100'
G1 = +0.28%
G2 = +1.29%
R = +1.01

TOP OF RAIL
TRACK 1

PVC STA 1728+06.20
EL 946.54

PVI STA 1728+56.20
EL 946.68

PVT STA 1729+06.20
EL 947.32

PVC STA 1732+06.20
EL 951.20

PVI STA 1732+56.20
EL 951.84

PVT STA 1733+06.20
EL 952.34

L = 100'
G1 = +1.29%
G2 = +1.00%
R = -0.29

STA 1734+29.66
EL 953.58

STA 1736+12.53
EL 955.41

SAN DIMAS STATION
PLATFORM

+0.28%

+1.29%

+1.00%

L = 100'
G1 = +1.30%
G2 = +0.28%
R = -1.02

EXISTING GROUND

970
940
930
920
910
900

2+00
1723+00
1724+00
1725+00
1726+00
1727+00
1728+00
1729+00
1730+00
1731+00
1732+00
1733+00
1734+00
1735+00
1736+00
1737+00
1738+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 SHIFTED SOUTH
- PLATFORM SHIFTED
- NO TC&C SITE
- NO CROSSOVER

PLATFORM PER ADD. 2

TC&C SITE PER ADD. 2

LRT TRACKS PER ADD. 2

FREIGHT TRK

FREIGHT TRK PER ADD. 2

SAN DIMAS STATION

NEW PLATFORM

TC&C

TC&C SITE PER ADD. 2

CROSSOVER PER ADD. 2

WALNUT AVE.

LRT 2 TRK

LRT 1 TRK

TS LRT1 1741+58.99

SC LRT1 1742+58.99

CS LRT1 1744+60.37

ST LRT1 1745+60.37

PC LRT2 1743+19.23

PT LRT2 1746+33.98

PC LRT1 1750+06.30

PT LRT1 1753+13.15

1740+00 1740+00 1740+00 1740+00

1745+00 1745+00 1745+00 1745+00

1750+00 1750+00 1750+00 1750+00

1755+00 1755+00

230+00 225+00 220+00

STA 1738+82.53
EL 958.11

L = 200'
G1=-1.00%
G2=+1.62%
R=0.31

PVC STA 1740+16.76
EL 959.45

PVI STA 1741+16.76
EL 960.45

PVT STA 1742+16.76
EL 962.07

+1.62%

EXISTING GROUND

L = 100'
G1=+1.62%
G2=+1.05%
R=-0.57

PVC STA 1746+05.49
EL 968.37

PVI STA 1746+55.49
EL 969.18

PVT STA 1747+05.49
EL 969.70

STA 1748+05.85
EL 970.75

TOP OF RAIL TRACK 1

+1.05%

L = 160'
G1=+1.05%
G2=+1.11%
R=0.04

PVC STA 1750+76.20
EL 973.59

PVI STA 1751+56.20
EL 974.43

PVT STA 1752+36.20
EL 975.31

TOP OF RAIL TRACK 1

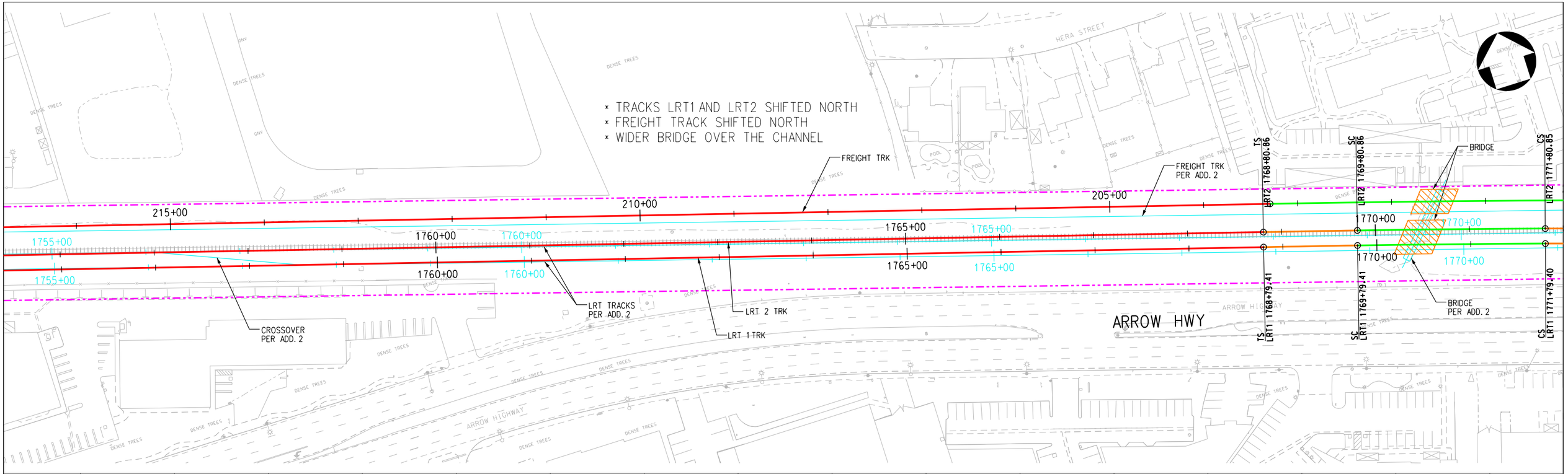
1020 1010 1000 990 980 970 960 950

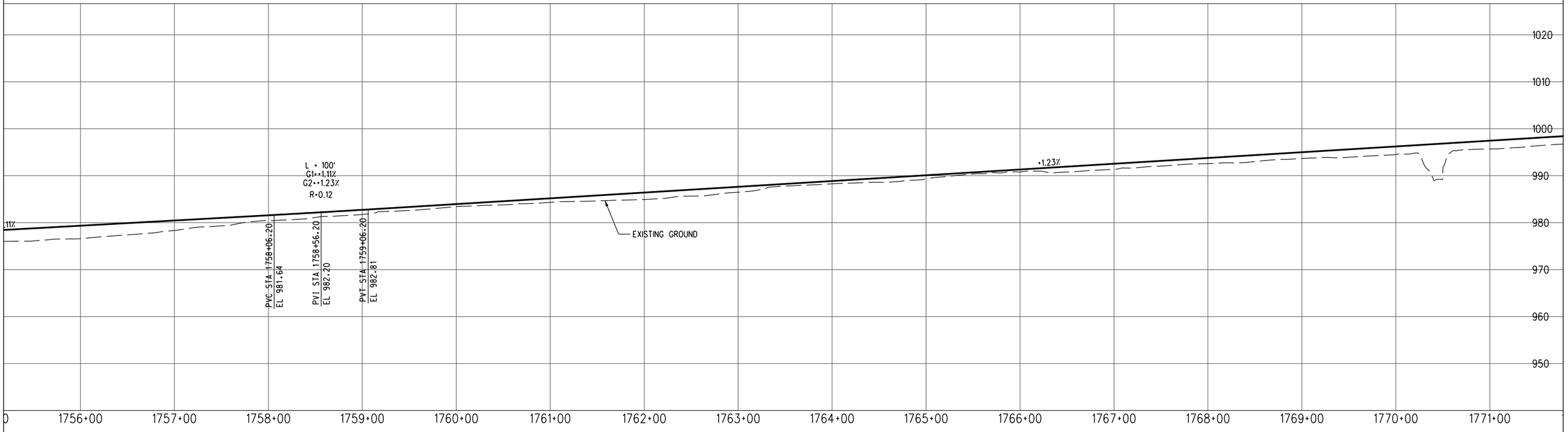
1739+00 1740+00 1741+00 1742+00 1743+00 1744+00 1745+00 1746+00 1747+00 1748+00 1749+00 1750+00 1751+00 1752+00 1753+00 1754+00 1755+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 SHIFTED NORTH
- FREIGHT TRACK SHIFTED NORTH
- WIDER BRIDGE OVER THE CHANNEL





10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 SHIFTED SOUTH
- FREIGHT TRACK SHIFTED NORTH
- NEW BRIDGE OVER THE CHANNEL

CITY OF LA VERNE
CITY OF SAN DIMAS

ARROW HWY

SAN DIMAS CANYON RD

ST LRT2 1772+80.85
TS LRT2 1777+41.03
SC LRT2 1779+41.03
ST LRT1 1772+79.40
TS LRT1 1777+39.45
SC LRT1 1779+39.45

200+00
195+00
190+00
185+00
1775+00
1780+00
1785+00

FREIGHT TRK
FREIGHT TRK PER ADD. 2
BRIDGE
LRT TRACKS PER ADD. 2
LRT 2 TRK
LRT 1 TRK

L = 100'
G1=+1.23%
G2=+1.58%
R=+0.35

PVC STA 1773+56.20
EL 1000.61

PVI STA 1774+06.20
EL 1001.23

PVT STA 1774+56.20
EL 1002.02

STA 1775+77.89
EL 1003.94

TOP OF RAIL TRACK 1

+1.58%

EXISTING GROUND

PVC STA 1779+56.
EL 1009.93

PVI STA 1780+5
EL 1011.51

PVT STA 1781+5
EL 1011.95

L = 200'
G1=+1.58%
G2=+0.45%
R=-0.57

TOP OF RAIL TRACK 1

+0.45%

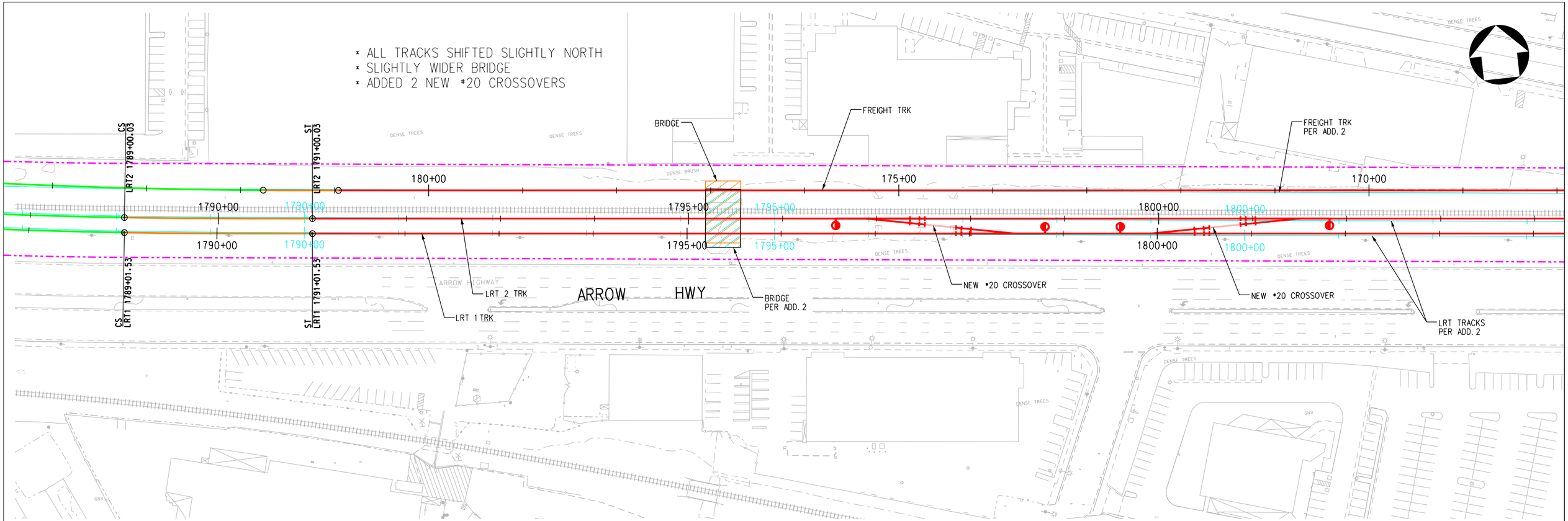
1020
1010
1000
990
980
970
960
950

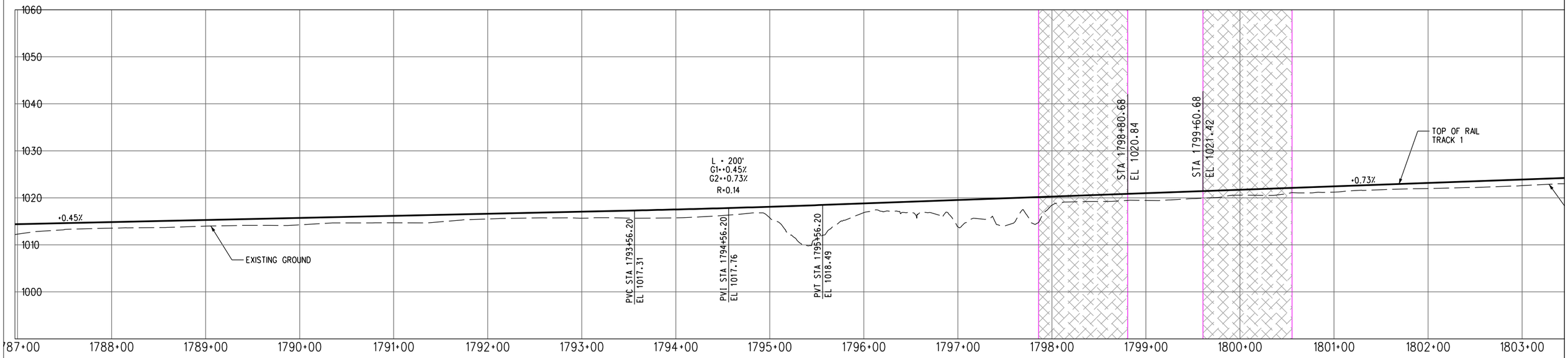
1772+00 1773+00 1774+00 1775+00 1776+00 1777+00 1778+00 1779+00 1780+00 1781+00 1782+00 1783+00 1784+00 1785+00 1786+00 1787+00 1788+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- ALL TRACKS SHIFTED SLIGHTLY NORTH
- SLIGHTLY WIDER BRIDGE
- ADDED 2 NEW #20 CROSSOVERS

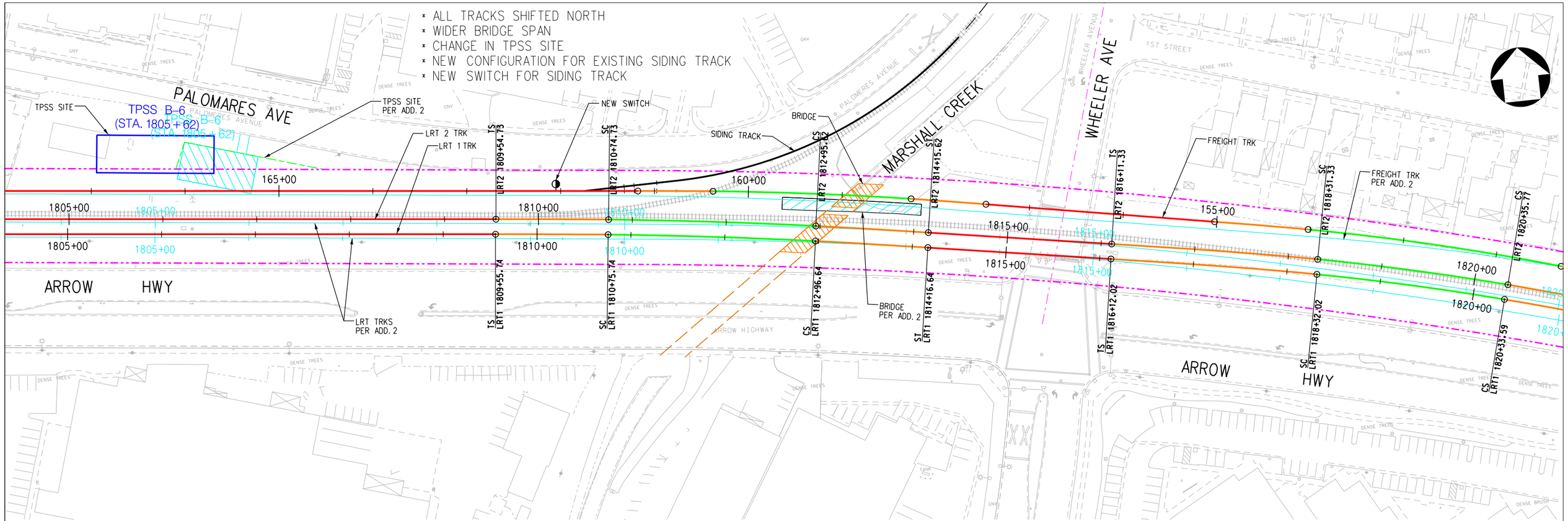


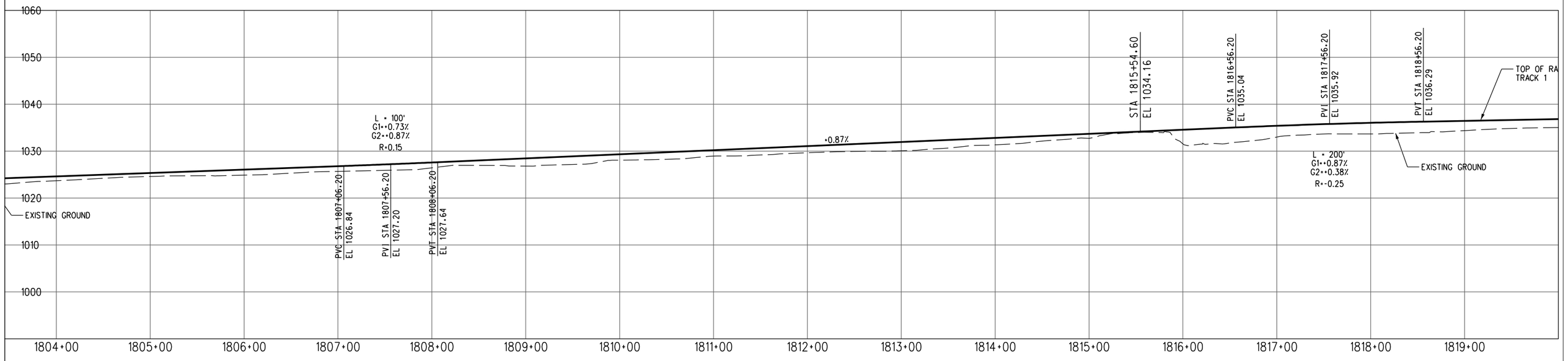


10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

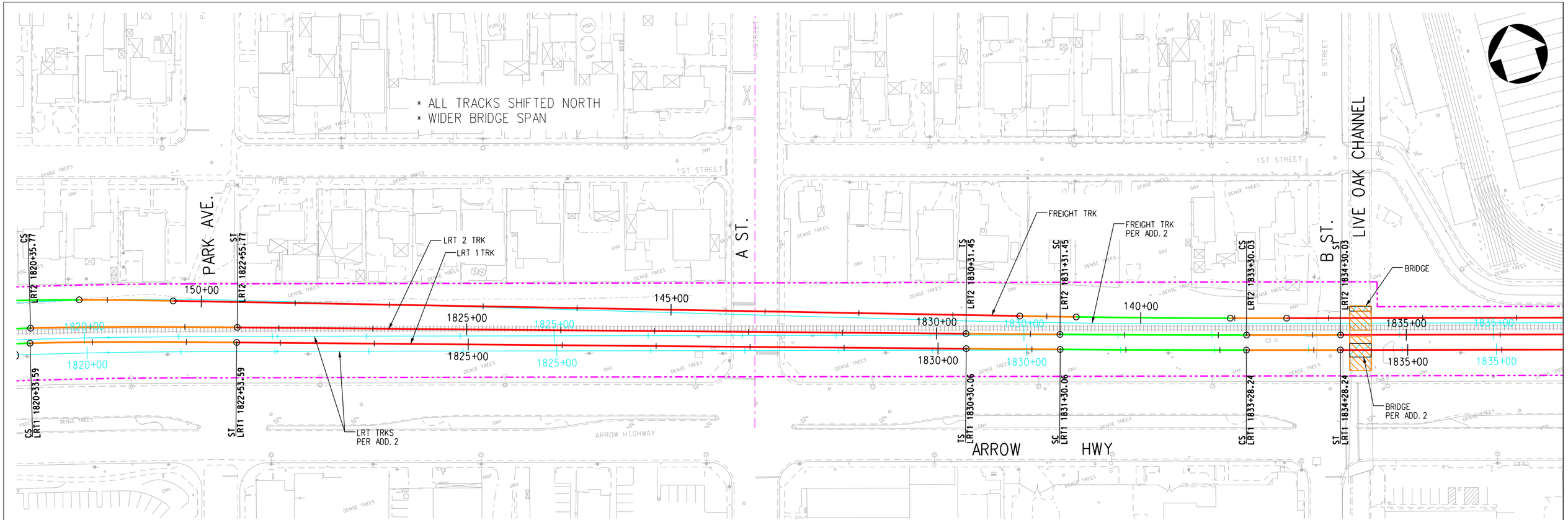
- ALL TRACKS SHIFTED NORTH
- WIDER BRIDGE SPAN
- CHANGE IN TPSS SITE
- NEW CONFIGURATION FOR EXISTING SIDING TRACK
- NEW SWITCH FOR SIDING TRACK

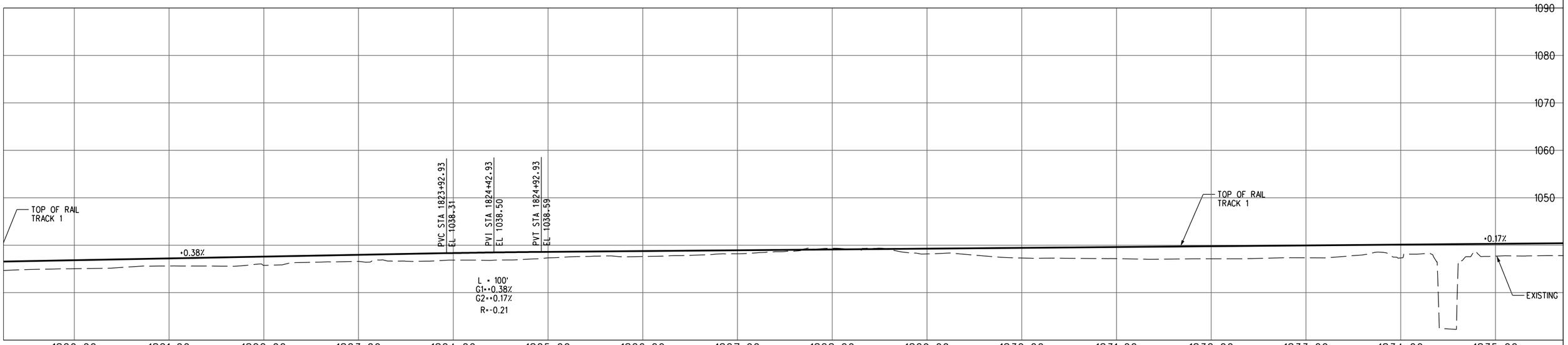




10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'





10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- LRT1 TRACK SHIFTED SOUTH
- FREIGHT TRACK SHIFTED NORTH

D ST.

E ST.

FAIRPLEX DRIVE

ARROW HIGHWAY

LRT 2 TRK

LRT 1 TRK

FREIGHT TRK

FREIGHT TRK
PER ADD. 2

LRT TRKS
PER ADD. 2

135+00 130+00 125+00 120+00

1840+00 1840+00 1845+00 1845+00 1850+00 1850+00

1840+00 1840+00 1845+00 1845+00 1850+00 1850+00

TS LRT1 1841+38.01

SC LRT1 1842+38.01

CS LRT1 1844+38.01

ST LRT1 1845+38.01

TS LRT1 1847+87.87

SC LRT1 1848+87.87

CS LRT1 1850+87.91

ST LRT1 1851+87.91

L = 100'
G1 = +0.17%
G2 = +0.59%
R = 0.43

PVC STA 1845+06.20
EL 1041.97

PVI STA 1845+56.20
EL 1042.05

PVT STA 1846+06.20
EL 1042.35

STA 1846+88.74
EL 1042.84

TOP OF RAIL
TRACK 1

EXISTING GROUND

GROUND

1090 1080 1070 1060 1050 1040 1030

1836+00 1837+00 1838+00 1839+00 1840+00 1841+00 1842+00 1843+00 1844+00 1845+00 1846+00 1847+00 1848+00 1849+00 1850+00 1851+00 1852+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- NO SHIFT IN TRACKS THROUGH STATION
- LRT1 AND LRT2 TRACKS START SHIFTING SOUTH PASS THE STATION
- FREIGHT TRACK SHIFTED SLIGHTLY
- TPSS SITE SHIFTED SOUTH
- NO TC&C SITE

LA VERNE STATION

ARROW HWY

TC&C

TC&C SITE PER ADD. 2

LRT 1 TRK

LRT 2 TRK

TPSS SITE PER ADD. 2

TPSS SITE

TPSS B-1 (STA. 1861+52)

FREIGHT TRK

LRT TRKS PER ADD. 2

FREIGHT TRK PER ADD. 2

PC LRT2 1860+26.93

PT LRT2 1862+26.93

PC LRT2 1866+46.41

PT LRT2 1868+47.94

TS LRT1 1859+25.97

SC LRT1 1860+25.97

CS LRT1 1862+24.81

SI LRT1 1863+24.81

TS LRT1 1865+49.21

SC LRT1 1866+49.21

CS LRT1 1868+48.05

ST LRT1 1869+48.05

STA 1852+69.02
EL 1046.28

STA 1854+47.63
EL 1047.34

LA VERNE STATION PLATFORM

STA 1857+17.63
EL 1048.95

TOP OF RAIL TRACK 1

PVC STA 1860+96.20
EL 1051.19

PVI STA 1861+56.20
EL 1051.55

PVT STA 1862+16.20
EL 1051.70

0.59%

L = 120'
G1=-0.59%
G2=+0.26%
R=-0.28

EXISTING GROUND

1090 1080 1070 1060 1050 1040 1030

1853+00 1854+00 1855+00 1856+00 1857+00 1858+00 1859+00 1860+00 1861+00 1862+00 1863+00 1864+00 1865+00 1866+00 1867+00 1868+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- LRT1 AND LRT2 TRACKS SHIFTED SOUTH
- NO SHIFT IN FREIGHT TRACK
- ADDED SIDING TRACK AND 2 SWITCHES
- CHANGE LOCATION OF THE 2 # 20 CROSSOVERS
- NO TC&C SITE

WHITE AVE.

LRT TRKS PER ADD. 2

FREIGHT TRK

FREIGHT TRK PER ADD. 2

CROSSOVER PER ADD. 2

CROSSOVER PER ADD. 2

100+00 95+00 90+00

1870+00 1875+00 1880+00 1885+00

NEW #20 CROSSOVER

NEW SWITCH

LRT 2 TRK

LRT 1 TRK

NEW SIDING TRK

NEW SWITCH

TC&C

TC&C SITE PER ADD. 2

NEW #20 CROSSOVER

STA 1873+34.31
EL 1054.58

STA 1873+84.31
EL 1054.71

PVC STA 1876+56.20
EL 1055.41

PVI STA 1877+56.20
EL 1055.67

PVT STA 1878+56.20
EL 1055.91

STA 1881+57.65
EL 1056.65

STA 1882+10.66
EL 1056.78

+0.26%

+0.24%

L = 200'
G1=+0.26%
G2=+0.24%
R=-0.01

TOP OF RAIL TRACK 1

EXISTING GROUND

1090 1080 1070 1060 1050 1040 1030

1869+00 1870+00 1871+00 1872+00 1873+00 1874+00 1875+00 1876+00 1877+00 1878+00 1879+00 1880+00 1881+00 1882+00 1883+00 1884+00 1885+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- LRT1 AND LRT2 TRACKS SHIFTED SOUTH
- NO SHIFT IN FREIGHT TRACK
- WIDER BRIDGE SPAN
- CHANGE CONFIGURATION OF BNSF SIDING TRACK

CITY OF POMONA
CITY OF LA VERNE
(APPROX.)

THOMPSON CREEK

FULTON AVE.

TS LRT2 1886+97.34

LRT TRKS PER ADD. 2

SC LRT2 1888+77.34

LRT 2 TRK

FREIGHT TRK

CS LRT2 1891+43.82

FREIGHT TRK PER ADD. 2

ST LRT2 1893+23.82

BRIDGE PER ADD. 2

TS LRT2 1895+65.98

BNSF SIDING TRK PER ADD. 2

BNSF SIDING TRK

SC LRT2 1898+25.98

EXISTING BNSF SIDING TRK

CS LRT2 1900+0.59

TS LRT1 1886+72.63

LRT 1 TRK

SC LRT1 1889+02.63

CS LRT1 1891+17.33

ST LRT1 1893+47.38

BRIDGE

TS LRT1 1895+99.20

SC LRT1 1898+89.20

CS LRT1 1901+03.81

1885+00 1890+00 1895+00 1900+00 70+00 75+00 80+00

L = 200'
G1=-0.24%
G2=+0.29%
R=0.02

TOP OF RAIL TRACK 1

+0.29%

STA 1894+38.48
EL 1059.96

L = 200'
G1=+0.29%
G2=+0.51%
R=0.11

+0.51%

PVC STA 1889+56.20
EL 1058.60

PVI STA 1890+56.20
EL 1058.85

PVT STA 1891+56.20
EL 1059.15

EXISTING GROUND

PVC STA 1895+56.20
EL 1060.30

PVI STA 1896+56.20
EL 1060.59

PVT STA 1897+56.20
EL 1061.10

1090 1080 1070 1060 1050 1040 1030

1886+00 1887+00 1888+00 1889+00 1890+00 1891+00 1892+00 1893+00 1894+00 1895+00 1896+00 1897+00 1898+00 1899+00 1900+00 1901+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACK SHIFTED SOUTH
- PLATFORM SHIFTED WEST
- BEGIN BRIDGE (BRIDGE START INSIDE THE STATION)
- GRADE SEPARATE GARY AVE.

GAREY AVE

SANTA FE STREET

POMONA STATION

SIDING TRK PER ADD. 2

FREIGHT TRK PER ADD. 2

LRT 2 TRK

FREIGHT TRK

SIDING TRK

BEGIN BRIDGE

LRT TRACKS AND PLATFORM PER ADD. 2

LRT 1 TRK

TC&C PER ADD. 2

BRIDGE

TC&C

DENSE TREES

ST LRT2 1903+30.59

ST LRT1 1903+93.81

PC LRT1 1909+65.35

PT LRT1 1911+60.51

TS LRT2 1912+62.18

SC LRT2 1913+62.18

TS LRT1 1914+33.56

SC LRT1 1915+53.56

CS LRT2 1915+83.50

ST LRT2 1916+83.50

CS LRT1 1917+65.23

0+00 65+00 60+00 55+00

1905+00 1910+00 1915+00

L = 200'
G1 = -0.51%
G2 = +1.00%
R=0.25

STA 1905+08.41
EL 1065.66

POMONA STATION PLATFORM

1.00%

STA 1907+78.41
EL 1068.35

L = 230'
G1 = +1.00%
G2 = +4.09%
R=1.34

TOP OF RAIL TRACK 1

+4.09%

PVC STA 1902+54.62
EL 1063.61

PVI STA 1903+54.62
EL 1064.12

PVT STA 1904+54.62
EL 1065.12

EXISTING GROUND

PVC STA 1908+85.00
EL 1069.42

PVI STA 1910+00.00
EL 1070.57

PVT STA 1911+15.00
EL 1075.27

PVC STA 1916+28.81
EL 1096.28

STA 1916+58.92
EL 1097.47

STA 1917+84.
EL 1101.54

1120 1110 1100 1090 1080 1070 1060 1050

1903+00 1904+00 1905+00 1906+00 1907+00 1908+00 1909+00 1910+00 1911+00 1912+00 1913+00 1914+00 1915+00 1916+00 1917+00 1918+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS SHIFTED SOUTH
- TPSS SITE CHANGED
- ADDED NEW #20 CROSSOVER

NEW #20 CROSSOVER

TS LRT2 1921+50.85

SC LRT2 1922+50.85

FREIGHT TRK

SIDING TRK

LRT 2 TRK

CS LRT2 1925+48.99

FREIGHT TRK PER ADD. 2

ST LRT2 1926+48.99

LRT 1 TRK

BRIDGE

LRT TRACKS PER ADD. 2

ACCESS TO GAREY AVE

TPSS B-8 (STA. 1928+37)

TPSS SITE PER ADD. 2

BRIDGE

TS LRT1 1918+85.23

TS LRT1 1921+40.53

SC LRT1 1922+40.53

CS LRT1 1925+67.16

ST LRT1 1926+67.16

1920+00 1925+00 1930+00 1935+00 45+00 50+00 40+00

MAPLE AVENUE

DENSE TREES

PVI STA 1
EL 1110.

PVT STA 1923+08.
EL 1102.87

L = 680'
G1=-4.09%
G2=-2.15%
R=-0.92

-2.15%

L = 940'
G1=-2.15%
G2=4.03%
R=0.66

TOP OF RAIL TRACK 1

EXISTING GROUND

PVC STA 1930+03.14
EL 1087.94

PVI STA 1934+73.14
EL 1077.84

1120 1110 1100 1090 1080 1070 1060 1050 1040

1919+00 1920+00 1921+00 1922+00 1923+00 1924+00 1925+00 1926+00 1927+00 1928+00 1929+00 1930+00 1931+00 1932+00 1933+00 1934+00 1935+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS SHIFTED SOUTH
- END OF SIDING TRACK
- ADD SWITCH FOR SIDING
- DIFFERENT BRIDGE CONFIGURATION DUE TO TRACK ALIGNMENT SHIFT

BEGIN BRIDGE PER ADD. 2
SIDING TRK
FREIGHT TRK
LRT 2 TRK
BRIDGE
LRT 1 TRK
FREIGHT TRK PER ADD. 2
BRIDGE PER ADD. 2
LRT TRACKS PER ADD. 2

TS LRT2 1938+25.51
SC LRT2 1939+25.51
CS LRT2 1941+42.14
ST LRT2 1942+42.14
TS LRT2 1947+52.73
SC LRT2 1948+92.73
CS LRT2 1951+02.60

TS LRT1 1938+29.71
SC LRT1 1939+29.71
CS LRT1 1941+46.34
ST LRT1 1942+46.34
TS LRT1 1947+40.01
SC LRT1 1949+00.01
CS LRT1 1951+03.57

35+00 30+00 25+00
1935+00 1940+00 1945+00 1950+00

TA 1939+43.14
96.78
EXISTING GROUND
+4.03%
PVC STA 1947+41.20
EL 1128.93
TOP OF RAIL TRACK 1
STA 1951+60.5
EL 1140.18

1160 1150 1140 1130 1120 1110 1100 1090

1936+00 1937+00 1938+00 1939+00 1940+00 1941+00 1942+00 1943+00 1944+00 1945+00 1946+00 1947+00 1948+00 1949+00 1950+00 1951+00

VERT. SCALE 1"=20'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 SHIFTED NORTH
- ADDING NO. 20 TURNOUT TO JOIN FREIGHT TRACK WITH METROLINK TRACK
- FREIGHT TRACK SHIFTED SOUTH AND JOINS EXISTING METROLINK TRACKS

TOWNE AVE.

ST LRT2 1952+42.60

TS LRT2 1955+12.49

SC LRT2 1956+52.49

BRIDGE PER ADD. 2

CS LRT2 1958+86.09

LRT 2 TRK

LRT 1 TRK

ST LRT2 1960+26.09

BRIDGE

END BRIDGE PER ADD. 2

END BRIDGE

20+00

1955+00

1960+00

1965+00

ST LRT1 1952+63.57

TS LRT1 1954+99.67

SC LRT1 1956+59.67

15+00

CS LRT1 1958+87.90

ST LRT1 1960+47.90

FREIGHT TRK PER ADD. 2

FREIGHT TRK ENDS AT METROLINK TRACK

10+00

LRT TRACKS PER ADD. 2

FREIGHT TRK

TOWN AVENUE

CARNEGIE AVENUE

CITY OF POMONA (APPROX.)

CITY OF CLAREMONT

PVI STA
EL 1150.

STA 1954+33.
EL 1141.43

PVT STA 1957+91.20
EL 1135.82

+-2.72%

L = 1050'
G1=+4.03%
G2=-2.72%
R=-0.64

L = 540'
G1=-2.72%
G2=+1.06%
R=0.70

EXISTING GROUND

PVC STA 1962+81.45
EL 1122.50

PVI STA 1965+51.45
EL 1115.16

PVT STA 1968+21.45
EL 1118.04

1160
1150
1140
1130
1120
1110
1100
1090

2+00
1953+00
1954+00
1955+00
1956+00
1957+00
1958+00
1959+00
1960+00
1961+00
1962+00
1963+00
1964+00
1965+00
1966+00
1967+00
1968+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS SHIFTED NORTH
- METROLINK TRACK SHIFTING SOUTH
- NO SOUND WALL
- LARGER TPSS SITE

LRT 2 TRK
LRT 1 TRK
LRT TRACKS PER ADD. 2
END OF FREIGHT TRK PER ADD. 2
METROLINK ML 1 TRK
METROLINK ML 2 TRK
TPSS SITE PER ADD. 2
TPSS B-9
(STA. 1977+87)
BEGIN SOUND WALL PER ADD. 2
METROLINK TRACKS PER ADD. 2
CAMBRIDGE AVE
PIEDMONT AVENUE
DIRT PILE
DENSE TREES
POOL

1970+00 1975+00 1980+00 1985+00
17005+00 17010+00 17015+00
1705+00 1710+00 1715+00
TS LRT2 1982+75.75
SC LRT2 1983+75.75
TS LRT1 1982+79.63
SC LRT1 1983+79.63

TOP OF RAIL TRACK 1
+1.06%
PVI STA 1977+99.74
EL 1128.45
STA 1980+88.08
EL 1130.76
+0.80%
EXISTING GROUND
TOP OF RAIL TRACK 1

1160 1150 1140 1130 1120 1110 1100 1090
1969+00 1970+00 1971+00 1972+00 1973+00 1974+00 1975+00 1976+00 1977+00 1978+00 1979+00 1980+00 1981+00 1982+00 1983+00 1984+00

10' 0 10' 20'
VERT. SCALE 1"=20'
50' 0 50' 100'
HORIZ. SCALE 1"=100'

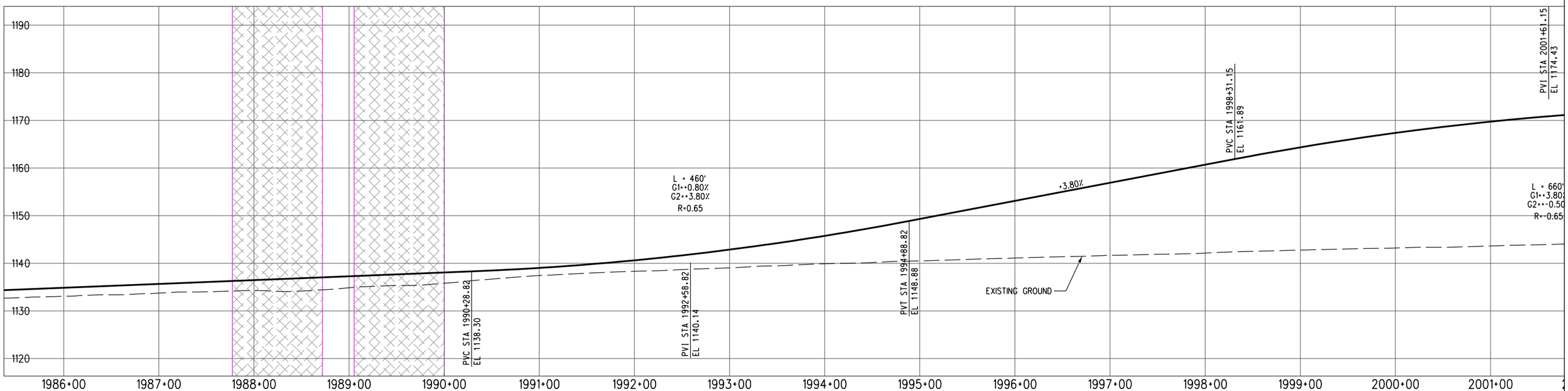
- TRACKS LRT1 AND LRT2 SHIFTED SOUTH
- METROLINK TRACK SHIFTING SOUTH
- NO SOUND WALL
- LOCATION OF DOUBLE-XOVER MOVED WEST
- GRADE SEPARATE LRT1 AND LRT2 TRACKS

BERKELEY AVENUE
1ST STREET
WHARTON DRIVE
DENSE TREES
POOL

CS LRT2 1985+83.27
ST LRT2 1986+83.27
DOUBLE X-OVER
SOUND WALL PER ADD. 2
BEGIN BRIDGE
LRT TRACKS PER ADD. 2
TS LRT2 1992+36.46
SC LRT2 1993+36.46
BRIDGE
CS LRT2 1995+42.20
ST LRT2 1996+42.20
END SOUND WALL PER ADD. 2
LRT 2 TRK
LRT 1 TRK
DOUBLE X-OVER PER ADD. 2
TS LRT2 2000+62.65
SC LRT2 2001+62.65

1985+00
1990+00
1995+00
2000+00
17020+00
17025+00
17030+00
1720+00
1725+00
1730+00

CS LRT1 1985+87.22
ST LRT1 1986+87.22
METROLINK ML 1 TRK
METROLINK ML 2 TRK
METROLINK TRACKS PER ADD. 2
TS LRT1 1992+40.34
SC LRT1 1993+40.34
CS LRT1 1995+46.08
ST LRT1 1996+46.08
TS LRT1 2000+68.02
SC LRT1 2001+68.02



10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- GRADE SEPARATE INDIAN HILL BLVD.
- TRACKS LRT1 AND LRT2 SHIFTED SOUTH
- METROLINK TRACK SHIFTING SOUTH
- NO SOUND WALL
- END OF BRIDGE
- CENTER PLATFORM FOR CLARMONT STATION

1ST STREET
INDIAN HILL BLVD
SANTA FE STREET
ROOFTOP PARKING
DENSE TREES
POOL

CS LRT2 2003+28.01
ST LRT2 2004+28.01
TS LRT2 2006+04.27
SC LRT2 2007+04.27
CS LRT2 2008+69.52
ST LRT2 2009+69.52
TS LRT2 2011+19.59
SC LRT2 2012+19.59
CS LRT2 2013+88.76
ST LRT2 2014+88.76
CS LRT1 2003+49.71
ST LRT1 2004+49.71
TS LRT1 2011+23.76
SC LRT1 2012+23.76
CS LRT1 2013+93.29
ST LRT1 2014+93.29

2005+00
2010+00
2015+00

BRIDGE
LRT 2 TRK
LRT 1 TRK
LRT TRACKS PER ADD. 2
END OF BRIDGE
LRT PLATFORMS PER ADD. 2
CLAREMONT STATION
METROLINK TRACKS PER ADD. 2
SOUND WALL PER ADD. 2
METROLINK ML 1 TRK
METROLINK ML 2 TRK
PROPOSED RIGHT OF WAY

PVT STA 2004+91.15
EL 1172.78
STA 2005+47.37
EL 1172.50
+-0.50%
STA 2006+47.37
PVI STA 2007+85.39
EL 1171.97
PVI STA 2007+85.39
EL 1171.32
L = 260'
G1 = -0.50%
G2 = -4.00%
R = -1.35
PVT STA 2009+15.39
EL 1166.12
+-4.00%
PVC STA 2011+13.29
EL 1158.20
L = 340'
G1 = -4.00%
G2 = 0.62%
R = 1.36
PVI STA 2012+83.29
EL 1151.40
PVT STA 2014+53.29
EL 1152.46
STA 2014+60.57
EL 1152.50
STA 2015+39.18
EL 1152.99
CLAREMONT STATION PLATFORM
STA 2018+09.18
EL 1154.67

1190
1180
1170
1160
1150
1140
1130
1120

2002+00 2003+00 2004+00 2005+00 2006+00 2007+00 2008+00 2009+00 2010+00 2011+00 2012+00 2013+00 2014+00 2015+00 2016+00 2017+00 2018+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 CONTINUOUS THRU (NO TAIL TRACKS)
- SHIFTING METROLINK ML 1 TRACK TO THE NORTH AND SHIFTING ML 2 TRACK TO THE SOUTH TO ACCOMMODATES FOR A 30' WIDE CENTER PLATFORM INSTEAD OF 2 SPLIT PLATFORMS (NOTE: STATION PLATFORM IS ON A CURVE, NEED METROLINK APPROVAL)
- REMOVE DOUBLE-XOVER

COLLEGE AVE

1ST STREET

DOUBLE X-OVER PER ADD. 2

TC&C

TPSS - B30 (STA 2030+96)

METROLINK CLAREMONT STATION

METROLINK TRACKS PER ADD. 2

METROLINK ML 1 TRK

METROLINK ML 2 TRK

METROLINK PLATFORMS PER ADD. 2

LRT 2 TRK

LRT 1 TRK

END LRT TRACKS PER ADD. 2

TS LRT1 2019+81.45

SC LRT1 2020+81.45

TS LRT2 2020+19.87

SC LRT2 2021+19.87

CS LRT1 2022+60.24

CS LRT2 2022+85.96

ST LRT1 2023+50.24

ST LRT2 2023+85.96

TS LRT1 2025+55.63

TS LRT2 2025+73.54

SC LRT1 2026+55.63

SC LRT2 2026+73.54

CS LRT1 2029+60.30

CS LRT2 2029+30.59

ST LRT1 2030+60.30

ST LRT2 2030+30.59

TS LRT1 2032+11.21

TS LRT2 2032+07.37

SC LRT1 2033+11.21

SC LRT2 2033+07.37

2020+00

2025+00

2030+00

TOP OF RAIL TRACK 1

STA 2019+26.96
EL 1155.41

+0.62%

L = 200'
G1=+0.62%
G2=+0.93%
R=0.15

PVC STA 2023+13.29
EL 1157.81

PVI STA 2024+13.29
EL 1158.43

PVT STA 2025+13.29
EL 1159.36

+0.93%

EXISTING GROUND

PVC STA 2030+50.49
EL 1164.34

PVI STA 2031+55.49
EL 1165.31

PVT STA 2032+60.49
EL 1166.04

L = 210'
G1=+0.93%
G2=+0.69%
R=-0.11

TOP OF RAIL TRACK 1

1190
1180
1170
1160
1150
1140
1130
1120

2019+00 2020+00 2021+00 2022+00 2023+00 2024+00 2025+00 2026+00 2027+00 2028+00 2029+00 2030+00 2031+00 2032+00 2033+00 2034+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 CONTINUOUS THRU
- METROLINK TRACKS SHIFTED SOUTH

LRT 2 TRK
LRT 1 TRK
METROLINK ML 1 TRK
METROLINK ML 2 TRK
METROLINK TRACKS PER ADD. 2

CLAREMONT BLVD.
CLAREMONT (APPROX.) MONTCLAIR
LOS ANGELES COUNTY
SAN BERNADINO COUNTY
ELDER DRIVE
CLAREMONT ROUTE YARD
GROUND NOT VISIBLE
DENSE TREES
POOL

ST LRT2 2035+00.03
ST LRT2 2036+00.03
ST LRT1 2035+03.74
ST LRT1 2036+03.74

2040+00 2045+00 2050+00
17070+00 17075+00 17080+00
1770+00 1775+00 1780+00

L = 400'
G1=+0.69%
G2=+0.78%
R=0.02

PVC STA 2039+91.27
EL 1171.11
PVI STA 2041+91.27
EL 1172.50
PVT STA 2043+91.27
EL 1174.05
STA 2046+09.
EL 1175.75

+0.69%
+0.78%
EXISTING GROUND

1190 1180 1170 1160 1150 1140 1130 1120

2035+00 2036+00 2037+00 2038+00 2039+00 2040+00 2041+00 2042+00 2043+00 2044+00 2045+00 2046+00 2047+00 2048+00 2049+00 2050+00 2051+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 CONTINUOUS THRU (OUTSIDE OF RIGHT-OF-WAY)
- METROLINK TRACKS SHIFTED SOUTH

DENSE TREES

TS LRT2 2053+43.19
SC LRT2 2054+73.19
CS LRT2 2056+88.70
ST LRT2 2058+18.70
TS LRT2 2061+13.02
SC LRT2 2062+43.02
CS LRT2 2064+55.04
ST LRT2 2065+85.04

LRT 2 TRK
LRT 1 TRK

2055+00
2060+00
2065+00
17085+00
1785+00
17090+00
1790+00
17095+00
1795+00
17100+00
1800+00

TS LRT1 2053+23.50
SC LRT1 2054+33.50
CS LRT1 2056+65.60
ST LRT1 2057+95.60
TS LRT1 2061+20.14
SC LRT1 2062+50.14
CS LRT1 2064+54.90
ST LRT1 2065+84.90

METROLINK TRACKS PER ADD. 2

METROLINK ML 1 TRK

METROLINK ML 2 TRK

SAN ANTONIO WASH

GNV

PVI STA 2052+00.00
EL 1180.34

PVT STA 2052+50.00
EL 1180.99

L = 100'
G1 = -0.78%
G2 = +1.29%
R = 0.51

TOP OF RAIL TRACK 1

+1.29%

EXISTING GROUND

PVC STA 2062+48.66
EL 1193.87

PVI STA 2063+23.66
EL 1194.83

PVT STA 2063+98.66
EL 1194.94

L = 150'
G1 = +1.29%
G2 = +0.14%
R = -0.77

STA 2066+66.43
EL 1195.31

+0.14%

EXISTING GROUND

1220
1210
1200
1150

2052+00 2053+00 2054+00 2055+00 2056+00 2057+00 2058+00 2059+00 2060+00 2061+00 2062+00 2063+00 2064+00 2065+00 2066+00 2067+00 2068+0

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

- TRACKS LRT1 AND LRT2 CONTINUOUS THRU (OUTSIDE OF RIGHT-OF-WAY)
- GRADE SEPARATE MONTE VISTA AVE.
- ADDED PLATFORM
- ADDING 2 DOUBLE X-OVERS BEFORE AND AFTER THE NEW PLATFORM
- END SHIFT OF METROLINK TRACKS

MONTE VISTA AVE

LRT 2 TRK

LRT 1 TRK

DOUBLE X-OVER

2070+00

2070+00

MONTICLAIR STATION

2075+00

2075+00

DOUBLE X-OVER

2080+00

2080+00

METROLINK MONTICLAIR STATION

TPSS B-11
(STA. 2082+83)

POE LRT2 2084+35.04

POE LRT1 2084+30.56

MISC. UTILITIES

METROLINK ML 1 TRK JOIN EXISTING METROLINK TRACK

METROLINK ML 2 TRK JOIN EXISTING METROLINK TRACK

METROLINK TRACKS PER ADD. 2

DENSE TREES

MONTE VISTA AVENUE

STA 2068+44.11
EL 1195.56

STA 2070+20.19
EL 1195.80

STA 2071+25.27
EL 1195.95

PVC STA 2071+74.68
EL 1196.02

PVI STA 2072+24.68
EL 1196.09

PVT STA 2072+74.68
EL 1196.09

STA 2073+95.59
EL 1196.09

MONTCLAIR STATION PLATFORM

STA 2076+65.59
EL 1196.09

STA 2077+88.43
EL 1196.09

STA 2081+28.56
EL 1196.09

PVI STA 2084+32.65
EL 1196.09

EXISTING GROUND

+0.00%

L = 100'
G1=+0.14%
G2=+0.00%
R=-0.14

TOP OF RAIL TRACK 1

TOP OF RAIL TRACK 1

1220
1210
1200
1190
1180
1170
1160
1150

0 2069+00 2070+00 2071+00 2072+00 2073+00 2074+00 2075+00 2076+00 2077+00 2078+00 2079+00 2080+00 2081+00 2082+00 2083+00 2084+00

10' 0 10' 20'
VERT. SCALE 1"=20'

50' 0 50' 100'
HORIZ. SCALE 1"=100'

Appendix B

Updates to the Foothill Gold Line Extension Azusa to Montclair Noise and Vibration Assessment (February 2016)

ATSConsulting
acoustics, transportation + strategy

MEMORANDUM

To: Denis Cournoyer, PE
Metro Gold Line Foothill Extension Construction Authority

From: Shannon McKenna
Hugh Saurenmen
ATS Consulting

Date: February 26, 2016

Subject: **DRAFT:** Updates to the Foothill Gold Line Extension Azusa to Montclair Noise and Vibration Assessment

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1. INTRODUCTION

This memorandum presents the noise and vibration analysis of design refinements that have taken place since the Final Environmental Impact Report (Final EIR) for the Metro Gold Line Foothill Extension from Azusa to Montclair Project was certified in March 2013[*]. Design refinement assessed in this memorandum include shifts in the alignment, relocation of crossovers, changes in TPSS sits, and the addition of two grade separations.

Consistent with the 2013 Final EIR, all analyses in this memorandum use the Federal Transit Administration (FTA) noise and vibration prediction procedures and impact criteria outlined in the FTA Guidance Manual[†]. The prediction models are described in detail in the 2013 Final EIR. This assessment uses the same prediction models used in the 2013 Final EIR; any differences in predicted noise and vibration levels compared to the 2013 Final EIR are due to changes to the input of the models reflecting the design refinements.

This memorandum presents updated noise and vibration predictions for all sensitive receivers identified during the 2013 Final EIR assessment. Where the updated predicted noise or vibration levels differ from the 2013 Final EIR predictions by more than a decibel, the design refinement resulting in the change is identified. Using the FTA methodology, all noise and vibration sensitive receivers identified along the alignment were grouped into clusters of similar land use and similar characteristics for noise and vibration (such as distance to the alignment, train speed, and track type). Each cluster of sensitive receivers was given a label. The same sensitive receiver clusters and labels used in the Final EIR are used for this analysis. The locations of the clusters are shown in maps in the 2013 Final EIR.

1.1 Summary of Design Refinements

The design refinements assessed in this memorandum include:

- Grade separations where LRT tracks will be elevated over the intersections of (1) Grand and Foothill in Glendora and (2) Indian Hill in Claremont. The Final EIR assumed these intersections would have at-grade crossings. The direct fixation track used on elevated structures increases noise levels by about 3 decibels compared to standard ballast-and-tie track. Elevated structures typically attenuate vibration levels by about 10 decibels.
- Revised special trackwork locations. The gaps in the rail associated with special trackwork such as crossovers and turnouts can increase noise levels by up to 6 decibels and vibration levels by up to 10 decibels.
- Revised traction power substation (TPSS) locations. TPSS units are the only ancillary noise source associated with the Project. The air conditioning units on the TPSS units are the main noise source and are assessed for potential impact at the noise sensitive land uses closest to the proposed TPSS sites.

[*] Final Environmental Impact Report for the Metro Gold Line Foothill Extension from Azusa to Montclair Project, 2013. http://www.foothillgoldline.org/construction_phases/glendora_to_montclair/metro-gold-line-foothill-extension-azusa-to-montclair-draft-environmental-impact-report/

[†] *Transit Noise and Vibration Impact Assessment* Document FTA-VA-90-1003-06. Office of Planning and Environment Federal Transit Administration. May 2006.

- Shifts in the track alignment. The LRT and BNSF track alignments have been shifted throughout the corridor since the completion of the Final EIR assessment in 2013. Shifting tracks further from receivers will reduce predicted noise and vibration levels. However, noise and vibration levels are logarithmically related to changes in distance. This means a five foot shift in alignment will have a larger effect on predicted noise and vibration levels for sensitive receivers located very close to the alignment compared to the receivers located farther than 100 feet away. The alignment shifts are summarized in Table 1.

Table 1: Summary of Alignment Shifts

City	Stationing (Approximate)	Cross Streets	Description of Shift
Glendora	1440+00 to 1501+00	West of Barranca Avenue to Vermont Avenue	Freight and LRT shifted north in alignment.
Glendora	1505+00 to 1567+00	Vermont Avenue to Lorraine Avenue	Freight and LRT shifted south in alignment. Due to close proximity of receivers in this area, slight shifts will result in a greater change in noise and vibration levels.
Glendora	1568+00 to 1610+00	Lorraine Avenue to Route 66	Freight and LRT shifted north in alignment.
San Dimas	1667+00 to 1680+00	Gladstone Street to 57 Fwy	Freight and LRT shifted south in alignment.
San Dimas	1700+00 to 1750+00	Eucla Avenue to Walnut Avenue	Freight and LRT shifted south, closer to some sensitive receivers
San Dimas	1770+00 to 1775+00	San Dimas Canyon Road	Freight and LRT shifted north in alignment.
La Verne	1780+00 to 1787+00	East of San Dimas Canyon Road	LRT shifted north in alignment.
La Verne	1780+00 to 1835+00	East of San Dimas Canyon Road to B Street	Freight shifted north in alignment
La Verne	1815+00 to 1835+00	Wheeler Avenue to B Street	LRT shifted north closer to many sensitive receivers
La Verne	1870+00 to 1883+00	White Avenue to west of Fulton Avenue	LRT shifted north. New LRT siding track.
La Verne	1885+00 to 1894+00	Fulton Avenue	LRT shifted south.
Pomona	1905+00 to 1936+00	West of Garey Avenue to west of Towne Avenue	Realignment of freight and siding track
Pomona	1925+00 to 1955+00	East of Garey Avenue to Towne Avenue	LRT shifted south.
Claremont	2045+00 to 2047+00	Claremont Boulevard	LRT shifted south.

1.2 Summary of Conclusions

1.2.1 Operational Noise

The design refinements that resulted in the greatest change in predicted noise levels at sensitive receivers are the changes to crossover locations. Crossovers can increase noise levels by up to six decibels compared with standard track. Changes in track alignment not associated with crossovers generally resulted in changes in predicted noise levels of only one to two decibels.

Table 2 presents a summary of the sensitive receivers where the design refinements resulted in a change in the predicted noise impact compared with the 2013 Final EIR assessment. Two of the three sensitive receiver clusters where the increase in predicted noise levels result in a noise impact that was not identified in the 2013 Final EIR are located near a crossover.

There were additional refinements to the mitigation measures other than those presented in Table 2 to account for the shift in track centerlines, relocated TPSS units, and relocation of crossovers at sensitive receivers where noise impact was also identified in the 2013 Final EIR. The shift in track centerlines resulted in a refinement of the recommended sound wall heights at several locations (changes from the 2013 Final EIR recommendations are shown in red in Table 21). The recommended mitigation for TPSS units is summarized in Section 3.1.5. In addition, the location of all crossovers where low-impact frogs are recommended is presented in Table 23.

Table 2: Change in Predicted Noise Impacts as a Result of Design Refinements

Receiver	Design Refinement	Recommended Mitigation
Glendora EB B	New crossover between Grand Avenue and Vermont Avenue	Low impact frog and consideration for sound insulation (no sound wall recommended because there is no outdoor use)
La Verne WB 2, 3, 4	Shift in LRT and freight track closer to sensitive receivers, predicted impact increased from moderate to severe	Increase in height of sound wall
Pomona WB 1	New turnout on Metrolink Tracks at tie-in of the Pasadena Subdivision into the San Gabriel Subdivision	Low impact frog and sound wall

1.2.2 Operational Vibration

Similar to the noise analysis, the design refinements that resulted in the greatest change in predicted vibration levels is the relocation of crossovers. Crossovers can increase vibration levels by up to ten decibels compared with standard track. Changes in track alignment not associated with crossovers generally resulted in changes to predicted vibration levels of one to two decibels.

Table 3 presents a summary of the sensitive receivers where the design refinements resulted in a change in predicted vibration impact compared to the 2013 Final EIR assessment. The changes all occur in Glendora where the sensitive receivers are located closer to the tracks. A shift in track alignment has a greater effect on predicted vibration levels if the receiver is located closer to the tracks.

There were additional refinements to the vibration mitigation measures other than those presented in Table 3. Those changes are summarized in Section 3.2.1. Section 3.2.4 notes that there are many sensitive receivers where the predicted level is equal to or one decibel above the vibration impact threshold. As

stated in the 2013 Final EIR vibration mitigation recommendations, further study is recommended at those sensitive receivers to ensure the most cost-effective mitigation measure is chosen to reduce predicted vibration levels to below the impact threshold.

Table 3: Change in Predicted Vibration Impacts as a Result of Design Refinements

Receiver	Design Refinement	Recommended Mitigation
Glendora WB 3a	LRT shifted closer to receivers	Ballast mat/TDA or further study (predicted level equal to impact threshold)
Glendora EB 8	LRT shifted closer to receivers	Ballast mat/TDA
Glendora EB 10	LRT shifted away from receivers	Mitigation no longer recommended
Glendora EB B	New crossover between Grand Avenue and Vermont Avenue	Low impact frog and floating slab (note floating slab is primarily recommended for receiver WB 2 located closer to the tracks)

2. NOISE AND VIBRATION IMPACT ASSESSMENT OF DESIGN REFINEMENTS

The following sub-sections identify the major design refinements in each of the cities, and the updated noise and vibration predictions. Where predicted noise or vibration levels have changed by one decibel or more as a result of the design refinements, the change in design is identified.

Predicted noise and vibration levels are presented for all sensitive receivers identified in the 2013 Final EIR. The sensitive receivers have been grouped into clusters, and are referred to with the same labels used in the 2013 Final EIR. The "WB", or westbound, clusters are located north of the tracks, and the "EB", or eastbound, clusters are located south of the tracks. The locations of the clusters are shown in maps included in the 2013 Final EIR. Sections 2.1 through 2.6 present the predicted levels for residential land uses. Section 2.7 presents the predicted levels for institutional land uses, such as schools, churches, or parks.

2.1 Glendora

The major design refinements in Glendora include:

- The addition of an aerial grade separation at Grand and Foothill.
- A new crossover at Carroll Avenue.
- The crossover near Dalton Wash was shifted east, closer to cluster WB 16 and away from cluster WB 14.
- Freight and LRT track centerlines were shifted north approximately between Barranca Avenue and Vermont Avenue (station 1440+00 to 1501+00)
- Both the freight and LRT track centerlines were shifted south (station 1505+00 to 1567+00). Due to the close proximity of receivers to the tracks in this area, slight shifts in the alignment will result in a greater change in noise and vibration levels compared to other areas. The majority of the sensitive receivers in the area are residences located north of the tracks, where the shift in alignment results in a decrease in predicted noise and vibration levels.
- Freight and LRT track centerlines were shifted north approximately between Lorraine Avenue and Route 66 (station 1568+00 to 1610+00)

2.1.1 Operational Noise

Table 4 presents the predicted noise levels that include the design refinements. The "Changes" column in Table 4 indicates any design refinements that resulted in a 1 dB or greater change in predicted noise levels. Although the design refinements resulted in changes to the predicted noise levels, there are no changes to locations of "moderate" or "severe" noise impacts that were identified in the 2013 EIR.

The changes in predicted noise levels include:

- A combination of a new crossover and closer LRT tracks by Glendora cluster WB2 raises the predicted noise level. Severe noise impact was also predicted at this cluster in the 2013 Final EIR; however, the design refinements have resulted in a predicted noise level that is 6.6 decibels higher than in the 2013 Final EIR.
- The LRT and BNSF tracks near clusters EB 4 and EB 5 (close to Barranca Avenue) shifted north. This shift decreased the predicted noise level at those clusters by 1 to 2 dB. Cluster EB 4 remains a predicted "severe" impact while cluster EB 5 remains no impact predicted.

- The noise predictions for clusters WB 6, WB 7, and clusters WB 9-12 were decreased by between 1 to 3 dB due to the LRT tracks shifting south. While the BNSF tracks shifted away from some of these clusters as well, the change to the LRT was the primary reason for the decreased predicted levels. Despite the decrease in predicted noise, these clusters all remain "severe" impacts.
- The crossover near Dalton Wash was shifted east away from WB 14 and towards WB 16. This results in a 3.9 dB decrease in predicted noise at cluster WB 14 and a 5.4 dB increase in predicted noise at cluster WB 16. These clusters both remain "severe" noise impacts.

2.1.2 Operational Vibration

Table 5 presents the predicted vibration levels that include the design refinements. The "Changes" column in Table 5 indicates any design refinements that resulted in a 1 dB or greater change in predicted vibration levels. The changes in predicted vibration levels include:

- A new crossover by WB 2 has increased the predicted vibration level there by 12 dB. Cluster WB 2 was also identified as a predicted vibration impact in the 2013 Final EIR.
- The LRT tracks by WB 3a have also shifted north and, now that this development has been constructed, a more accurate distance to the proposed tracks can be used. Compared to the 2013 Final EIR, the predicted vibration level has increased by 1 decibel and is now equal to the impact threshold.
- For the majority of the alignment from Pasadena Avenue to Lorraine Avenue, the LRT alignment shifted south. This resulted in a decrease in the vibration predictions for clusters WB 5-7 and WB 9-12. Most of this stretch of the alignment does not shift very far compared to the 2013 Final EIR plans; however, small changes in the track alignment will have largest effect on receivers in this area because they are located closest to the proposed tracks. Despite the reduction in predicted vibration levels, predicted vibration impact is identified at all receivers in this area due to their proximity.
- The LRT tracks near EB 8 have been shifted south, closer to the receiver. Compared to the 2013 Final EIR, the predicted vibration level has increased by 1 decibel and is now equal to the impact threshold.
- The crossover near Dalton Wash was moved east away from cluster WB 14 and towards cluster WB 16. This reduced the vibration predicted at WB 14 by 8 dB and increased the prediction at WB 16 by 10 dB. Both clusters remain impacts.
- The LRT tracks by clusters EB 9 and EB 10 shifted slightly farther away. Compared to the 2013 Final EIR, the predicted vibration level decreased by 1 decibel and the predicted level at EB10 is now one decibel below the impact threshold. EB 9 remains a predicted vibration impact. However, vibration impact is no longer predicted at EB 10.

Table 4: Predicted Noise Levels in Glendora, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Existing Ldn, dBA	Predicted Ldn, dBA	Threshold[3]		Impact	No. of Impacts[4]	Changes[5]
						Mod.	Sev.			
Glendora Westbound										
WB1	1453+00	148	65	55	59.1	3.2	7.1	Moderate	2	
WB1a	1458+00	156	65	55	59.5	3.2	7.1	Moderate	13	
WB1b	1465+00	149	65	55	58.7	3.2	7.1	Moderate	5	
WB1c	1470+00	134	65	55	59.2	3.2	7.1	Moderate	12	
WB1d	1477+50	108	65	55	61.4	3.2	7.1	Moderate	7	
WB2	1494+00	48	65	58	70.7	2.4	5.8	Severe	5	Crossover moved next to this receiver
WB3	1499+00	186	65	58	57.7	2.4	5.8	—	—	
WB3a	1510+00	78	55	58	62.7	2.4	5.8	Moderate	19	
WB4	1522+50	34	55	56	65.7	2.9	6.6	Severe	12	
WB5	1527+00	24	55	56	67.0	2.9	6.6	Severe	8	
WB6	1530+50	27	65	56	67.8	2.9	6.6	Severe	20	LRT moved away, BNSF moved away
WB7	1540+00	40	65	56	65.7	2.9	6.6	Severe	20	LRT moved away
WB8	1548+00	30	65	56	67.4	2.9	6.6	Severe	9	
WB9	1553+00	41	65	56	66.3	2.9	6.6	Severe	4	LRT moved away, BNSF moved away
WB10	1555+00	50	65	56	65.8	2.9	6.6	Severe	4	LRT moved away
WB11	1559+00	28	65	56	67.6	2.9	6.6	Severe	5	LRT moved away, BNSF moved away
WB12	1564+00	60	65	56	63.5	2.9	6.6	Severe	6	LRT moved away
WB13	1568+00	42	65	56	66.3	2.9	6.6	Severe	4	
WB14	1572+00	42	65	56	66.2	2.9	6.6	Severe	4	Crossover moved away from this receiver
WB15	1576+00	44	65	56	71.0	2.9	6.6	Severe	10	
WB16	1587+00	52	65	58	70.1	2.4	5.8	Severe	12	Crossover moved towards this receiver
WB17	1594+00	42	65	58	65.8	2.4	5.8	Severe	5	
WB18	1599+00	41	65	58	65.9	2.4	5.8	Severe	8	
WB19	1616+00	52	65	58	64.5	2.4	5.8	Severe	19	
WB20	1624+00	54	65	58	64.8	2.4	5.8	Severe	10	
Glendora Eastbound										

Table 4: Predicted Noise Levels in Glendora, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Existing Ldn, dBA	Predicted Ldn, dBA	Threshold[3]		Impact	No. of Impacts[4]	Changes[5]
						Mod.	Sev.			
EB1	1434+00	68	65	55	63.0	3.2	7.1	Severe	24	
EB2	1444+00	54	65	55	64.5	3.2	7.1	Severe	12	
EB3	1452+00	76	65	55	65.8	3.2	7.1	Severe	7	
EB4	1457+00	62	65	55	67.4	3.2	7.1	Severe	5	LRT moved away, BNSF moved away
EB5	1461+00	80	65	55	62.0	3.2	7.1	Moderate	7	LRT moved away, BNSF moved away
EB5a	1479+00	75	65	55	65.6	3.2	7.1	Severe	13	
EB6	1504+00	104	45	58	62.0	2.4	5.8	Moderate	4	
EB7	1537+00	76	65	56	62.3	2.9	6.6	Moderate	4	
EB8	1542+00	98	65	56	60.8	2.9	6.6	Moderate	4	
EB9	1587+00	54	65	58	64.8	2.4	5.8	Severe	6	
EB10	1610+00	102	65	58	61.5	2.4	5.8	Moderate	4	
EB11	1626+00	84	65	58	62.4	2.4	5.8	Moderate	4	
EB12	1664+00	91	65	64	65.9	1.5	3.9	Moderate	3	
Total Impacts in Glendora:									320	

Source: ATS Consulting, 2016
Notes:
[1]The buildings included in each cluster are detailed in the figures in Appendix B.
[2]The distance in feet from the closest sensitive receiver in the cluster to the proposed near light-rail track.
[3]The threshold is the allowable increase in noise from the existing Ldn. The FTA designates two threshold levels: moderate and severe.
[4]Number of dwelling units in the impacted cluster.
[5]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

Table 5: Predicted Vibration Levels in Glendora, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Threshold, VdB	Predicted Band Max., VdB[3]	1/3 Octave Band, Hz[4]	Impact	No. of Impacts[5]	Changes[6]
Glendora Westbound									

Table 5: Predicted Vibration Levels in Glendora, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Threshold, VdB	Predicted Band Max., VdB[3]	1/3 Octave Band, Hz[4]	Impact	No. of Impacts[5]	Changes[6]
WB1	1453+00	148	65	72	69	31.5	—	—	LRT moved closer
WB1a	1458+00	156	65	72	68	31.5	—	—	
WB1b	1465+00	149	65	72	69	31.5	—	—	LRT moved closer
WB1c	1470+00	134	65	72	69	31.5	—	—	
WB1d	1477+50	108	65	72	71	31.5	—	—	
WB2	1494+00	48	65	72	88	50.0	Yes	5	Crossover moved next to this receiver
WB3	1499+00	186	65	72	67	31.5	—	—	
WB3a	1510+00	78	55	72	72	31.5	**New**	19	New development closer to LRT than initially projected, **new vibration impact**
WB4	1522+50	34	55	72	81	50.0	Yes	12	
WB5	1527+00	24	55	72	86	50.0	Yes	8	LRT moved away
WB6	1530+50	27	65	72	86	50.0	Yes	20	LRT moved away
WB7	1540+00	40	65	72	80	50.0	Yes	20	LRT moved away
WB8	1548+00	30	65	72	84	50.0	Yes	9	LRT moved closer
WB9	1553+00	41	65	72	80	50.0	Yes	5	LRT moved away
WB10	1555+00	50	65	72	77	50.0	Yes	3	LRT moved away
WB11	1559+00	28	65	72	85	50.0	Yes	5	LRT moved away
WB12	1564+00	60	65	72	75	31.5	Yes	6	LRT moved away
WB13	1568+00	42	65	72	80	50.0	Yes	4	LRT moved closer
WB14	1572+00	42	65	72	80	50.0	Yes	5	Crossover moved away from this receiver
WB15	1576+00	44	65	72	89	50.0	Yes	9	
WB16	1587+00	52	65	72	87	50.0	Yes	12	Crossover moved towards this receiver
WB17	1594+00	42	65	72	80	50.0	Yes	5	LRT moved closer
WB18	1599+00	41	65	72	80	50.0	Yes	8	LRT moved closer
WB19	1616+00	52	65	72	77	50.0	Yes	19	
WB20	1624+00	54	65	72	76	50.0	Yes	10	

Table 5: Predicted Vibration Levels in Glendora, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Threshold, VdB	Predicted Band Max., VdB[3]	1/3 Octave Band, Hz[4]	Impact	No. of Impacts[5]	Changes[6]
Glendora Eastbound									
EB1	1434+00	68	65	72	74	31.5	Yes	24	
EB2	1444+00	54	65	72	76	50.0	Yes	12	LRT moved away
EB3	1452+00	76	65	72	73	31.5	Yes	7	LRT moved away
EB4	1457+00	62	65	72	75	31.5	Yes	5	LRT moved away
EB5	1461+00	80	65	72	73	31.5	Yes	7	LRT moved away
EB5a	1479+00	75	65	72	74	31.5	Yes	13	
EB6	1504+00	104	45	72	68	31.5	—	4	
EB7	1537+00	76	65	72	73	31.5	Yes	4	
EB8	1542+00	98	65	72	72	31.5	**New**	4	LRT moved closer, **new vibration impact**
EB9	1587+00	54	65	72	76	50.0	Yes	6	LRT moved away
EB10	1610+00	102	65	72	71	31.5	**removed**		LRT moved away, **impact no longer predicted**
EB11	1626+00	84	65	72	73	31.5	Yes	4	
EB12	1664+00	91	65	72	72	31.5	New	3	
							Total Impacts in Glendora:	277	

Source: ATS Consulting, 2016
Notes:
[1]The cluster numbers refer to the same sensitive receivers used for the noise analysis. The buildings included in each cluster are detailed in the figures in Appendix B.
[2]The distance in feet from the closest sensitive receiver in the cluster to the proposed near light-rail track.
[3]Maximum predicted vibration level in any 1/3 octave band.
[4]The 1/3 octave band that corresponds to the predicted band maximum.
[5]Number of dwelling units in the impacted cluster.
[6]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

2.2 San Dimas

The major design refinements in San Dimas include:

- A crossover near the intersection of Eucla Avenue and Bonita Avenue
- LRT shifted south between Gladstone Street and Freeway 57 (roughly between stations 1667+00 and 1680+00)
- LRT shifted south between Eucla Avenue and Walnut Avenue (roughly between stations 1700+00 and 1750+00)
- LRT shifted north to the west of San Dimas Canyon Road (roughly between stations 1770+00 and 1775+00)

2.2.1 Operational Noise

Table 6 presents the predicted noise levels that include the design refinements in San Dimas. The "Changes" column in Table 6 indicates any design refinements that resulted in a 1 dB or greater change in predicted noise levels. In San Dimas, cluster WB1 is the only receiver where the shift in BNSF alignment resulted in a change greater than a decibel. However, severe noise impact was also predicted at cluster WB1 in the 2013 Final EIR. The shifts in alignment did not result in any changes to where noise impact was predicted compared to the 2013 Final EIR.

The closest noise sensitive receiver to the new crossover (EB 3) is located 260 feet west of the crossover. At this distance, the crossover does not significantly contribute to the noise level at the receiver.

2.2.2 Operational Vibration

Table 7 presents the predicted vibration levels that include the design refinements in San Dimas. The "Changes" column in Table 7 indicates any design refinements that resulted in a 1 dB or greater change in predicted vibration levels. A shift of the LRT tracks south by about 5 to 10 feet increased vibration by a decibel at eastbound receivers and decreased vibration by a decibel at the westbound receivers. The small change in predicted vibration levels did not result in any additional impacts compared to the 2013 Final EIR analysis.

Note that at receiver WB1, where there is an increase in predicted noise level due to the shift of the BNSF track, there is a decrease in predicted vibration level. This is because the predicted vibration level from the LRT is presented, and the LRT is shifted away from the receiver. The strictest FTA vibration criteria apply to the maximum vibration level of frequent[*] vibration events, which includes the LRT. FTA guidance is that the existing vibration from an infrequently used rail corridor (fewer than 5 train events per day) in a shared corridor should be disregarded, and the frequent event criteria should be applied to the new LRT vibration source. For the noise analysis, all noise sources are considered.

[*] The FTA manual defines "frequent events" as 70 or more vibration events per day.

Table 6: Predicted Noise Levels in San Dimas, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Existing Ldn, dBA	Predicted Ldn, dBA	Threshold[3]		Impact	No. of Impacts[4]	Changes[5]
						Mod.	Sev.			
San Dimas Westbound										
WB1	1668+00	53	65	64	70.9	1.5	3.9	Severe	3	BNSF moved closer
WB2	1680+00	60	65	64	66.4	1.5	3.9	Moderate	3	
WB3	1683+00	76	65	60	63.4	2.0	5.0	Moderate	4	
WB4	1691+00	173	65	60	60.7	2.0	5.0	—	—	
WB5	1739+00	78	45	65	65.1	1.4	3.6	—	—	
WB6	1745+00	99	65	64	64.3	1.5	3.9	—	—	
WB7	1766+00	102	65	61	64.0	1.9	4.7	Moderate	5	
WB8	1770+00	118	65	60	63.1	2.0	5.0	Moderate	10	
San Dimas Eastbound										
EB1	1686+00	14	65	60	69.5	2.0	5.0	Severe	20	
EB2	1701+00	130	65	60	61.5	2.0	5.0	—	—	
EB3	1705+00	70	65	60	64.7	2.0	5.0	Moderate	8	
EB3a	1723+00	75	55	60	63.6	2.0	5.0	Moderate	8	
							Total Impacts in San Dimas:		61	

Source: ATS Consulting, 2016
Notes:
[1]The buildings included in each cluster are detailed in the figures in Appendix B.
[2]The distance in feet from the closest sensitive receiver in the cluster to the proposed near light-rail track.
[3]The threshold is the allowable increase in noise from the existing Ldn. The FTA designates two threshold levels: moderate and severe.
[4]Number of dwelling units in the impacted cluster.
[5]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

Table 7: Predicted Vibration Levels in San Dimas, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Threshold, VdB	Predicted Band Max., VdB[3]	1/3 Octave Band, Hz[4]	Impact	No. of Impacts[5]	Changes[6]
San Dimas Westbound									
WB1	1668+00	53	65	72	72	31.5	Yes	3	LRT moved away
WB2	1680+00	60	65	72	70	31.5	—	—	LRT moved away
WB3	1683+00	76	65	72	66	31.5	—	—	
WB4	1691+00	173	65	72	55	12.5	—	—	
WB5	1739+00	78	45	72	62	31.5	—	—	LRT moved away
WB6	1745+00	99	65	72	61	31.5	—	—	LRT moved away
WB7	1766+00	102	65	72	61	31.5	—	—	
WB8	1770+00	118	65	72	59	31.5	—	—	LRT moved closer
San Dimas Eastbound									
EB1	1686+00	14	65	72	96	63	Yes	20	
EB2	1701+00	130	65	72	57	31.5	—	—	LRT moved closer
EB3	1705+00	70	65	72	67	31.5	—	—	LRT moved closer
EB3a	1723+00	75	55	72	65	31.5	—	—	LRT moved closer
						Total Impacts in San Dimas:		23	

Source: ATS Consulting, 2016
Notes:
[1]The cluster numbers refer to the same sensitive receivers used for the noise analysis. The buildings included in each cluster are detailed in the figures in Appendix B.
[2]The distance in feet from the closest sensitive receiver in the cluster to the proposed near light-rail track.
[3]Maximum predicted vibration level in any 1/3 octave band.
[4]The 1/3 octave band that corresponds to the predicted band maximum.
[5]Number of dwelling units in the impacted cluster.
[6]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

2.3 La Verne

The design refinements in La Verne include:

- A crossover near the intersection of Carrion Road and Arrow Highway, but there are no nearby sensitive receivers
- A crossover between White Avenue and Fulton Avenue, but the nearest sensitive receivers are over 200 feet away.
- LRT shifted north to the east of San Dimas Canyon Road (roughly between stations 1780+00 and 1787+00) and BNSF tracks shifted north between San Dimas Canyon Road and B Street (roughly between stations 1780+00 and 1835+00)
- LRT shifted north, from approximately Wheeler Avenue to B Street (station 1815+00 to 1835+00)
- LRT shifted north between White Avenue and Fulton Avenue (roughly between stations 1870+00 and 1883+00). Additional siding track added
- LRT shifted south by Fulton Avenue (roughly between stations 1885+00 and 1894+00).

2.3.1 Operational Noise Predictions

Table 8 presents the updated predicted noise levels at sensitive receivers in La Verne. The shifts in the LRT and freight track centerlines near receiver clusters WB2 through WB4 resulted in greater than 1 dB change in noise levels. The predicted noise levels at cluster WB2, WB3, and WB4 now exceed the FTA "Severe" noise impact threshold (a "moderate" noise impact was predicted in the 2013 Final EIR).

The predicted noise level at cluster EB4 increased by less than a decibel compared to the 2013 Final EIR; however, the predicted level is now equal to the moderate impact threshold. Because the predicted level does not exceed the moderate impact threshold, no impact is identified in Table 8 and no mitigation is recommended. This is consistent with the FTA Guidance Manual which states if the predicted noise level "falls just above the No Impact threshold, there is less need" for mitigation.

2.3.2 Operational Vibration Predictions

Table 9 presents the updated predicted vibration levels at sensitive receivers in La Verne. The 2013 Final EIR analysis identified no vibration impacts and the design refinements resulted in no new predicted vibration impacts. The shifts in alignment resulted in predicted increase of about 1 to 3 decibels where the LRT alignment was shifted closer and a similar decrease where the alignment was shifted further from the receivers.

Crossovers can increase predicted vibration levels by up to 10 decibels. However, the receivers closest to the crossovers in La Verne (clusters EB2 and EB3) are over 200 feet away. No vibration impact is predicted as a result of the crossovers.

Table 8: Predicted Noise Levels in La Verne, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Existing Ldn, dBA[6]	Predicted Ldn, dBA	Threshold[3]		Impact	No. of Impacts[4]	Changes[5]
						Mod.	Sev.			
La Verne Westbound										
WB1	1805+00	190	65	60	61.7	2.0	5.0	—	—	Updated receiver distance
WB2	1817+00	71	65	62	67.4	1.7	4.4	Severe	5	LRT moved closer, BNSF moved closer, **updated to severe impact**
WB3	1820+00	71	65	62	66.8	1.7	4.4	Severe	5	LRT moved closer, BNSF moved closer, **updated to severe impact**
WB4	1825+00	70	65	62	68.6	1.7	4.4	Severe	8	LRT moved closer, BNSF moved closer, **updated to severe impact**
WB5	1829+00	76	65	62	65.3	1.7	4.4	Moderate	5	
WB6	1832+00	72	65	62	65.5	1.7	4.4	Moderate	4	
WB7	1850+00	98	65	61	63.7	1.9	4.7	Moderate	6	
La Verne Eastbound										
EB1	1784+00	233	65	59	59.4	2.2	5.4	—	—	
EB2	1876+00	260	55	59	60.9	2.2	5.4	—	—	New crossover
EB3	1886+00	118	65	60	61.3	2.0	5.0	—	—	
EB4	1891+00	120	65	60	62.0	2.0	5.0	—	—	
Total Impacts in La Verne:									33	

Source: ATS Consulting, 2016
Notes:
[1]The buildings included in each cluster are detailed in the figures in Appendix B.
[2]The distance in feet from the closest sensitive receiver in the cluster to the proposed near light-rail track.
[3]The threshold is the allowable increase in noise from the existing Ldn. The FTA designates two threshold levels: moderate and severe.
[4]Number of dwelling units in the impacted cluster.
[5]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.
[6]Ambient level was adjusted by the distance to the BNSF since the BNSF horn was the main sound source of the ambient noise measured for this city.

Table 9: Predicted Vibration Levels in La Verne, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Threshold, VdB	Predicted Band Max., VdB[3]	1/3 Octave Band, Hz[4]	Impact	No. of Impacts[5]	Changes[6]
La Verne Westbound									
WB1	1805+00	190	65	72	54	12.5	—	—	Receiver information updated
WB2	1817+00	71	65	72	67	31.5	—	—	LRT moved closer
WB3	1820+00	71	65	72	67	31.5	—	—	LRT moved closer
WB4	1825+00	70	65	72	67	31.5	—	—	LRT moved closer
WB5	1829+00	78	65	72	66	31.5	—	—	
WB6	1832+00	72	65	72	67	31.5	—	—	LRT moved closer
WB7	1850+00	98	65	72	62	31.5	—	—	
La Verne Eastbound									
EB1	1784+00	233	65	72	53	12.5	—	—	LRT moved away
EB2	1876+00	260	55	72	56	12.5	—	—	Crossover, LRT moved away from this receiver
EB3	1886+00	118	65	72	59	31.5	—	—	LRT moved towards this receiver
EB4	1891+00	120	65	72	58	31.5	—	—	LRT moved closer
							Total Impacts in La Verne:	0	

Source: ATS Consulting, 2016
Notes:
[1]The cluster numbers refer to the same sensitive receivers used for the noise analysis. The buildings included in each cluster are detailed in the figures in Appendix B.
[2]The distance in feet from the closest sensitive receiver in the cluster to the proposed near light-rail track.
[3]Maximum predicted vibration level in any 1/3 octave band.
[4]The 1/3 octave band that corresponds to the predicted band maximum.
[5]Number of dwelling units in the impacted cluster.
[6]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

2.4 Pomona

No LRT crossovers are located in Pomona and the sensitive receiver clusters are located relatively far from the tracks which means predicted noise and vibration levels are less sensitive to changes in realignments of the track centerlines. The design refinements in Pomona include:

- Freight and siding track realigned between Garey Avenue and west of Towne Avenue (roughly between stations 1905+00 and 1936+00).
- LRT shifted south between Garey Avenue and Towne Avenue (roughly between stations 1925+00 and 1955+00)

2.4.1 Operational Noise Predictions

Table 10 presents the updated predicted noise levels at sensitive receivers in Pomona. Shifts in the LRT and freight track centerlines do not result in changes in noise levels greater than a decibel. However, a freight track turnout is now located closer to cluster WB1. The turnout, used to tie in the freight track to the Metrolink tracks to the south, can increase noise levels by up to 6 decibels. The addition of the turnout results in a moderate noise impact predicted at cluster WB1. There was no noise impact predicted at cluster WB1 in the 2013 Final EIR. No other changes in predicted noise impact were identified as a result of the design refinements.

The predicted noise level at cluster EB2 increased by less than a decibel compared to the 2013 Final EIR; however, the predicted level is now equal to the moderate impact threshold. Because the predicted level does not exceed the moderate impact threshold, no impact is identified in Table 10 and no mitigation is recommended. This is consistent with the FTA Guidance Manual which states if the predicted noise level "falls just above the No Impact threshold, there is less need" for mitigation.

2.4.2 Operational Vibration Predictions

Table 11 presents the updated predicted LRT vibration levels at sensitive receivers in Pomona. There are no changes to predicted vibration impacts as a result of design refinements in Pomona.

Table 12 presents the predicted Metrolink vibration levels at cluster WB1 in Pomona. A new FRT/Metrolink turnout is located near cluster WB1; however, no vibration impact is predicted. There are no changes to the existing Metrolink tracks near other receivers in Pomona, so predicted vibration levels are not presented.

Table 10: Predicted Noise Levels in Pomona, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Existing Ldn, dBA	Predicted Ldn, dBA	Threshold[3]		Impact	No. of Impacts[4]	Changes[5]
						Mod.	Sev.			
Pomona Westbound										
WB1	1964+00	87	65	62	65.3	1.7	4.4	Moderate	8	BNSF moved away, **new moderate impact**
WB2	1968+00	64	65	62	65.3	1.7	4.4	Moderate	6	
Pomona Eastbound										
EB1	1929+00	140	65	62	63.3	1.7	4.4	—		
EB2	1943+00	123	65	62	63.7	1.7	4.4	—		
EB3	1967+00	232	65	62	62.7	1.7	4.4	—		
Total Impacts in Pomona:									14	

Source: ATS Consulting, 2016
Notes:
[1]The buildings included in each cluster are detailed in the figures in Appendix B.
[2]The distance in feet from the closest sensitive receiver in the cluster to the proposed near light-rail track.
[3]The threshold is the allowable increase in noise from the existing Ldn. The FTA designates two threshold levels: moderate and severe.
[4]Number of dwelling units in the impacted cluster.
[5]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

Table 11: Predicted Vibration Levels in Pomona, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Threshold, VdB	Predicted Band Max., VdB[3]	1/3 Octave Band, Hz[4]	Impact	No. of Impacts[5]	Changes[6]
Pomona Westbound									
WB1	1964+00	87	65	72	60	31.5	—	—	
WB2	1968+00	64	65	72	72	31.5	Yes	6	
Pomona Eastbound									
EB1	1929+00	140	65	72	68	31.5	—	—	LRT moved closer
EB2	1943+00	123	65	72	58	31.5	—	—	
EB3	1967+00	232	65	72	65	31.5	—	—	

Table 11: Predicted Vibration Levels in Pomona, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Threshold, VdB	Predicted Band Max., VdB[3]	1/3 Octave Band, Hz[4]	Impact	No. of Impacts[5]	Changes[6]
						Total Impacts in Pomona:		6	

Source: ATS Consulting, 2016
Notes:
[1]The cluster numbers refer to the same sensitive receivers used for the noise analysis. The buildings included in each cluster are detailed in the figures in Appendix B.
[2]The distance in feet from the closest sensitive receiver in the cluster to the proposed near light-rail track.
[3]Maximum predicted vibration level in any 1/3 octave band.
[4]The 1/3 octave band that corresponds to the predicted band maximum.
[5]Number of dwelling units in the impacted cluster.
[6]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

Table 12: Predicted Metrolink Vibration Levels in Pomona, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft	Change in Dist., ft	Predicted Current Band Max., VdB	Predicted Future Band Max., VdB[2]	1/3 Octave Band, Hz[4]	Impact[3]	No. of Impacts[5]	Changes[6]
Pomona Westbound									
WB1	1964+00	203	0	60	70	80	—	—	New Metrolink turnout added
						Total Impacts in Pomona:		0	

Source: ATS Consulting, 2016
Notes:
[1]The cluster numbers refer to the same sensitive receivers used for the noise analysis. The buildings included in each cluster are detailed in the figures in Appendix B.
[2]Maximum predicted vibration level in any 1/3 octave band.
[3]There is impact if the predicted future band maximum exceeds 72 VdB and the predicted future level exceeds the predicted current level by at least 3 dB.
[4]The 1/3 octave band that corresponds to the predicted band maximum.
[5]Number of dwelling units in the cluster.
[6]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

2.5 Claremont

The design refinements in Claremont include:

- A crossover near Indian Hill Boulevard has been added
- Grade separation for the LRT alignment at Indian Hill Boulevard.
- LRT shifted south around Claremont Boulevard (roughly between stations 2045+00 and 2047+00)

2.5.1 Operational Noise Predictions

Table 13 presents the predicted noise levels that include the design refinements in Claremont. The "Changes" column in Table 13 indicates any design refinements that resulted in a 1 dB or greater change in predicted noise levels.

A crossover was added near Indian Hill Boulevard which resulted in a noise increase at the nearby cluster WB 5. Cluster WB5 was also identified as a severe impact in the 2013 Final EIR analysis.

At cluster WB4, a shift in the Metrolink light-rail tracks have decreased the predicted noise level by less than a decibel; however, this change results in a predicted moderate noise impact instead of the severe noise impact predicted in the 2013 Final EIR.

The grade separation at Indian Hill Boulevard does not result in any significant changes to predicted noise levels. The retained fill section of the aerial structure could introduce reflected Metrolink train noise to receivers south of the tracks (cluster EB4). However, the train itself will shield most of the reflected noise so noise reflections are not taken into account in the analysis.

2.5.2 Operational Vibration Predictions

Table 14 presents the predicted vibration levels that include the design refinements in Claremont. The "Changes" column in Table 14 indicates any design refinements that resulted in a 1 dB or greater change in predicted vibration levels. There were no changes to the locations of predicted vibration impacts as a result of the design refinements.

The crossover near Indian Hill Boulevard results in an increase in predicted vibration levels at cluster WB 5. Vibration impact was also identified at this location in the 2013 Final EIR.

A new grade separation was introduced at Indian Hill Boulevard. Cluster EB 4 is located adjacent to over ten feet of retained fill from the aerial structure. The retained fill will provide about 3 decibels of attenuation.. No vibration impact is predicted at this location (and no vibration impact was predicted in the 2013 Final EIR)

The vibration predictions for Metrolink operations are presented in Table 15. No changes were made to the Metrolink tracks since the Final EIR analysis that affected predicted vibration levels.

Table 13: Predicted Noise Levels in Claremont, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Existing Ldn, dBA	Predicted Ldn, dBA	Threshold[3]		Impact	No. of Impacts[4]	Changes[5]
						Mod.	Sev.			
Claremont Westbound										
WB1	1971+00	128	65	62	60.8	1.7	4.4			
WB2	1973+00	80	65	62	63.6	1.7	4.4			
WB3	1978+00	37	65	62	68.6	1.7	4.4	Severe	7	
WB4	1983+00	98	65	62	66.0	1.7	4.4	Moderate	8	
WB5	1990+00	24	65	62	73.8	1.7	4.4	Severe	50	Crossover moved towards this receiver
WB6	2048+00	38	65	64	70.6	1.5	3.9	Severe	3	
Claremont Eastbound										
EB1	1970+00	170	65	62	63.4	1.7	4.4			
EB2	1974+00	151	65	62	67.7	1.7	4.4	Severe	7	
EB3	1978+00	165	65	62	66.9	1.7	4.4	Severe	3	
EB4	2008+00	90	55	64	68.2	1.5	3.9	Severe	10	
EB5	2035+00	114	65	64	69.2	1.5	3.9	Severe	9	
EB6	2041+00	110	65	64	69.8	1.5	3.9	Severe	6	
EB7	2047+00	72	65	64	70.9	1.5	3.9	Severe	4	
								Total Impacts in Claremont:	107	

Source: ATS Consulting, 2016
Notes:
[1]The buildings included in each cluster are detailed in the figures in Appendix B.
[2]The distance in feet from the closest sensitive receiver in the cluster to the proposed near light-rail track.
[3]The threshold is the allowable increase in noise from the existing Ldn. The FTA designates two threshold levels: moderate and severe.
[4]Number of dwelling units in the impacted cluster.
[5]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

Table 14: Predicted Vibration Levels in Claremont, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Threshold, VdB	Predicted Band Max., VdB[3]	1/3 Octave Band, Hz[4]	Impact	No. of Impacts[5]	Changes[6]
Claremont Westbound									
WB1	1971+00	128	65	72	66	50	—	—	
WB2	1973+00	80	65	72	70	50	—	—	
WB3	1978+00	37	65	72	77	63	Yes	7	
WB4	1983+00	98	65	72	69	50	—	—	
WB5	1990+00	24	65	72	82	63	Yes	50	Crossover moved near to this receiver
WB6	2048+00	38	65	72	77	63	Yes	3	
Claremont Eastbound									
EB1	1970+00	170	65	72	65	31.5	—	—	
EB2	1974+00	151	65	72	65	31.5	—	—	
EB3	1978+00	165	65	72	65	31.5	—	—	
EB4	2008+00	90	55	72	65	50	—	—	New aerial structure
EB5	2035+00	114	65	72	67	50	—	—	
EB6	2041+00	110	65	72	68	50	—	—	
EB7	2047+00	72	65	72	71	50	—	—	LRT moved closer
						Total Impacts in Claremont:		60	

Source: ATS Consulting, 2016
Notes:
[1]The cluster numbers refer to the same sensitive receivers used for the noise analysis. The buildings included in each cluster are detailed in the figures in Appendix B.
[2]The distance in feet from the closest sensitive receiver in the cluster to the proposed near light-rail track.
[3]Maximum predicted vibration level in any 1/3 octave band.
[4]The 1/3 octave band that corresponds to the predicted band maximum.
[5]Number of dwelling units in the impacted cluster.
[6]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

Table 15: Predicted Metrolink Vibration Levels in Claremont, Category 2 Land Uses

Cluster No.[1]	Eng. Station	Dist., ft	Change in Dist., ft	Predicted Current Band Max., VdB	Predicted Future Band Max., VdB[2]	1/3 Octave Band, Hz[4]	Impact[3]	No. of Impacts[5]	Changes[6]
Claremont Eastbound									
EB1	1970+00	94	0	—	—	—	—	—	—
EB2	1974+00	100	0	—	—	—	—	—	—
EB3	1978+00	110	0	—	—	—	—	—	—
EB4	2008+00	60	22	69	72	50.0	Yes	5	—
EB5	2035+00	74	20	67	70	50.0	—	—	—
EB6	2041+00	72	20	67	70	50.0	—	—	—
EB7	2047+00	46	20	71	75	50.0	Yes	4	—
							Total Impacts in Claremont:	9	

Source: ATS Consulting, 2016
Notes:
[1]The cluster numbers refer to the same sensitive receivers used for the noise analysis. The buildings included in each cluster are detailed in the figures in Appendix B.
[2]Maximum predicted vibration level in any 1/3 octave band.
[3]There is impact if the predicted future band maximum exceeds 72 VdB and the predicted future level exceeds the predicted current level by at least 3 dB.
[4]The 1/3 octave band that corresponds to the predicted band maximum.
[5]Number of dwelling units in the cluster.
[6]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

2.6 Montclair

There were no noise or vibration sensitive receivers identified in Montclair in the 2013 Final EIR; therefore, the design refinements would not result in any changes to the impact assessment.

2.7 Institutional Land Uses

The design refinements that affect institutional land uses include:

- A new crossover by Carroll Avenue in Glendora
- Alignment shifts in LRT tracks
- Alignment shifts in Metrolink tracks

2.7.1 Operational Noise Predictions

Table 16 presents the predicted noise levels that include the design refinements. The "Changes" column in Table 16 indicates any design refinements that resulted in a 1 dB or greater change in predicted noise levels.

A new crossover by cluster EB B, Foothill Presbyterian Hospital, increases the predicted noise level by 1.6 decibels. Because of this increase, cluster EB B is now a "moderate" noise impact. There are no other changes to the predicted impact locations compared to the 2013 Final EIR.

2.7.2 Operational Vibration Predictions

Table 17 presents the predicted LRT vibration levels that include the design refinements. The "Changes" column in Table 17 indicates any design refinements that resulted in a 1 dB or greater change in predicted vibration levels.

A new crossover by Carroll Avenue increases the predicted vibration at cluster EB B by 10 dB; EB B is now identified as a predicted vibration impact.

No changes were made to the Metrolink tracks since the Final EIR analysis that affected any institutional receivers.

Table 16: Predicted Noise Levels for Category 3 Land Uses

City	Land Use	Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Existing Ldn, dBA	Predicted Ldn, dBA	Threshold[3]		Impact	Changes[4]
								Mod.	Sev.		
Glendora	Calvary Lutheran Church	EB A	1430+00	136	65	50	56.3	8.9	14.7		
Glendora	Presbyterian Hospital	EB B	1495+00	67	45	61	64.8	4.3	8.6	Moderate	New crossover, **new noise impact**
Glendora	Foothill Christian Preschool, (no freight)	EB C	1525+00	96	55	50	56.6	8.9	14.7		
Glendora	Foothill Christian preschool (with freight)	EB C	1525+00	96	55	75	73.8	1.2	4.9		
Glendora	Woodglen Medical Group (no freight)	EB D	1527+00	70	55	50	58.2	8.9	14.7		
Glendora	Woodglen Medical Group (with freight)	EB D	1527+00	70	55	75	75.8	1.2	4.9		
San Dimas	Pioneer Park	EB E	1719+00	248	55	58	58.5	5.3	9.9		
San Dimas	Freight Hour	EB E	1719+00	248	55	75	65.4	1.2	4.9		
La Verne	University of La Verne (no freight)	WB F	1847+00	32	35	57	60.5	5.6	10.4		
La Verne	University of La Verne (with freight)	WB F	1847+00	32	35	75	84.3	1.2	4.9	Severe	
Claremont	Keck Graduate Institute	EB G	1993+00	193	65	58	59.1	5.3	9.9		

Source: ATS Consulting, 2016
Notes:
[1]The buildings included in each cluster are detailed in the figures in Appendix B.
[2]The distance in feet from the closest sensitive receiver in the cluster to the proposed near light-rail track.
[3]The threshold is the allowable increase in noise from the existing Ldn. The FTA designates two threshold levels: moderate and severe.
[4]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

Table 17: Predicted Vibration Levels for Category 3 Land Uses

City	Land Use	Cluster No.[1]	Eng. Station	Dist., ft[2]	Speed, mph	Threshold, VdB	Predicted Band Max., VdB[3]	1/3 Octave Band, Hz[4]	Impact	Changes[6]
Glendora	Calvary Lutheran Church	EB A	1430+00	136	65	75	69	31.5	—	
Glendora	Presbyterian Hospital	EB B	1495+00	67	45	75	81	31.5	**New**	New crossover by this receiver, **new vibration impact**
Glendora	Foothill Christian Preschool	EB C	1525+00	96	55	75	70	31.5	—	
Glendora	Woodglen Medical Group	EB D	1527+00	70	55	75	73	31.5	—	LRT moved closer
San Dimas	Pioneer Park	EB E	1719+00	248	55	75	64	31.5	—	LRT moved closer
La Verne	University of La Verne	WB F	1847+00	32	35	75	78	50	Yes	
Claremont	Keck Graduate Institute	EB G	1993+00	193	65	75	67	31.5	—	

Source: ATS Consulting, 2016
Notes:
[1]The cluster numbers refer to the same sensitive receivers used for the noise analysis. The buildings included in each cluster are detailed in the figures in Appendix B.
[2]The distance in feet from the closest sensitive receiver in the cluster to the proposed near light-rail track.
[3]Maximum predicted vibration level in any 1/3 octave band.
[4]The 1/3 octave band that corresponds to the predicted band maximum.
[5]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

Table 18: Predicted Vibration Levels for Category 3 Land Uses

City	Land Use	Cluster No.[1]	Eng. Station	Dist., ft	Predicted Current Band Max., VdB	Predicted Future Band Max., VdB[2]	1/3 Octave Band, Hz[4]	Impact[3]	Impact	Changes[5]
Claremont	Keck Graduate Institute	EB G	1993+00	170	65	75	69	31.5	—	—

Source: ATS Consulting, 2016
Notes:
[1]The cluster numbers refer to the same sensitive receivers used for the noise analysis. The buildings included in each cluster are detailed in the figures in Appendix B.
[2]Maximum predicted vibration level in any 1/3 octave band.
[3]There is impact if the predicted future band maximum exceeds 72 VdB and the predicted future level exceeds the predicted current level by at least 3 dB.
[4]The 1/3 octave band that corresponds to the predicted band maximum.
[5]Changes made to the alignment that result in either at least a 1 dB increase or 1 dB decrease in the predicted band maximum vibration.

2.8 TPSS Units

The only ancillary equipment expected to have the potential of causing noise impacts are the traction power substation (TPSS) units. The primary noise source from the TPSS units is from the transformer hum and the cooling system. On most modern TPSS units, the transformer hum is minimal so most noise is generated by the ventilation and cooling system.

Some of the proposed TPSS sites have been relocated since the completion of the 2013 Final EIR. Updated predicted TPSS noise levels are provided for the new TPSS locations. In addition, the revised predictions include updated reference noise levels for TPSS units based on measurements completed in March 2015 at two units on the Exposition Phase 1 line. The measured noise level at the Exposition TPSS units was 58 dBA at 50 feet, higher than what was assumed in the 2013 Final EIR analysis. The following formula was used to estimate noise levels at the sensitive receivers closest to the TPSS units:

$$Ldn_{TPSS} = 10 * \log\left(15 * 10^{\frac{SPL}{10}} + 9 * 10^{\frac{SPL+10}{10}}\right) - 13.8 + 20 * \log\left({Dist}/{Dist_{ref}}\right)$$

where:

Ldn_{TPSS} = TPSS day-night sound level
SPL = Reference sound pressure level of TPSS (58 dBA at 50 feet)
$Dist$ = Distance from the TPSS to the façade of the nearest sensitive receiver
$Dist_{ref}$ = Reference level distance (50 feet)

Note that the above equation assumes the ventilation and cooling system is running continuously 24-hours per day, which is a conservative assumption.

The predicted noise level at the nearest sensitive receiver to each TPSS location is presented in Table 19, along with the FTA noise impact criteria. The FTA noise impact criteria depends on the existing noise level at the nearest sensitive receiver, so the impact criteria varies for the different TPSS locations. Moderate noise impact is predicted at the TPSS sites located within 100 feet of a residential building, and severe noise impact is predicted at the TPSS site located 19 feet from a residence. Recommended mitigation measures are presented in Section 3. The most effective mitigation measure is to specify quieter TPSS units.

Table 19: Predicted TPSS Noise Levels

City	TPSS	Eng. Station	Dist., ft[1]	Nearest Sensitive Receiver	Estimated TPSS Noise Ldn, dBA[2]	FTA Mod. Criteria[2], Ldn dBA	Impact
Glendora	B-1 -Alt	1488+30	No noise sensitive receivers near this TPSS location				
Glendora	B-1	1496+10	88	WB 2	60	57	**Yes**
Glendora	B-2 -Alt	1557+20	19	WB11	73	56	**Yes (Severe)**
Glendora	B-2	1560+30	82	WB 11	60	56	**Yes**
Glendora	B-3	1639+70	No noise sensitive receivers near this TPSS location				
San Dimas	B-4	1682+65	65	EB 1	62	58	**Yes**
San Dimas	B-5 -Alt	1717+70	No noise sensitive receivers near this TPSS location				

Table 19: Predicted TPSS Noise Levels

City	TPSS	Eng. Station	Dist., ft[1]	Nearest Sensitive Receiver	Estimated TPSS Noise Ldn, dBA[2]	FTA Mod. Criteria[2], Ldn dBA	Impact
San Dimas	B-5	1725+40	90	EB 3a	59	58	**Yes**
La Verne	B-6	1805+62	78	WB 1	61	58	**Yes**
La Verne	B-7	1861+52	No noise sensitive receivers near this TPSS location				
Pomona	B-8	1928+37	116	EB 1	57	59	No
Claremont	B-9	1977+87	50	EB 3	64	59	**Yes**
Claremont	B-10	2030+96	No noise sensitive receivers near this TPSS location				
Montclair	B-11	2082+83	No noise sensitive receivers near this TPSS location				

Source: ATS Consulting, 2016
Notes:
[1]The distance in feet from the closest sensitive receiver in the cluster to the proposed TPSS location.
[2] The FTA moderate noise impact criteria, based on the existing noise level at the receiver.

3. MITIGATION RECOMMENDATIONS FOR DESIGN REFINEMENTS

3.1 Operational Noise

The updated noise analysis identified noise sensitive receivers where there is potential for future noise levels to exceed the applicable FTA noise impact threshold. Mitigation measures that may be incorporated into the design to reduce predicted noise levels to below the FTA thresholds are:

- **Noise barriers –** This is a common approach to reduce noise impacts from surface transportation sources. The primary requirements for an effective noise barrier are (1) the barrier must be high enough and long enough to break the line-of-sight between the sound source and the receiver; (2) the barrier must be of an impervious material with a minimum surface density of 4 lb/sq. ft; and (3) the barrier must not have any gaps or holes between panels or at the bottom. Because numerous materials meet these requirements, the selection of materials for noise barriers is usually dictated by aesthetics, durability, cost, and maintenance considerations.
- **Building Sound Insulation –** Sound insulation of residences and institutional buildings improve the outdoor-to-indoor noise reduction. Although this approach has no effect on noise in exterior areas, it may be the best choice for sites where noise barriers are not feasible or desirable, for buildings where indoor sensitivity is of most concern, or where horn noise dominates the noise environment.
- **Low-impact frogs –** Frogs are used in special trackwork such as turnouts and crossovers where two rails cross. At the gap where the two wheels cross, the wheels strike the end of the gap and increase noise and vibration levels. There are alternatives to typical frogs that result in lower impact forces and lower noise level increases at receivers near special trackwork.

Table 20 presents the recommended measures to be incorporated into the design to reduce the predicted noise levels to below the impact threshold and the predicted noise level with the mitigation measure incorporated into the design. Table 20 includes the clusters where design refinements resulted in new predicted impacts, or a change from moderate to severe predicted impact. The sections following Table 20 summarize the noise mitigation recommendations for all sensitive receiver clusters.

Table 20: Recommendations to Reduce Predicted Noise Levels

Receiver	Recommended Mitigation Measure	Predicted Noise Level After Mitigation	Predicted Increase over Existing After Mitigation[1]	FTA Moderate Impact Threshold Allowable Increase
Glendora EB B	Low impact frog	63.4 dBA Leq(1 hour)	2.4 dB	4.3 dB
La Verne WB 2	Increase height of sound wall to 12 ft	57 dBA Ldn	- 5 dB	1.7 dB
La Verne WB 3	Increase height of sound wall to 12 ft	56 dBA Ldn	- 4 dB	1.7 dB
La Verne WB 4	Increase height of sound wall to 12 ft	59 dBA Ldn	- 3 dB	1.7 dB

Pomona WB 1	Low impact frog and sound wall	52 dBA	-10 dB	1.7 dB

[1]Where the predicted increase is negative, the future predicted noise levels are less than the predicted existing noise level. This will happen where the mitigation measure will reduce the existing BNSF and/or Metrolink noise, in addition to the LRT noise.

At sensitive receiver clusters Glendora EB B and Pomona WB 1, a low-impact frog is recommended. The analysis assumes that a monoblock frog would be installed, which would halve the noise contributed from the frog compared to a standard RBM frog. A sound wall is also proposed at receiver Pomona WB 1 to further reduce the predicted noise levels.

At sensitive receiver clusters WB 2, 3, and 4 in La Verne, the shift in the LRT and freight alignment closer to the receivers resulted in a severe predicted noise impact, where a moderate noise impact was predicted in the 2013 Final EIR. As a result of the alignment shift, the height of the sound barrier recommended in the 2013 EIR is increased to 12 ft. Note that the tall barrier height recommended in this area is because a major noise source is the BNSF horn noise. The horn is located on the top of the locomotive, which requires a tall barrier to break the line-of-sight between the noise source and the sensitive receiver. An alternative noise mitigation option is to design the noise barrier to reduce the wheel-rail train noise (which would result in a lower wall height), and evaluate the residences for residential sound insulation to mitigate the horn noise.

3.1.1 Summary of Noise Barriers

The primary recommended mitigation measure is construction of noise barriers to shield sensitive receivers from train noise. Table 21 indicates the approximate noise barrier locations and any changes from the 2013 Final EIR recommendations. Sound barrier heights and lengths were altered at some sensitive receivers where there was no change in the predicted level of impact. The design refinements from the 2013 Final EIR noise barrier recommendations include:

- One new wall is introduced in Glendora to reduce noise from a new crossover (Glendora Wall 2a).
- There are refinements in recommended wall heights as a result of crossover relocations, grade separations, or alignment shifts.
- The start and end station numbering has been updated to reflect the most recent design drawings.

As final design progresses, the barrier heights and lengths should be refined for constructability. This includes limiting wall heights near intersections to meet safety standards, identifying the best setback distance for the sound wall (which would result in changes to wall heights), and determining if there are existing walls or structures that would serve as noise barriers. Where future refinements in the sound wall design would limit effectiveness (such as lowering the height of the sound wall near an intersection to maintain visibility), other mitigation measures such as building sound insulation should be considered following the guidelines in the FTA Guidance Manual for determining where noise mitigation is reasonable and feasible.

Table 21: Recommended Locations for Noise Barriers

City	Wall No.	Direction [1]	Eng. Station		Length (ft)	Height [2] (ft)	Clusters Mitigated	Design Refinement
			Start	End				

Glendora	1	WB	1452+00	1454+50	250	6	WB 1	--
Glendora	2	WB	1455+50	1483+00	2,750	***6***	WB 1a, 1b, 1c, 1d	Wall height decreased (LRT moved away)
Glendora	***2a***	***WB***	***1492+00***	***1497+00***	***500***	***8***	***WB 2***	***New wall at crossover***
Glendora	3	WB	1506+50	1517+00	1,050	***6***	WB 3a	Wall height decreased (LRT moved away)
Glendora	4	WB	1518+00	1528+50	1,050	8	WB 4,5	--
Glendora	5	WB	1529+00	1550+50	2,150	8	WB 6, 7, 8	--
Glendora	6	WB	1550+50	1556+50	600	8	WB 9, 10	--
Glendora	7	WB	1557+75	1570+00	1,225	***8***	WB 11, 12, 13	Decrease in wall height (LRT moved away)
Glendora	8	WB	1570+00	1579+00	900	6	WB 14, 15	--
Glendora	9	WB	1583+00	1601+50	1,850	6	WB 16, 17, 18	--
Glendora	10	WB	1611+00	1622+50	1,150	***6***	WB 19	Wall height adjusted
			1622+50	1632+50	1,000	***8***	WB 20	
Glendora	11	EB	1430+00	1448+00	1,800	6	EB 1, 2	--
Glendora	12	EB	1449+50	1454+00	450	12	EB 3	--
Glendora	13	EB	1455+50	1463+25	775	12	EB 4,5	--
Glendora	14	EB	1468+75	1479+75	1,100	12	EB 5a	--
Glendora	15	EB	1502+50	1504+25	175	12	EB 6	--
Glendora	16	EB	1537+00	1539+00	200	6	EB 7	--
Glendora	17	EB	1541+00	1543+50	250	6	EB 8	--
Glendora	18	EB	1586+50	1589+00	250	6	EB 9	--
Glendora	19	EB	1604+50	1612+50	800	6	EB 10	--
Glendora	20	EB	1623+50	1628+50	500	8	EB 11	--
Total Length, Glendora (ft)					**20,775**			
San Dimas	1	WB	1668+00	1671+00	300	12	WB 1	--
San Dimas	2	WB	1679+00	1685+00	600	6	WB 2, 3	--
San Dimas	3	WB	1764+50	1772+00	750	***10***	WB 7, 8	Increase wall height (tracks moved closer)
San Dimas	4	EB	1684+00	1689+00	500	6	EB 1	--
San Dimas	5	EB	1704+00	1706+50	250	6	EB 3	--
San Dimas	6	EB	1722+00	1726+00	400	6	EB 3a	--
Total Length, San Dimas (ft)					**2,800**			
La Verne	1	WB	1816+00	1827+75	1,175	***12***	WB 2, 3, 4	Increase wall height (tracks moved closer)
La Verne	2	WB	1828+50	1834+50	600	6	WB 5, 6	--

La Verne	3	WB	1447+25	1452+25	500	14	WB 7, F (Cat. 3)	--
Total Length, La Verne (ft)					**2,275**			
Pomona	1	WB	1961+50	1970+50	900	8	WB 1, 2	--
Total Length, Pomona (ft)					**900**			
Claremont	1	WB	1976+00	1978+50	250	8	WB 3	--
Claremont	2	WB	1980+25	1997+50	1,725	8	WB 4, 5	Crossover closer to WB5
Claremont	3	WB	2047+50	2050+50	300	8	WB 6	
Claremont	4	EB	1972+00	1979+50	850	12	EB 2, 3	--
Claremont	5	EB	2006+50	2010+00	350	***6***	EB 4	
Claremont	6	EB	2034+00	2045+00	1,100	12	EB 5, 6	--
Claremont	7	EB	2046+50	2050+00	350	12	EB 7	--
Total Length, Claremont (ft)					**5,125**			
Total Length, All Cities (ft)					**32,100**			

Source: ATS Consulting, 2016
Notes:
Heights and lengths of the sound walls are subject to further design refinements. Heights may be significantly altered if quiet zones waivers are granted for at-grade crossings.
[1] EB = towards Montclair (south side of tracks); WB = towards Azusa (north side of tracks)
[2] Height above the top-of-rail

3.1.2 Sound Insulation of Buildings

The 2013 Final EIR recommends sound insulation as a mitigation measure for sensitive receivers:

1. near intersections because sound barriers cannot extend into the intersection, which reduces their effectiveness for receivers located at the intersection, and
2. with second floors where it may not be feasible or cost effective to increase the height of the barriers to provide adequate noise reduction

The following locations are sensitive receiver clusters that are identified as an impact due to design refinements and were not identified in the 2013 Final EIR. The following sensitive receiver cluster also should be considered for sound insulation:

Table 22: Proposed Locations for Sound Insulation

City	Cluster	Type of Sound Insulation	Change from 2013 Final EIR
Pomona	WB 1	Second story	New FRT/Metrolink turnout location

3.1.3 Quiet Zones for Horn Noise

The Federal Railroad Administration (FRA) regulations require all trains operating on the national rail system to sound horns as they approach an at-grade rail/roadway crossing. In 2005, the FRA finalized a horn rule that provides the opportunity to mitigate the effects of train horn noise by establishing "quiet zones." The FRA may grant a quiet zone if the affected jurisdiction agrees to implement supplemental

safety measures such as four quadrant gates. If the application is approved, freight trains are not required to sound their horns as they approach at-grade crossings. Implementing a quiet zone requires cooperation by all jurisdictions involved with the grade crossing and is contingent on approval by the FRA.

Noise reduction from quiet zones is not considered in the predicted noise levels or the noise barrier recommendations in Table 21. However, if quiet zones were approved it would eliminate the need for some of the sound walls listed in Table 21 and some of the building sound insulation recommendations. There is no change to the sensitive receiver clusters recommended for quiet zones compared to the 2013 Final EIR.

3.1.4 Low-impact Frogs

Low-impact frogs can be used to reduce noise and vibration from special trackwork. The different options for low-impact frogs are described in detail in Appendix B: Background information on Frogs. The low-impact frog recommended for crossovers or turnouts near noise and vibration sensitive receivers is the monoblock frog.

Monoblock frogs are basically milled out of a single block of steel eliminating all rail joints and creating a smoother running surface. Compared to other frogs that provide a greater reduction in noise levels (such as a moveable point frog), the monoblock frog is less expensive, easier to maintain, and is expected to increase the lifespan of the frog.

Table 23 presents the crossover locations where monoblock frogs are recommended.

Table 23: Recommended Nosie and Vibration Mitigation for Crossovers

Crossover Stationing	Location	Closest Receiver	Recommendation
1490+00 to 1495+00	Carroll Avenue – Near Glendora WB2	Glendora WB2, Glendora B	Monoblock Frog
1580+00 to 1585+00	Dalton Wash – crossover shifted to the east	Glendora WB14, 15, and 16	Monoblock Frog
1709+00 to 1712+00	Eucla Ave at Bonita Ave, San Dimas	San Dimas EB3	Standard or Monoblock Frog (closest receiver 260 ft away)
1797+00 to 1802+00	Carrion Road at Arrow Hwy, La Verne	No nearby receivers	Standard or Monoblock Frog
1872+00 to 1883+00	Between White Avenue and Fulton Avenue, La Verne	Laverne EB 3	Standard or Monoblock Frog (closest receiver at least 200 ft away)

Table 23: Recommended Nosie and Vibration Mitigation for Crossovers			
Crossover Stationing	**Location**	**Closest Receiver**	**Recommendation**
2003+00 to 2005+00	Near Indian Hill Boulevard	Claremont WB5 and Claremont G	Monoblock Frog
2067+00 to 2071+00	Monte Vista Avenue	No nearby receivers	Standard or Monoblock Frog
2078+00 to 2081+00	Tail track east of Montclair station	No nearby receivers	Standard or Monoblock Frog
1918+00 to 1920+00 (freight track)	East of Garey Avenue	Freight crossover shifted closer to a new development	Monoblock Frog
1963+00 (freight track turnout)	East of Towne Avenue	New turnout to tie freight track into SCRRA tracks near near MFR (Pomona WB1)	Monoblock Frog
Source: ATS Consulting, 2016			

3.1.5 Mitigation of TPSS Units

Noise impact is predicted at several of the proposed TPSS sites. The following mitigation measures are recommended to mitigate noise from the TPSS units:

- Include a noise limit in the purchase specifications for TPSS units. The recommended limit is a maximum level of 50 dBA at a distance of 50 feet from any part of the TPSS unit. It may be possible to procure quieter units when necessary.
- Locate the unit within the parcel as far from the sensitive receivers as feasible. If possible, orient the cooling fans away from sensitive receivers avoiding direct line-of-sight from the cooling fans to the sensitive receivers.
- If the fans cannot be oriented away from the receivers, build an enclosure around the TPSS unit. The enclosure may consist of a shroud around the cooling fans or a wall that blocks the line-of-sight from the fans to the nearest sensitive receivers.

Table 24 shows the predicted noise level at the TPSS sites assuming the units are specified to have a sound level of 50 dBA at 50 feet. If the units meet the specification, the predicted noise level is reduced to below the noise impact threshold at all but one TPSS site where the unit would be located within 20 feet of the nearest sensitive receiver. At that site, the TPSS noise can be reduced to below the impact threshold by building an enclosure or wall blocking the line-of-sight from the fans to the sensitive receiver.

Table 24: Predicted TPSS Noise Levels With Mitigation

TPSS	Distance[1], ft	Nearest Sensitive Receiver	Estimated TPSS Noise with Spec[2], Ldn , dBA	Estimated TPSS Noise with Spec and Enclosure[3], Ldn, dBA	FTA Mod. Criteria[4], Ldn dBA
B-1 -Alt	No noise sensitive receivers near this TPSS location				
B-1	88	WB 2	52	--	57
B-2 -Alt	19	WB11	65	55	56
B-2	82	WB 11	52	--	56
B-3	No noise sensitive receivers near this TPSS location				
B-4	65	EB 1	54	--	58
B-5 -Alt	No noise sensitive receivers near this TPSS location				
B-5	90	EB 3a	51	--	58
B-6	78	WB 1	53	--	58
B-7	No noise sensitive receivers near this TPSS location				
B-8	116	EB 1	49	--	59
B-9	50	EB 3	56	--	59
B-10	No noise sensitive receivers near this TPSS location				
B-11	No noise sensitive receivers near this TPSS location				

Source: ATS Consulting, 2016
Notes:
[1]The distance in feet from the closest sensitive receiver in the cluster to the proposed TPSS location.
[2]The estimated TPSS noise level assuming the units are specified to have a noise level of 50 dBA at 50 ft
[3]The estimated TPSS noise level assuming the units are specified to have a noise level of 50 dBA at 50 ft and have an enclosure or wall that provides 10 dB of attenuation.
[4] The FTA moderate noise impact criteria, based on the existing noise level at the receiver.

3.2 Operational Vibration

The updated vibration analysis identified vibration sensitive receivers where there is potential for future vibration levels to exceed the applicable FTA vibration impact threshold. Mitigation measures that may be implemented to reduce vibration to below the FTA thresholds include:

- **Ballast Mats –** A ballast mat consists of a pad made of rubber or rubber-like material placed on the subballast with normal ballast, ties, and rail on top. The reduction in groundborne vibration provided by a ballast mat is strongly dependent on the frequency content of the vibration and the design and support of the mat. Depending on the soil properties, an asphalt or concrete layer under the ballast may be required.
- **Tire-derived aggregate –** TDA consists of a resilient layer of shredded tires or recycled rubber chips placed beneath the sub-ballast layer of standard open ballast and tie track. This mitigation method provides results similar to ballast mats and would be strongly dependent on the frequency content of the vibration.
- **Floating slab track –** The track is constructed on a concrete slab that is supported by resilient elements (either pads 2 to 6 inches thick or a continuous resilient mat). This type of track construction is very expensive and is typically used only where substantial vibration mitigation is needed.

- **Low-impact frogs-** Frogs are used in special trackwork such as turnouts and crossovers where two rails cross. At the gap where the two wheels cross, the wheels strike the end of the gap which increases noise and vibration levels. There are alternatives to typical frogs that result in lower impact forces and lower vibration level increases at receivers near special trackwork.

Table 25 presents the recommended measures to be incorporated into the design to reduce the predicted vibration levels to below the impact threshold where vibration impacts were predicted as a result of design refinements. The sections following summarize the vibration mitigation recommendations for all sensitive receiver clusters.

Table 25: Recommendations to Reduce Predicted Vibration Levels

Receiver	Recommended Mitigation Measure	Predicted Level after Mitigation	FTA Impact Threshold
Glendora WB 3a	Ballast mat/TDA[1]	67 VdB at 31.5 Hz	72 VdB
Glendora EB 8	Ballast mat/TDA	67 VdB at 31.5 Hz	72 VdB
Glendora EB B	Low impact frog and floating slab (note floating slab is primarily recommended for receiver WB 2 located closer to the tracks)	66 VdB at 31.5 Hz	75 VdB
Claremont EB4	Low impact frog	70 VdB at 50 Hz	72 VdB

[1]The predicted level without mitigation at Glendora WB 3a is equal to the impact thresholds. Further study (ie. site specific measurements) may show that vibration mitigation is not warranted.

3.2.1 Recommended LRT Vibration Mitigation

Mitigation is considered for all clusters that exceed the vibration threshold for light-rail operations. Table 26 presents the recommended vibration mitigation locations, types, and lengths. The rightmost column identifies design refinements that resulted in a change in the recommended mitigation compared to the Final EIR. Where no design refinement is identified, there has been no change in the mitigation recommendation. Changes from the Final EIR recommendations include:

- Mitigation for Glendora WB2 was changed from ballast mat/TDA to floating slab because a crossover is now located in close proximity to sensitive receivers. Note that further study at this site, such as site specific vibration propagation measurements, may show that ballast mat is a sufficient vibration mitigation measure.
- In Glendora, the LRT was shifted away from sensitive receivers. The Final EIR recommended floating slab for receivers Glendora WB 4 to 15. Because the new alignment has shifted away from the sensitive receivers in this area, the recommendation at some locations has been revised from floating slab in the Final EIR to ballast mat or TDA
- Vibration mitigation is no longer recommended for San Dimas WB1 and Pomona WB2 because the LRT was shifted away from the receivers. The predicted vibration level taking into account the alignment shift for both of these clusters is equal to the FTA impact threshold. These

receivers are recommended for further study (see Section 3.2.4) to confirm that vibration mitigation is not necessary.

Table 26: Recommended Locations for Vibration Mitigation

City	Eng. Station		Length (ft)	Mitigation Type	Clusters Mitigated	Design Refinement Resulting in Change
	Start	End				
Glendora	1430+00	1465+00	3,500	Ballast Mat/TDA	EB 1, 2, 3, 4, 5	--
Glendora	1468+00	1480+00	1,200	Ballast Mat/TDA	EB 5a	Shorter length to reflect extents of new development
Glendora	1490+00	1496+00	600[1]	Floating Slab	WB 2 B (Category 3)	Crossover relocated to this area
Glendora	1518+00	1524+50	700	Ballast Mat/TDA	WB 4; EB 6a	LRT shifted away from receivers
Glendora	1524+50	1535+00	1,050	Floating Slab	WB 5, 6	--
Glendora	1535+00	1543+75	875	Ballast Mat/TDA	WB 7; EB 7, 8	LRT shifted away from receivers
Glendora	1543+75	1550+50	650	Floating Slab	WB 8	--
Glendora	1550+50	1556+50	600	Ballast Mat/TDA	WB 9, 10	LRT shifted away from receivers
Glendora	1556+50	1561+00	450	Floating Slab	WB 11	--
Glendora	1561+00	1578+50	1750	Ballast Mat/TDA	WB 12, 13, 14, 15	LRT shifted away from receivers
Glendora	1578+50	1584+00	550	Floating Slab	Crossover by WB 15, 16	--
Glendora	1584+00	1601+50	1750	Ballast Mat/TDA	WB 16, 17, 18; EB 9	--
Glendora	1612+00	1632+500	2,050	Ballast Mat/TDA	WB 19-20, EB 11	--
Total Length Glendora (ft)			15,725			
San Dimas	1683+00	1689+00	600	Floating Slab	EB 1	--
Total Length San Dimas (ft)			600			
La Verne	1846+50	1848+00	150	Ballast Mat/TDA	F (Category 3)	--
Total Length La Verne (ft)			150			
Claremont	1975+00	1980+00	500	Ballast Mat/TDA	WB 3	--
Claremont	1987+00	1997+00	1000	Ballast Mat/TDA	WB 5	--
Claremont	2047+00	2050+00	300	Ballast Mat/TDA	WB 6	--

Total Length Claremont (ft)	1,800
Total Ballast Mat/TDA (all cities):	14,325
Total Floating Slab (all cities):	3,900

Source: ATS Consulting, 2016
Notes: It is assumed that mitigation will be placed under both near and far tracks.
The "design refinement resulting in change" column identifies mitigation recommendations that represent a change from the 2013 Final EIR recommendations.
[1]Floating slab is recommended to extend for 50 feet on either side of the frog. A continuous floating slab for the entire length is not necessary.

3.2.2 Recommended Metrolink Vibration Mitigation

The Final EIR also included vibration mitigation recommendations from the relocation of the Metrolink tracks in Claremont. There is no change to the vibration mitigation recommendations in the 2013 Final EIR for the Metrolink tracks as a result of the design refinements assessed in this memorandum.

3.2.3 Low impact frogs

Low-impact frogs can be used to reduce noise and vibration from special trackwork. The different options for low-impact frogs are described in detail in Appendix B: Background information on Frogs. The monoblock frog is recommended as a vibration mitigation measure at the same locations as for the noise assessment. The locations where monoblock frogs are recommended are presented in Table 23.

3.2.4 Vibration Impacts Recommended for Further Study

As in the Final EIR, some of the predicted vibration impacts are recommended for further study where (1) there is residual vibration impact even with mitigation and (2) the predicted vibration level without mitigation is equal to or exceeds the vibration impact threshold by 1 decibel. The 2013 Final EIR recommends that the vibration recommendations at these locations be revisited during final design to ensure that the appropriate level of vibration mitigation is applied.

This analysis does not include the further study recommended in the Final EIR, but only updates the predicted levels based on changes in the alignment or crossover locations. Table 27 lists the sensitive receiver clusters that are recommended for further study, and the current predicted vibration level. Further study could include site specific vibration propagation tests to refine assumptions and/or assessment of alternative mitigation measures, such as thicker ballast mat or sound walls with a large foundation that may provide the necessary vibration reduction without resorting to a floating slab.

Table 27: Vibration Impacts Recommended for Further Study

City	Cluster	Distance (ft)	Mitigation Type	Predicted Level[1]
Glendora	WB 3a	78	None	72 VdB at 31.5 Hz
Glendora	WB 4	34	Ballast Mat/TDA	73 VdB at 31.5 Hz
Glendora	WB 7	40	Ballast Mat/TDA	73 VdB at 31.5 Hz
Glendora	WB 9	41	Ballast Mat/TDA	73 VdB at 31.5 Hz
Glendora	WB 13	42	Ballast Mat/TDA	73 VdB at 31.5 Hz
Glendora	WB 14	42	Ballast Mat/TDA	73 VdB at 31.5 Hz
Glendora	WB 17	42	Ballast Mat/TDA	72 VdB at 31.5 Hz
Glendora	WB 18	41	Ballast Mat/TDA	72 VdB at 31.5 Hz

Glendora	EB 12	91	None	72 VdB at 31.5 Hz
San Dimas	WB 1	53	None	72 VdB at 31.5 Hz
San Dimas	EB 1	14	Floating Slab	79 VdB at 31.5 Hz
Pomona	WB 2	64	None	72 VdB at 31.5 Hz

Source: ATS Consulting 2016

[1]The predicted level with the reduction from the mitigation type listed is included.

APPENDIX A: FUNDAMENTAL CONCEPTS OF NOISE AND VIBRATION

Noise Fundamentals

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise is generally defined as unwanted or excessive sound. Sound can vary in intensity by over one million times within the range of human hearing. Therefore, a logarithmic scale, known as the decibel scale (dB), is used to quantify sound intensity and compress the scale to a more convenient range. Another advantage of the decibel scale is that human hearing is approximately logarithmic.

Sound is characterized by both its amplitude and frequency (or pitch). The human ear does not hear all frequencies equally. In particular, the ear deemphasizes low and very high frequencies. To better approximate the sensitivity of human hearing, the A-weighted decibel scale has been developed. A-weighted decibels are abbreviated as "dBA." On this scale, the human range of hearing extends from approximately 3 dBA to around 140 dBA. As a point of reference, Figure 1 includes examples of A-weighted sound levels from common indoor and outdoor sounds.

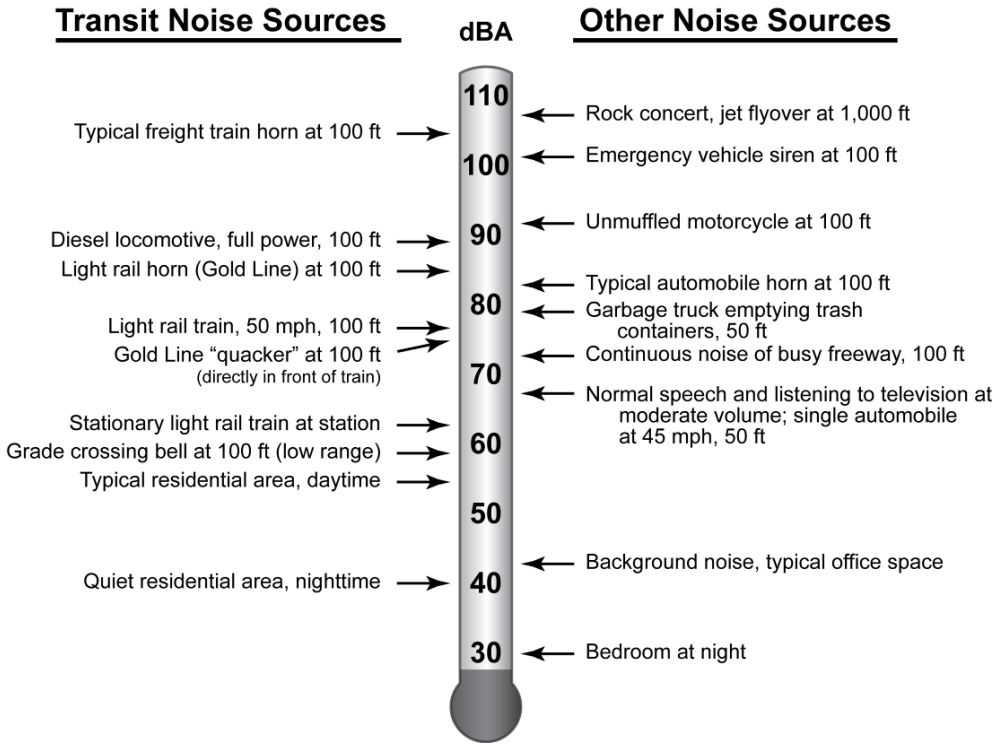

Figure 1: Typical Indoor and Outdoor Noise Levels

Using the decibel scale, sound levels from two or more sources cannot be directly added together to determine the overall sound level. Rather, the combination of two sounds at the same level yields an increase of 3 dB. The smallest recognizable change in sound level is approximately 1 dB. A 3-dB increase in the A-Weighted sound level is generally considered perceptible, whereas a 5-dB increase is readily perceptible. A 10-dB increase is judged by most people as an approximate doubling of the perceived loudness.

The two primary factors that reduce levels of environmental sounds are increasing the distance between the sound source and the receiver and having intervening obstacles such as walls, buildings, or terrain features that block the direct path between the sound source and the receiver. Factors that act to make environmental sounds louder include moving the sound source closer to the receiver, sound enhancements caused by reflections, and focusing caused by various meteorological conditions.

Following are brief definitions of the measures of environmental noise used in this study:

- *Maximum Sound Level (L_{max}):* L_{max} is the maximum sound level that occurs during an event such as a train passing. For this analysis L_{max} is defined as the maximum sound level using the slow setting on a standard sound level meter.
- *Equivalent Sound Level (L_{eq}):* Environmental sound fluctuates constantly. The equivalent sound level (L_{eq}) is the most common means of characterizing community noise. L_{eq} represents a constant sound that, over a specified period of time, has the same sound energy as the time-varying sound. L_{eq} is used by the FTA to evaluate noise effects at institutional land uses, such as schools, churches, and libraries, from proposed transit projects.
- *Day-Night Sound Level (L_{dn}):* L_{dn} is basically a 24-hour L_{eq} with an adjustment to reflect the greater sensitivity of most people to nighttime noise. The adjustment is a 10 dB penalty for all sound that occurs between the hours of 10:00 p.m. to 7:00 a.m. The effect of the penalty is that, when calculating L_{dn}, any event that occurs during the nighttime is equivalent to ten occurrences of the same event during the daytime. L_{dn} is the most common measure of total community noise over a 24-hour period and is used by the FTA to evaluate residential noise effects from proposed transit projects.
- *L_{XX}:* This is the percent of time a sound level is exceeded during the measurement period. For example, the L_{99} is the sound level exceeded during 99 percent of the measurement period. For a 1-hour period, L_{99} is the sound level exceeded for all except 36 seconds of the hour. The tables of the hourly noise levels in Appendix B include L_1, L_{33}, L_{50}, and L_{99}, the sound levels exceeded 1 percent, 33 percent, 50 percent and 99 percent of the hour. L_1 represents typical maximum sound levels, L_{33} is approximately equal to L_{eq} when free-flowing traffic is the dominant noise source, L_{50} is the median sound level, and L_{99} is close to the minimum sound level.
- *Sound Exposure Level (SEL):* SEL is a measure of the acoustic energy of an event such as a train passing. In essence, the acoustic energy of the event is compressed into a 1-second period. SEL increases as the sound level of the event increases and as the duration of the event increases. It is often used as an intermediate value in calculating overall metrics such as L_{eq} and L_{dn}.
- *Sound Transmission Class (STC):* STC ratings are used to compare the sound insulating effectiveness of different types of noise barriers, including windows, walls, etc. Although the amount of attenuation varies with frequency, the STC rating provides a rough estimate of the transmission loss from a particular window or wall.

Vibration Fundamentals

One potential community effect from the proposed project is vibration that is transmitted from the tracks through the ground to nearby buildings. This is referred to as *groundborne vibration*. When evaluating human response, groundborne vibration is usually expressed in terms of decibels using the root mean square (RMS) vibration velocity. RMS is defined as the average of the squared amplitude of the vibration

signal. To avoid confusion with sound decibels, the abbreviation VdB is used for vibration decibels. All vibration decibels in this report use a decibel reference of 1 micro-inch/second (µin/sec.).[*] The potential adverse effects of rail transit groundborne vibration are:

- **Perceptible Building Vibration:** This is when building occupants feel the vibration of the floor or other building surfaces. Experience has shown that the threshold of human perception is around 65 VdB and that vibration that exceeds 75 to 80 VdB may be intrusive and annoying to building occupants.
- **Rattle:** The building vibration can cause rattling of items on shelves and hanging on walls, and various different rattle and buzzing noises from windows and doors.
- **Reradiated Noise:** The vibration of room surfaces radiates sound waves that may be audible to humans. This is referred to as *groundborne noise*. When audible groundborne noise occurs, it sounds like a low-frequency rumble. For a surface rail system such as the proposed build alternatives, the groundborne noise is usually masked by the normal airborne noise radiated from the transit vehicle and the rails.
- **Damage to Building Structures:** Although it is conceivable that vibration from a light-rail system could cause damage to fragile buildings, the vibration from light-rail transit systems is usually one to two orders of magnitude below the most restrictive thresholds for preventing building damage. Hence the vibration impact criteria focus on human annoyance, which occurs at much lower amplitudes than does building damage.

Vibration is an oscillatory motion that can be described in terms of the displacement, velocity, or acceleration of the motion. The response of humans to vibration is very complex. However, the general consensus is that for the vibration frequencies generated by passenger trains, human response is best approximated by the vibration velocity level. Therefore, vibration velocity has been used in this study to describe train-generated vibration levels.

Figure 2 shows typical vibration levels from rail and non-rail sources as well as the human and structure response to such levels.

[*] One µin/sec= 10^{-6} in/sec.

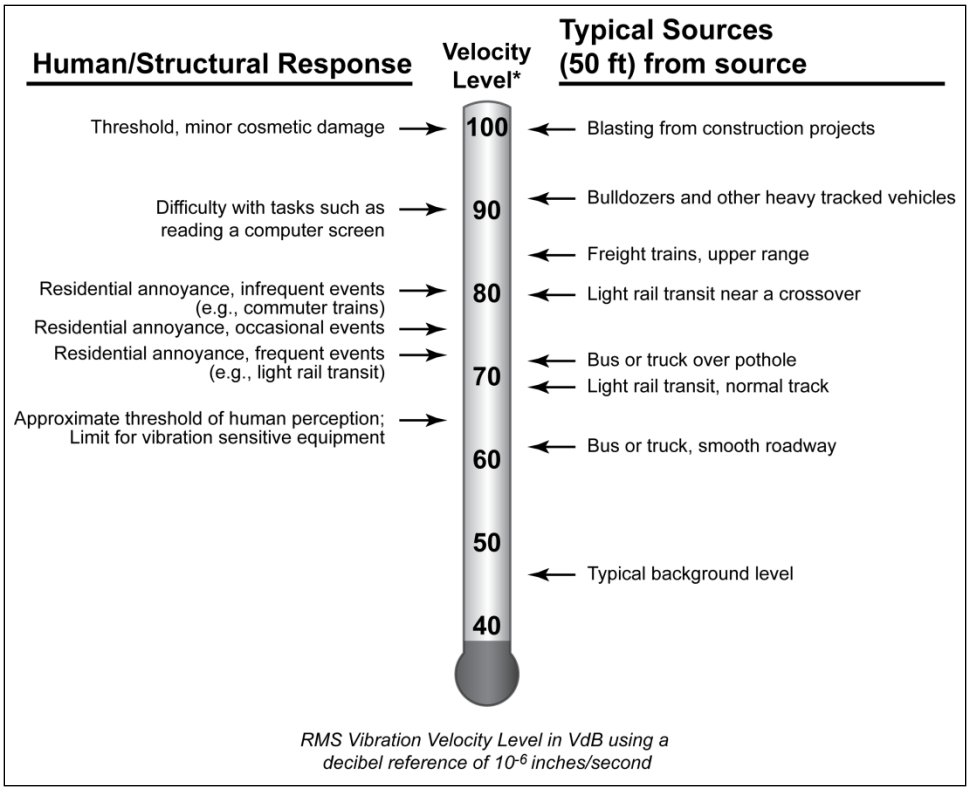

Figure 2: Typical Vibration Levels

Although there has been relatively little research into human and building response to groundborne vibration, there is substantial experience with vibration from rail systems. In general, the collective experience indicates that:

- It is rare that groundborne vibration from transit systems results in building damage, even minor cosmetic damage. The primary consideration therefore is whether vibration will be intrusive to building occupants or will interfere with interior activities or machinery.
- The threshold for human perception is approximately 65 VdB. Vibration levels in the range of 70 to 75 VdB are often noticeable but acceptable. Beyond 80 VdB, vibration levels are often considered unacceptable.
- For human annoyance, there is a relationship between the number of daily events and the degree of annoyance caused by groundborne vibration. The FTA Guidance Manual includes an 8 VdB higher impact threshold if there are fewer than 30 events per day and a 3 VdB higher threshold if there are fewer than 70 events per day.

Often it is necessary to determine the contribution at different frequencies when evaluating vibration or noise signals. The 1/3-octave band spectrum is the most common procedure used to evaluate frequency components of acoustic signals. The term “octave” has been borrowed from music where it refers to a span of eight notes. The ratio of the highest frequency to the lowest frequency in an octave is 2:1. For a 1/3-octave band spectrum, each octave is divided into three bands where the ratio of the lowest frequency to the highest frequency in each 1/3-octave band is $2^{1/3}$:1 (1.26:1). An octave consists of three 1/3 octaves.

The 1/3-octave band spectrum of a signal is obtained by passing the signal through a bank of filters. Each filter excludes all components except those that are between the upper and lower range of one 1/3-octave band. The FTA Guidance Manual is a good reference for additional information on transit noise and vibration and the technical terms used in this section.

APPENDIX B: BACKGROUND INFORMATION ON FROGS

Following is a discussion of the different frogs that can be installed at crossovers and turnouts. Table 28 presents a summary of the expected increase in noise or vibration levels for each option compared to continuously welded rail. All options besides the RBM frog are "low-impact frogs" and provide noise and vibration benefit compared to the standard RBM frog.

The frog recommended as a mitigation measure is the monoblock frog. Compared to other frogs that provide a greater reduction in vibration levels (such as a moveable point frog), the monoblock frog is less expensive, easier to maintain, and is expected to increase the lifespan of the frog.

Rail-Bound Manganese (RBM) frogs:

RBM frogs are assumed as the "standard frog" in the vibration predictions. The RBM frog was designed for main line freight track but is often used on transit systems. Impacts as wheels cross the gap in the rail and when wheels hit the frog point typically increase vibration levels by 10 VdB.

Monoblock frogs:

Monoblock frogs are basically milled out of a single block of steel eliminating all rail joints and creating a smoother running surface. Based on informal measurements that ATS performed at the PATH commuter rail system in New Jersey, it appears that the increase in vibration levels with a good-condition monoblock frog is about half of that with a standard RBM frog (a 5 dB reduction in vibration level). To further smooth the running surface, monoblock frogs should be designed with a conformal top to match the profile of the wheels. A conformal top frog, as opposed to a flat-top frog, has material removed from the top of the frog to match the wheel profile. A monoblock frog with a conformal top is expected to increase the lifespan of the frog, as well as reduce noise and vibration levels.

Flange-bearing frogs:

Flange-bearing frogs have ramps that are designed to transfer the load from the wheel tread to the wheel flange with lower impact forces than traditional RBM frogs. A low-impact flange bearing frog should have a minimum ramp length of two feet to provide a smooth transition of the load from tread to flange. The increase in vibration levels from a low-impact flange-bearing frog is about half of that of a standard RBM frog (a 5 dB reduction in vibration level). A drawback of the flange-bearing frogs is that transit design standards suggest the ramp ratio should be no steeper than 1 divided by twice the design speed in kilometers per hour.[*] For a design speed of 40 kph, the ramp ratio should be no steeper than 1/80, or a 1.25% slope.

One-way low speed (OWL) Frogs:

OWL frogs are designed for use when traffic in the diverting direction is infrequent and low-speed, such as emergency turnouts or infrequently used storage tracks. Most OWL designs are flange bearing in the diverting direction and have no break in the rail in the mainline direction. These are often referred to as "jump frogs" because in the diverting direction the wheels are lifted up and over the rail with some form of flange bearing ramps. Because the rail is solid in the main line direction, there would be little or no increase in noise or vibration. However, the drawbacks of the OWL frogs are the low-speed required for the diverting direction and the ability to implement safe signaling at those speeds. OWL frogs are not recommended for turnouts or crossovers that are used frequently.

[*] http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_155.pdf

Spring rail or moveable point frogs:

Spring rail and moveable point frogs have a moveable wing rail held against the point rail by springs. These frogs are expensive and difficult to maintain, but they result in only a marginal increase in vibration levels compared to standard track, which is an 8 to 10 decibel reduction compared to standard RBM frogs.

Table 28: Summary of Low-Impact Frogs

Frog type	Description	Increase in Noise Levels[1]	Increase in Vibration Levels[1]
RBM frog	Standard frog	+6	+10
Monoblock frog	Monoblock frogs are milled out of a single piece of steel eliminating all rail joints and creating a smoother running surface which leads to lower noise and vibration levels. The smoother running surface also has maintenance benefits.	+3	+5
Flange-bearing frog	These frogs have ramps that are designed to transfer the load from the wheel tread to the wheel flange with lower impact forces than traditional RBM frogs, which leads to lower noise and vibration levels.	+3	+5
One-way low speed frog	OWL frogs have no break in the rail in the mainline direction; in the diverting direction the wheels are lifted up and over the rail with some form of flange bearing ramps.	+0	+0
Spring rail or moveable point frog	These frogs have a moveable wing rail held against the point rail by springs. Their moving parts make these frogs expensive and difficult to maintain; however, they provide the most noise and vibration benefit of the low-impact frog types.	+0	+0

[1]The increase in noise or vibration level compared with standard continuously welded rail. The noise and vibration predictions without mitigation assume a standard RBM frog at all turnouts and crossovers.