REDLANDS
PASSENGER RAIL PROJECT
Noise Technical Memorandum
In the Cities of San Bernardino, Loma Linda, and Redlands, San Bernardino County, California

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Acronyms and Abbreviations

BNSF	Burlington Northern Santa Fe
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CNEL	community noise equivalent level
CPUC	California Public Utility Commission
dB	decibel
dBA	A-weighted decibels
DEIS/DEIR	Draft Environmental impact Statement/Environmental Impact Report
DSBPRP or Project	Downtown San Bernardino Passenger Rail Project
EIS	environmental impact statement
EMF	Eastern Maintenance Facility
EPA	U.S. Environmental Protection Agency
FA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FTA	Federal Transit Administration
I-10	Interstate 10
IEMF	Inland Empire Maintenance Facility
Ldn	day-night average sound level
Leq	equivalent noise level
Leq[h]	hourly equivalent sound level
MP	mile post
NEPA	National Environmental Policy Act
OSHA	Occupational Safety and Health Administration
PPV	peak particle velocity
RMS	Root mean square
RMS	root-mean-square
ROW	right-of-way
RPRP or Project	Redlands Passenger Rail Project

SBD	San Bernardino International Airport
SEL	sound exposure level
TNM	Traffic Noise Model
USC	United States Code
VdB	velocity in decibels

EXECUTIVE SUMMARY

As part of the Redlands Passenger Rail Project (RPRP or Project), San Bernardino Associated Governments (SANBAG) is proposing the development of commuter rail service between the City of San Bernardino and the City of Redlands in San Bernardino County (please see Figure ES-1). The noise analysis considered two build alternatives and three design options for the RPRP, as described in Chapter 2, Alternatives Considered of the Draft Environmental Impact Statement/Environmental Impact Report (DEIS/DEIR). The alternatives and design options considered include the Preferred Project (Alternative 2), the Reduced Project Footprint (Alternative 3), the Train Layover Facility at Waterman Ave. (Design Option 1), and the Use of Existing Train Layover Facilities (Design Option 2). The build alternatives would include the replacement of rail infrastructure along a 9-mile section of railroad owned by SANBAG and part of the former Atchison, Topeka, and Santa Fe (ATSF) Railroad's Redlands Subdivision, commonly referred to as the "Redlands Spur." Each of the build alternatives would include passenger rail operations along the existing rail corridor, with stops at five locations. Two of the five stops proposed would be located at E St. and Tippecanoe Ave. in the City of Bernardino, and the remaining three stops would be located within the City of Redlands at New York St., Orange St. (Downtown Redlands), and University St. (University of Redlands). Each of the build alternatives would also include track and subgrade improvements, rail station improvements, and improvements to existing bridge structures and at-grade highway-rail crossings. A train layover facility is also proposed as part of the Project, and the design options considered provide for flexibility in the location of this facility. This report presents the results of the noise and vibration analysis conducted for the Project, along with background information and a discussion of methodology.

NOISE AND VIBRATION STUDY METHODOLOGY

The study methodology followed the guidelines contained in the Federal Transit Administration's (FTA's) *Transit Noise and Vibration Impact Assessment* manual (May 2006). As part of the process, the following steps were carried out: Noise- and vibration-sensitive receivers in the vicinity were inventoried, noise measurements were conducted at representative sites, a noise/vibration impact assessment was conducted using FTA impact criteria, and mitigation measures were developed for evaluation by project sponsors and FTA.

The Project would result in noise and vibration impacts during the operational and construction phases, as detailed below.

OPERATIONAL NOISE

A detailed noise assessment was conducted using the guidance in Chapter 6 of the FTA manual. Noise from proposed rail operations was analyzed, as were changes in traffic noise levels on roadways in the vicinity (as a result of trips to and from the four proposed stations).

Rail Noise. Rail noise sources include locomotives (including horn noise near crossings) and railcars as well as crossing signals. Potential noise impacts from the four station parking areas were also evaluated using the guidance in Chapter 5 of the FTA manual. Three levels of noise impact are utilized in this assessment: severe impact, moderate impact, and no impact (consistent with FTA Manual determinations). Specific details regarding the determination of impact as well as noise terminology and noise metrics are provided in the body of this report and Appendix A.

Severe and moderate impacts from rail operations were predicted to occur at 43 of the 72 modeled representative receivers in the vicinity of the project improvements, as identified below by project segment. Of the 43 receivers found to have noise impacts, 22 are categorized as severe impact and 21 are categorized as moderate impact.

E St. to southeast of Sierra Way. Severe impacts are predicted to occur at four receivers, representative of a total of 13 residential (Category 2) land uses. Moderate impacts are predicted to occur at two receivers representative of 32 residential land uses.

Southeast of Sierra Way to southeast of South Waterman Ave. Severe impacts are predicted to occur at nine receivers, representative of 21 residential land uses. Moderate impacts are predicted to occur at five receivers representative of 10 residential land uses.

Southeast of South Waterman Ave. to Bryn Mawr Ave. Severe impacts are predicted to occur at five receivers, representative of 33 residential land uses in the area. Moderate impacts from project-related rail noise are predicted to occur at four receivers, representative of 32 residential land uses.

Bryn Mawr Ave. to east of Texas St. Severe impacts are predicted to occur at one receiver, representative of one Category 2 (hotel/motel) land use. Moderate impacts are predicted to occur at two receivers, representative of seven Category 2 land uses.

East of Texas St. to east of North University St. Severe impacts are predicted to occur at three receivers, representative of 15 Category 2 land uses. Moderate impacts are predicted to occur at five receivers, representative of 29 residential land uses. Moderate impacts from project-related rail noise are predicted to occur at three receivers, representative of three Category 3 land uses (a church, a park, and a school (University of Redlands).

Traffic Noise. Traffic noise associated with the proposed Project was assessed using the Federal Highway Administration's Traffic Noise Model, version 2.5. Traffic volumes, identified in the project traffic analysis (HDR 2013), were used to estimate traffic noise levels at noise-sensitive receivers in the area for the following scenarios:

- Existing.
- Future Year 2018 project-only traffic.
- Future Year 2038 project-only traffic.

Project-related noise levels were then assessed for potential impacts using the same impact criteria as that used for rail noise. None of the representative modeled receivers were predicted to experience an increase in traffic noise equating to severe impact. No mitigation is required.

Rail Station Parking Lot Noise. Noise from the parking lots associated with the five proposed rail stations was evaluated using the screening methodology recommended in the FTA manual. It was determined that the nearest noise-sensitive receivers are beyond the screening distances (ranging from 50 feet at the University St. station to 325 feet at the E St. station) for potential noise impacts from any of the proposed parking lots. No mitigation is required.

Layover Facility Noise. Noise from the Project's proposed layover facility was evaluated using the screening methodology recommended in the FTA manual. It was determined that the nearest noise-sensitive land uses are outside the adjusted screening distance for the layover facility under any of the proposed alternatives. Therefore, there would be no impact. No mitigation is required.

Operational Vibration

Operation of the Project would result in ground-borne vibration along the alignment. Effects are predicted to occur at eight receivers, representative of a total of 23 residential or transient residential land uses in the area. No ground borne noise effects are predicted from the Project (throughout the alignment).

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Figure ES-1
RPRP Study Area
Redlands Passenger Rail Project

Also, no project-related vibration effects are predicted at Category 3 land uses along the entire alignment. The ground-borne vibration effects at the residential land uses would be adverse. With the implementation of mitigation measures (resiliently supported ties or ballast mats), operational vibration levels would be minimized to no-effect levels. No residual ground-borne noise effects are predicted to result from the Project.

Construction Noise

After noise levels from construction activities were estimated, impacts were predicted to occur at all sensitive land uses along the project alignment at distances of up to approximately 325 feet under daytime impact criteria and approximately 500 feet under nighttime impact criteria. The construction noise impact is considered severe. However, implementation of mitigation measures (including limiting construction hours to the extent practicable, using available noise suppression devices and techniques such as “quiet” models of air compressors and other stationary noise sources, temporary sound barriers or enclosures, etc.) would minimize this effect to a moderate impact or lower.

Construction Vibration

The vibration levels from construction activities were estimated, and FTA construction vibration damage thresholds were not exceeded at any of the representative receiver locations. However, FTA construction annoyance criteria were exceeded at representative receivers as far as 100 feet from the alignment (as measured from rail centerline). Implementation of a community awareness program as a mitigation measure would reduce this effect such that no residual effect would occur.

Operational and Construction Vibration at Historic Properties

The potential for damage to adjacent architectural resources from project-related vibration was investigated, in addition to the modeled noise- and vibration-sensitive receivers. The historic Redlands Depot, along with three other National Register–eligible or –listed buildings, is located adjacent to the proposed alignment and, thus, is subject to potential vibration effects.

Given the conservative assumptions used for the analysis, there is the potential for vibration damage to the Depot (and, by extension, the other three historic structures) because of the potential closeness of the work (5 feet or less from the structure). At 5 feet, the predicted vibration levels from a loaded truck or a large bulldozer would substantially exceed the threshold for potential damage to fragile historic buildings during construction and would have an effect. Operational vibration levels would not exceed the criteria threshold and would have no effect.

Mitigation Measures

Pursuant to FTA requirements, mitigation of moderate or severe noise impacts was considered using the recommendations contained in Section 6.8 of the FTA manual and pertinent site information.

The measures below could be implemented to reduce rail noise and vibration impacts.

Mitigation Measure NV-1: Establish Quiet Zones

At-grade crossings shall be designed and constructed to be compatible with the formation of Quiet Zones. Prior to the Project’s operation, SANBAG shall coordinate and assist the Cities of San Bernardino, Loma Linda, and Redlands in establishing quiet zones at the following 12 grade crossings: South Arrowhead Ave., South Sierra Way, West Central Ave., East Orange Show Rd., South Waterman Ave., South Tippecanoe Ave., South Richardson St., Mountain View Ave., West Colton Ave., Tennessee St., Church St., and North University St. Following implementation of the Quiet Zones, residual effects (moderate or severe impacts) would remain.

Mitigation Measure NV-2: Construct Sound Barriers

Sound barriers will be constructed along portions of the rail alignment to reduce noise levels at receivers with moderate or severe noise impacts.

Mitigation Measure NV-3: Wayside Rail Lubrication

Wayside applicators will be installed for all tight-radius curves (curves of less than a 1,000 foot radius) on the project alignment. If the wayside applicators are not able to reduce squeal to an acceptable level, additional reduction may be possible through customized profiling of the rail to reduce the forces required for trains to negotiate the curve.

Mitigation Measure NV-4: Use Ballast Mats, Resiliently Supported Ties, or Measures of Comparable Effectiveness on Portions of the Rail near Sensitive Receivers

The project design team will ensure the track design specifications include the use of ballast mats or resiliently supported ties on portions of the track near sensitive receivers to minimize project-related ground-borne vibration generated when the trains pass sensitive receivers.

Mitigation Measure NV-5: Employ Noise-Reducing Measures during Construction

The project sponsor will require its construction contractors to employ measures to minimize and reduce construction noise. Measures that will be implemented to reduce construction noise to acceptable levels include the following:

- Comply with local noise regulations and limit construction hours to the extent practicable (i.e., between the hours of 7 a.m. and 8 p.m.).
- Use available noise suppression devices and techniques, including:
  - Equipping all internal combustion engine-driven equipment with mufflers, air-inlet silencers, and any other shrouds, shields, or other noise-reducing features that are in good operating condition and appropriate for the equipment (5- to 10-decibel reduction possible).
  - Using “quiet” models of air compressors and other stationary noise sources where such technology exists.
  - Using electrically powered equipment instead of pneumatic or internal combustion-powered equipment, where feasible.
  - Using noise-producing signals, including horns, whistles, alarms, and bells, for safety-warning purposes only.
  - Locating stationary noise-generating equipment, construction parking, and maintenance areas as far as reasonable from sensitive receivers when sensitive receivers adjoin or are near the construction project area of potential effects.
  - Prohibiting unnecessary idling of internal combustion engines (i.e., in excess of 5 minutes).
  - Placing temporary sound barriers or enclosures around stationary noise-generating equipment when located near noise-sensitive areas (5- to 15-decibel reduction possible).
  - Ensuring that project-related public address or music systems are not audible at any adjacent receiver.
  - Notifying adjacent residents in advance of construction work.

Mitigation Measure NV-6: Prepare a Community Awareness Program for Project Construction

In consultation with the representatives of the neighboring cities, the construction contractor will prepare and maintain a program to enhance community awareness of project construction issues, including noise, vibration, nighttime noise, nighttime lighting, and roadway closures. Initial information packets will be prepared and mailed to all residences within a 500-foot radius of project construction, with updates prepared as necessary to indicate new scheduling or processes. A project liaison will be identified who will be available to respond to community concerns regarding noise, vibration, and light.

Mitigation Measure NV-7: Structural Evaluation of Historic Properties

To determine the structural stability of historic properties adjacent to the rail alignment (including Redlands Depot), structural evaluations will be prepared by a qualified engineer for the four buildings prior to the commencement of construction. Qualified recommendations within the structural evaluation will be adhered to, as appropriate.

1.0 OVERVIEW

This technical noise and vibration report describes the analysis approach, existing noise and vibration conditions, and the impact assessment and mitigation measures for the Redlands Passenger Rail Project (RPRP or Project). Noise-sensitive receivers in the project area include residential land uses, transient residential/commercial land uses (motels), schools and a university, a church, and parks.

1.1 PROJECT DESCRIPTION

The following project description information has been summarized from the Draft Environmental impact Statement/Environmental Impact Report (DEIS/DEIR) for the Project (Chapter 2.0, Alternatives Considered). For more detail, please refer to that document.

The RPRP would involve the implementation of necessary improvements to facilitate commuter rail service between E St. in the City of San Bernardino and the University of Redlands in the City of Redlands (Figures 1-1 and 1-2). The five station stops proposed in conjunction with the RPRP would be located at E St. and Tippecanoe Ave. within the City of San Bernardino and New York St., Orange St. (Downtown Redlands), and University St. (University of Redlands) within the City of Redlands. As part of the Preferred Project, maintenance activities would be performed at a new layover facility proposed west of California St. and south of Interstate 10 (I-10) in the City of Redlands, just north of the Loma Linda city limits.

Local rail service would be provided by up to two trainsets composed of up to two cars and one locomotive shuttling between the University of Redlands and San Bernardino on 30-minute headways during the peak morning and evening periods and on 1-hour headways during off-peak hours and weekends. Up to two Metrolink express trains would also run westbound in the AM peak period and eastbound in the PM peak period, originating/terminating at the Downtown Redlands Station, These trains will be composed of a typical Metrolink trainset. With the exception of the express train, daily operations would not interline with Metrolink's Los Angeles Union Station line (Metrolink San Bernardino line) or Inland Empire to Orange County line (Metrolink IEOC line). Rather, the RPRP would interface with Metrolink's IEOC and San Bernardino lines at E St. to facilitate commuter rail service farther west into Los Angeles.

Project components would include the following with construction planned to start in 2015:

Track Improvements. Proposed track improvements would require demolition and replacement of the existing track from E St. in San Bernardino to Cook St. in Redlands. Existing ballast and sub-grade materials would be reused to the extent possible and may serve as fill material to raise the site of the proposed layover facility. The track improvements would include the installation of new continuously welded rail on concrete ties and new ballast and sub-ballast sections throughout the rail corridor. Several drainage facility improvements would also be necessary to accommodate the track improvements, bridge replacements, station improvements, and the layover facility.

Rail Station Improvements. The proposed station improvements would include the installation of new station boarding platforms, ticket vending machines, a shade canopy with some seating, accessible walkways to the public right-of-way (ROW) or parking area, lighting, and parking area(s).

Structural Crossings and Bridges. The Project would require replacement or retrofitting of up to six existing structural crossings to facilitate the loading requirements of the passenger and freight trains and the track foundation. Five of the six structural crossings would consist of existing bridge structures at water crossings, including Warm Creek, Twin Creek, SAR, Bryn Mawr Ave., and Mill Creek Zanja. The proposed bridge replacements could include the installation of new concrete aprons, new parapet walls, infill walls, concrete abutments, and/or placement of new concrete foundations.

Roadway Grade Crossing Improvements. The Project would include upgraded safety improvements at 21 of the existing at-grade crossings and closure of six at-grade crossings along the corridor. Safety improvements would be implemented in accordance with California Public Utility Commission (CPUC) General Orders; crossings would be redesigned to include raised medians, widened sidewalks, traffic striping, flashing lights, pedestrian gate arms, and swing gates where appropriate or where requested by the CPUC.

Parcel Acquisitions and Temporary Construction Easements. Acquisition of additional ROW along the constrained sections of the existing railroad ROW would be required for the Project. Additional Temporary Construction Easements (TCEs) would also be required.

Train Layover Facility. The Project would require the development of a new train layover facility, with tracks for light maintenance activities and operational activities, including an area for storing trains outside of operating hours. Other facilities would include offices, training rooms, and a crew break room. The estimated total building square footage at the facility would be approximately 3,000 square feet.

Utility Replacement and Relocation. Storm drains, sewer lines, water lines, under drains, railroad signal houses, street lights, power poles and conductors, telephone and/or fiber optic communications lines, commercial billboards, and an oil line would require replacement, relocation, or extension, as necessary, to accommodate the proposed track improvements.

Drainage Improvements. Several drainage facility improvements would be necessary to accommodate the track improvements, bridge replacements, station improvements, and layover facility. It is anticipated that the majority of the storm drain facilities would be protected in place and would not need to be lowered to meet minimum depth requirements. Most of the existing culverts under the tracks would be reconstructed as part of the Project; some existing facilities that were constructed by other agencies would also need to be reconstructed. New drainage facilities would also be added to improve drainage of the railroad ROW.

To ensure the structural integrity of the track improvements along sections of Mission Zanja Channel, bank stabilization improvements (e.g., armoring) would be required on the northern bank of the channel, from MP 3.6 to MP 6.1, so it would be able to support the additional loading requirements and withstand scour during high-flow events. Additional armoring and excavation is proposed along the planned abutment embankment at Bridge 3.4 to maintain channel capacity within the existing floodway.

Rail Operations. The Project would incorporate previously owned passenger rail vehicles and start operations in early 2018. At this time, for purposes of analysis, SANBAG is considering the use of a MP36- or F59-type locomotive; the locomotives purchased by SANBAG for the Project will meet Tier 4 requirements. As mentioned previously, trains will operate every 30 minutes in the peak periods and every hour in the off-peak period. This will translate to 25 daily round trips on average along the alignment during weekdays.

Maintenance. Typical railroad maintenance would be required during the operational phase of the Project, including routine maintenance for the tracks and ties, grade crossings, and signal system. Vegetation management and weed abatement would be required along the railroad ROW. Each station would require routine landscaping and facility maintenance (e.g., replacement light fixtures, cleaning, etc.). Routine vehicle inspection and light repairs would be performed at the proposed train layover facility.

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Figure 1-1
Regional Vicinity Map
Redlands Passenger Rail Project

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ICF INTERNATIONAL

Figure 1-2
RPRP Study Area
Redlands Passenger Rail Project

1.2 ALTERNATIVES CONSIDERED

The following sections describe the alternatives and design options considered for the Project, including the No Project/Action Alternative required by the California Environmental Quality Act (CEQA) Section 15126.6 and the National Environmental Policy Act (NEPA).

1.2.1 Alternative 1 – No Build

The No Project Alternative, as required by CEQA, and the No Action Alternative, as required by NEPA, are analyzed as a single No Build Alternative (Alternative 1) to the Preferred Project. Under the No Build Alternative, SANBAG would not implement the Preferred Project, and the proposed improvements to the approximately 9-mile Redlands Corridor would not occur. Specifically, passenger rail service would not be extended from San Bernardino east to the University of Redlands. Additionally, the No Build Alternative would not include 1) improvements to or reconstruction of rail infrastructure to accommodate passenger rail service, 2) roadway closures, 3) rail station improvements, or 4) a train layover facility. Existing conditions within the rail corridor would remain unchanged, and the rail line east of E St. would continue to be used for low-speed, local freight service. This alternative assumes the continuation of existing modes of transportation with no corresponding potential for passenger rail service along the rail corridor.

Under the No Build Alternative, SANBAG would still be required to perform regularly scheduled maintenance on the existing track and corresponding improvements at grade crossings and bridges to facilitate continued freight service per SANBAG's obligations with Burlington Northern Santa Fe (BNSF). As a result, the No Build Alternative assumes that some renovation and rehabilitation projects will be required within the next 10 years to facilitate continued freight operations. These maintenance improvements will occur along the existing track alignment and may extend throughout the railroad corridor to Redlands. This will include maintenance of existing bridges, including Bridges 1.1 (Historic Warm Creek), 2.2 (Twin Creek), and 3.4 (SAR), and improvements to the Gage Canal crossing. Maintenance improvements at nearly all existing grade crossings will also be required but will be limited to paving and track panel improvements and will not be to the level of improvement associated with the Project.

1.2.2 Alternative 2 – Preferred Project

The Preferred Project would involve the implementation of rail improvements along the Redlands Corridor to facilitate passenger rail service between E St. in the City of San Bernardino and the University of Redlands in the City of Redlands. Major components of the Preferred Project include track improvements, improvements to existing bridges, roadway at-grade crossings, station improvements, a train layover facility, property acquisitions and relocations, utility replacement and relocation, drainage improvements, operations and maintenance characteristics, and construction activities.

1.2.3 Alternative 3 – Reduced Project Footprint

This alternative would include development of the Project within a reduced footprint to minimize disturbances to biological and cultural resources that border and intersect the rail corridor. Similar to the Preferred Project, Alternative 3 would involve new tracks and grade crossing improvements, replacement or retrofit of existing bridges, construction of a new train layover facility, and the development of rail station improvements at Tippecanoe Ave., New York St., Downtown Redlands, and the University of Redlands.

Bank stabilization improvements (e.g., armoring) to the northern bank of the Mission Zanja Channel, from MP 4.2 to 7.2, would not be implemented; alternative bridge structures are proposed at Bridges 1.1

(Historic Warm Creek) and 3.4 (SAR) to minimize the placement of permanent structures within waters of the United States. Temporary and permanent encroachment impacts on the Interstate 10/California Citrus Grove would also be avoided to minimize potential impacts on historic properties adjacent to the railroad ROW.

1.2.4 Design Option 1 – Train Layover Facility (Waterman Avenue)

Under Design Option 1, SANBAG would construct facilities similar to those proposed under the build alternatives, including new tracks and grade crossing improvements, replacement or retrofit of existing bridges, and the development of station improvements at Tippecanoe Ave., New York St., Downtown Redlands, and the University of Redlands. The main distinguishing feature under Alternative 1 that differentiates it from the build alternatives is the optional location for the proposed train layover facility at an alternate site located in the City of San Bernardino, west of the Santa Ana River and immediately north of the rail corridor.

1.2.5 Design Option 2 – Use of Existing Layover Facilities

Under Design Option 2, SANBAG would construct facilities similar to those proposed under the build alternatives; however, rather than constructing a new train layover facility as described for the build alternatives and Design Option 1, Design Option 2 would integrate project-related layover operations with existing Metrolink layover operations at two existing facilities. More specifically, this design option would integrate project-related layover operations with existing train layover facilities at Metrolink's Eastern Maintenance Facility (EMF) and Inland Empire Maintenance Facility (IEMF). Integration of the Project with existing layover facilities would increase the length of train operations to 10.5 miles and allow for train layover operations to occur at these existing facilities, which are located west of E St...

2.0 NOISE/VIBRATION CRITERIA

2.1 NOISE IMPACT CRITERIA

2.1.1 Federal Regulations

Several federal laws and guidelines are relevant to the assessment of ground transportation noise and vibration impacts:

- The National Environmental Policy Act of 1969 (42 United States Code [USC] 4321, et seq.) (PL-91-190) (40 Code of Federal Regulations [CFR] 1506.5) requires the preparation of an environmental impact statement (EIS) for federal or federally supported projects that will affect environmental quality, including projects that cause noise impacts.
- The Noise Control Act of 1972 (42 USC 4910) was the first comprehensive statement of national noise policy. It declared that "it is the policy of the U.S. to promote an environment for all Americans free from noise that jeopardizes their health or welfare."
- The Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure Hearing Conversation Amendment (Federal Register [FR] 48 (46), 9738–9785) establishes noise exposure limits for the workplace, specifically relevant during construction.
- U.S. Environmental Protection Agency (EPA) Railroad Noise Emission Standards (40 CFR 201) pertain to noise emissions from railroads.

The U.S. Department of Transportation has implemented these mandates and published impact assessment procedures and criteria pertaining to noise. Noise impact criteria have been adopted by the Federal Transit Administration (FTA) to assess the contribution of noise from conventional rail sources to the existing environment (U.S. Department of Transportation, Federal Transit Administration 2006). These guidelines establish methods for analyzing and assessing noise and vibration impacts. The impact criteria are based on the goal of maintaining a noise environment considered acceptable for land uses where noise may have an impact. The noise exposure is measured in terms of the day-night average sound level (L_{dn}) for residential land uses or in terms of the hourly equivalent sound level (L_{eq}[h]) for other land uses.

In FTA's *Transit Noise and Vibration Impact Assessment*, noise impact criteria for construction and operation of rail facilities are based on the change in outdoor noise exposure using a sliding scale with three land use categories and three degrees of impact. These criteria apply to various surface transportation modes, including heavy rail. They respond to heightened community annoyance caused by late-night or early-morning service as well as communities' varying sensitivity to noise from projects during different ambient noise conditions.

For operational rail noise, FTA's three land use categories are as follows:

- **Noise Category 1:** Tracts of land where quiet is an essential element in their intended purpose, such as outdoor amphitheaters, concert pavilions, and National Historic Landmarks with significant outdoor use.
- **Noise Category 2:** Residences and buildings where people normally sleep, including homes, hospitals, and hotels.
- **Noise Category 3:** Institutional land uses (schools, places of worship, libraries) with use typically during the daytime and evening. Other uses in this category can include medical offices, conference

rooms, recording studios, concert halls, cemeteries, monuments, museums, historical sites, parks, and recreational facilities.

The categories are determined from general land use information about each receiver. No Category 1 receivers are located within 1 mile of the Project's proposed alignment. Outdoor hourly L_{eq} applies to Categories 1 and 3, whereas outdoor L_{dn} applies to Category 2.

Noise impacts on these three categories as a result of a proposed Project are assessed by comparing existing and future project-related outdoor noise levels, as illustrated in Figure 2-1. As shown in Figure 2-1, the criterion for each degree of impact is based on a sliding scale that is dependent on the existing noise exposure and the increase in noise exposure due to the Project. These potential noise impacts fall into three types: "no impact," "moderate impact," and "severe impact" and are described further below:

- No impact– A project, on average, will result in an insignificant increase in the number of instances where people are "highly annoyed" by new noise.
- Moderate impact– The change in cumulative noise is noticeable to most people but may not be sufficient to cause strong, adverse community reactions.
- Severe impact– A significant percentage of people would be highly annoyed by the noise, perhaps resulting in vigorous community reaction.

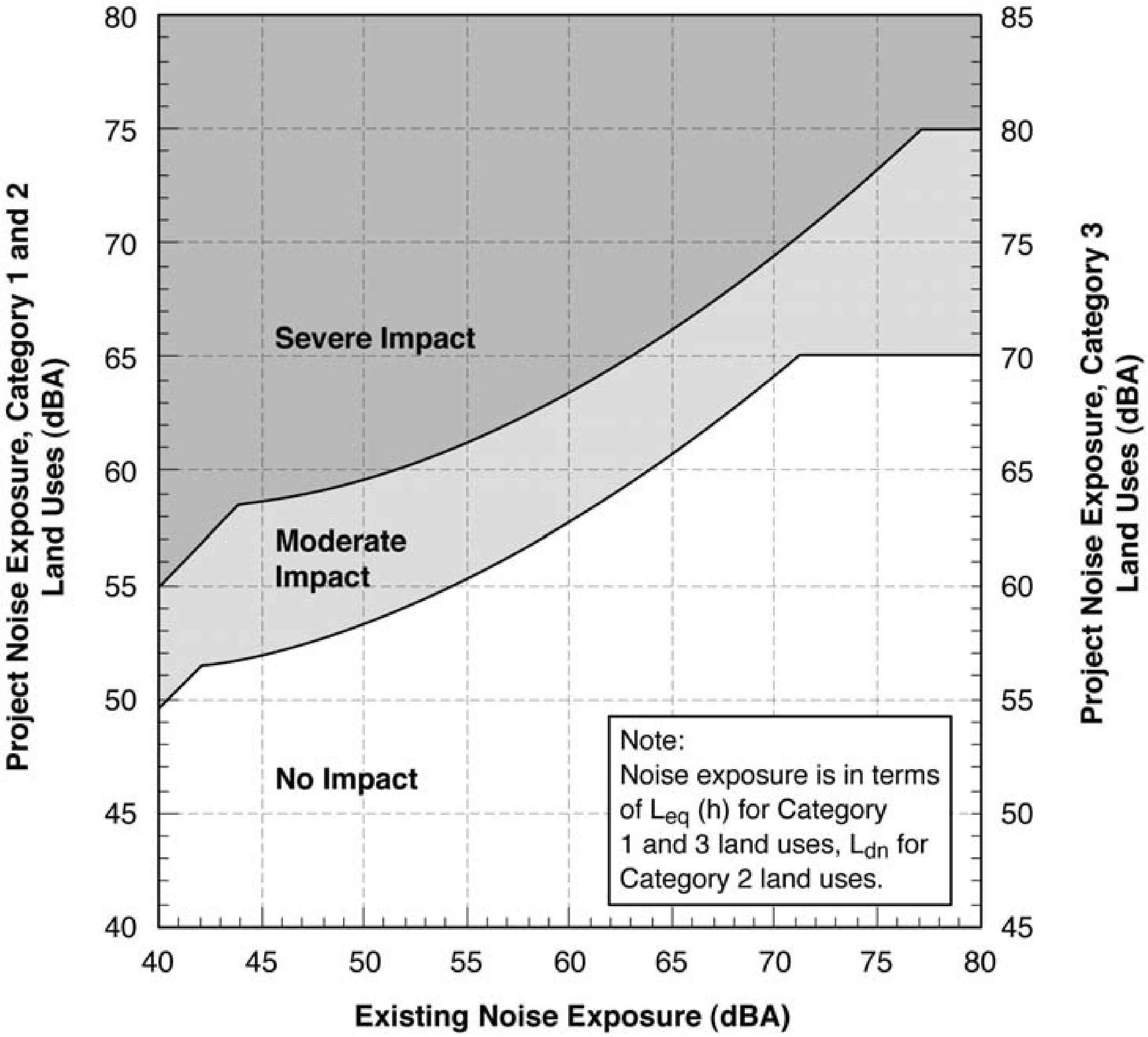
As an example of impact evaluation, consider the FTA's sliding impact criterion for Category 2 receivers. An existing environment of 50 A-weighted decibels (dBA) L_{dn} would experience a moderate impact if the rail project creates a noise exposure of approximately 53 dBA to 59 dBA L_{dn}. An existing environment of 65 dBA L_{dn} would be classified as having no impact if the rail project creates a noise exposure of 61 dBA to 66 dBA L_{dn}. Those same "existing" environments (50 or 65 dBA L_{dn}) would be classified as having a severe impact if the rail project creates noise exposure levels greater than 59 dBA and 66 dBA L_{dn}, respectively.

2.1.2 State Regulations

At the state level, the California Noise Control Act was enacted in 1973 (Health and Safety Code Section 46010 et seq.). It provides for the Office of Noise Control in the Department of Health Services to provide assistance to local communities developing local noise control programs, and work with the Office of Planning and Research to provide guidance for the preparation of the required noise elements in city and county general plans, pursuant to Government Code Section 65302(f). In preparing the noise element, a city or county must identify local noise sources and analyze and quantify to the extent practicable current and projected noise levels for various sources, including highways and freeways, passenger and freight railroad operations, ground rapid transit systems, commercial, general, and military aviation and airport operations, and other ground stationary noise sources. Noise level contours must be mapped for these sources, using either the community noise equivalent level (CNEL) or L_{dn}, and used as a guide in land use decisions to minimize the exposure of community residents to excessive noise. Airports are subject to the noise requirements set by the Federal Aviation Administration (FAA) and noise standards under the California Code of Regulations (CCR), Title 21, Section 5000.

CEQA (Section 21000 et seq.) is a state statute passed in 1970. CEQA requires state and local agencies to identify the significant environmental impacts of their actions, including potential effects from noise and vibration, and avoid or mitigate those impacts, when feasible.

Figure 2-1: FTA Noise Impact Criteria



The State of California has established land use compatibility criteria that provide guidance on the compatibility of different types of land uses based upon the existing community noise level. These guidelines are often adopted by city and county agencies for land use planning purposes. However, the State of California has not adopted specific noise criteria that are applicable to rail projects. Therefore, the noise impact assessment has been based on the guidelines provides by FTA.

2.1.3 Local Regulations

The Project is located in the Cities of San Bernardino, Loma Linda and Redlands. The regulations for each of these cities are addressed below.

City of San Bernardino. Local noise standards are addressed in the Noise Element of the City's General Plan (Chapter 14). The Noise Element sets forth goals, policies, and implementation guidelines to ensure land use compatibility with respect to noise. Among the City's General Plan objectives is the desire to ensure that excessive noise levels do not significantly affect citizens of the City. The General Plan policies address the siting of new noise-sensitive projects, suggesting that they are to be located where noise from mobile noise sources (i.e., motor vehicle, rail, or aircraft) will not exceed an existing or projected future exterior noise level of 65 dBA L_{dn} or an interior noise level of 45 dBA L_{dn} (Goal 14.1). The Noise Element also promotes the reduction of noise from transportation-related sources, including rail (Goal 14.2).

Although the City's Noise Element acknowledges that the regulation of noise from the operation of railroad trains is preempted by state and federal law from local noise regulation while operating within dedicated rights-of-way, the following policies address rail operations within the City:

> Policy 14.2.15: "Work with all railroad operators in the City to properly maintain lines and establish operational restrictions during the early morning and late evening hours to reduce impacts in residential areas and other noise sensitive areas."

> Policy 14.2.16: "Work with all railroad operators to install noise mitigation features where operations impact existing adjacent residential or other noise-sensitive uses."

The City regulates noise sources (such as construction noise) that are not pre-empted from local noise control. The following policies pertain to construction noise:

> Policy 14.3.1: "Require that construction activities adjacent to residential units be limited as necessary to prevent adverse noise impacts."

> Policy 14.3.2: "Require that construction activities employ feasible and practical techniques that minimize the noise impacts on adjacent uses."

Additionally, the City's Municipal Code Noise Ordinance (Chapter 8.54, Noise Control) prohibits disturbance from construction noise except between the hours of 7 a.m. and 8 p.m. (Section 8.54.070) with certain exceptions. Exceptions (contained in Section 8.54.060, Exemptions) include the following:

> "H. Construction, operation, maintenance, and repairs of equipment, apparatus, or facilities of park and recreation departments, public work projects, or essential public services and facilities…"

> "I. Construction, repair, or excavation work performed pursuant to a valid written agreement with the City, or any of its political subdivisions, which provides for noise mitigation measures."

> "J. Any activity to the extent that regulation thereof has been pre-empted by state or federal law."

City of Loma Linda. Local noise standards are addressed in the Noise Element of the City's General Plan (Chapter 7). The General Plan's stated purpose is to limit the community's exposure to excessive noise levels. Similar to San Bernardino, the City of Loma Linda's General Plan has Guiding Policies (Section 7.8) that address the siting of new noise-sensitive projects. The standard for residential land uses is 65 dBA exterior and 45 dBA interior. School classrooms have a 65 dBA exterior standard, while play and sports areas have a 70 dBA exterior noise standard. Libraries, churches, hospitals and nursing homes have an exterior noise standard of 60 dBA. Section 7.8.1.2 (Implementing Noise Policies for Circulation and Transportation Noise) includes the goal to "Work with the passenger and freight train operators to establish 'quiet zones' (areas where train whistles are not sounded) within the City."

Additionally, the City's Municipal Code Noise Ordinance (Chapter 9.20, Noise Regulations) prohibits disturbance from construction noise except between the hours of 7 a.m. and 8 p.m. (Section 9.20.070) during the weekday. Noise from heavy construction equipment operation is prohibited on weekends and national holidays.

City of Redlands. Local noise standards are addressed in the Noise Element of the City's General Plan (Chapter 9). The General Plan's stated purpose is to achieve and maintain land use compatibility within the City. The City of Redland's standards for residential land uses, hospitals, schools, and classrooms are 60 dBA CNEL exterior and 45 dBA interior. Parks also have a 60 dBA CNEL exterior noise standard, while hotels and motels have a 65 dBA CNEL exterior noise standard and a 45 dBA CNEL interior standard (GP Table 9.2).

Additionally, the City's Municipal Code (Chapter 8.06) prohibits disturbance from construction noise except between the hours of 7 a.m. and 6 p.m. (Section 8.06.090) during weekdays and Saturdays. Construction activities are prohibited on Sundays and federal holidays.

2.2 Operational Vibration

2.2.1 Federal Regulations

Vibration impact levels, stated as the maximum root-mean-square (RMS) vibration level, are affected by the land use category and the number of vibration events per day. The impact level also depends on the type of analysis being conducted (i.e., ground-borne vibration or ground-borne noise).

FTA provides guidelines to assess human response to different levels of ground-borne noise and vibration. These are shown in Table 2–1. The project study area does not have any Category 1 land uses within approximately1,500 feet of the alignment. The majority of vibration-sensitive land uses in the project study area are Category 2 land uses. The term "frequent events" is defined as more than 70 vibration events per day, while the term "infrequent events" is defined as less than 70 vibration events per day.

Ground-borne noise is normally not a consideration when trains are at grade. In these situations, the airborne noise is the major consideration. Ground-borne noise generally becomes an important consideration for subways or other projects in which part of the alignment includes a tunnel.

FTA analysis guidelines call for investigation of the potential for vibration-induced damage to "fragile" or "extremely fragile" buildings. Damage to a building is possible (but not necessarily probable) if ground vibration levels exceed the following criteria:

- 0.20-inch-per-second peak particle velocity (PPV) (approximately 100 VdB) for fragile buildings.
- 0.12-inch-per-second PPV (approximately 95 VdB) for extremely fragile buildings.

No fragile or extremely fragile buildings are in proximity to the Project.

Table 2-1. Ground-Borne Vibration and Noise Impact Criteria

Land Use Category	Ground-borne Vibration Impact Levels (VdB re 1 micro inch/sec)		Ground-borne Noise Impact Levels (dB re 20 micro Pascals)	
	Frequent Events[a]	Infrequent Events[b]	Frequent Events[a]	Infrequent Events[b]
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB[c]	65 VdB[c]	N/A[d]	N/A[d]
Category 2: Residences and buildings where people normally sleep.	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	83 VdB	40 dBA	48 dBA

Notes:

a. The term *frequent events* is defined as more than 70 vibration events per day.

b. The term *infrequent events* is defined as fewer than 70 vibration events per day.

c. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the heating, ventilation, and air-conditioning systems and stiffened floors.

d. Vibration-sensitive equipment is not sensitive to ground-borne noise.

Source: FTA 2006.

2.2.2 State Regulations

At the state level, vibrations limits have not been set.

2.2.3 Local Regulations

The Cities of San Bernardino and Loma Linda do not have vibration standards or thresholds in its municipal code or other ordinances. The City of Redlands Municipal Code (Section 8.06.090) states that the following is prohibited: “Operating or permitting the operation of any device that creates a vibration which is above the vibration perception threshold of an individual at or beyond the property boundary of the source if on private property or at one hundred fifty feet (150') from the source if on a public space or public right of way.” The aforementioned prohibition would be applicable to the construction phase of the Project. Vibration from transportation systems is exempt from local regulations.

3.0 PROJECT STUDY AREA AND NOISE-/VIBRATION-SENSITIVE SITES

Figure 1-2 shows an overview of the project study area, and the following discussion provides a description of the RPRP Study Area according to rail mile post (MP) from west to east. The RPRP Study Area starts just west of MP 1 east of E St. with the City of San Bernardino and ends at MP 10.1 at the University of Redlands.

MP 1 to 2. This segment of the RPRP Study Area is generally bordered by existing industrial and commercial development with some isolated vacant parcels. Residential uses exist to the south of the alignment on South Pershing Ave. and to the east along Dorothy St...

MP 2 to 3.5. Industrial and commercial uses generally border this section of the RPRP Study Area north of Central Ave. South of Central Ave., land uses bordering the RPRP Study Area transition to residential with large lots. East of Waterman Ave., adjacent land uses transition back to industrial. The alternative train layover facility site under consideration as Alternative 1 is located adjacent and north of the rail ROW.

MP 3.5 to 6. Tippecanoe Ave. demarcates a land use transition from commercial and industrial uses to the east and varying densities of residential development to the east. At Mountain View Ave., the study area exits the City of San Bernardino and enters the City of Redlands. Mountain View Ave. demarcates another significant transition in land use with residential use predominately to the west and commercial and industrial uses to the east. A day care facility is also located on the southwest side of the rail alignment at Mountain View Ave.

MP 5.7 to 8.5. Commercial and office uses generally border this portion of the RPRP Study Area, with the following exceptions: To the east of New York St., the rail ROW diverts back to the east and away from Redlands Blvd. and parallels Stuart Ave. to the south. Residential and transient residential (motels) land uses exist south of Redlands Ave. in this area, east and west of Kansas St. A park is located south of Redlands Blvd. at New York St. On the north side of the rail ROW, a motel is located to the east of Nevada St.; a second one is located west of Tennessee St. A residence is located just west of New York St. along the north side of the rail ROW, and several residences are located north of Stuart Ave., east of Texas St.

MP 8.5 to 10. This portion of the RPRP study area is comprised mainly of commercial land uses; however, several residences exist along Stuart Ave., from east of Eureka St. to Church St... A church also exists in this area. Residences also exist to the south of the rail ROW, along Central Ave. between 9th St. and the I-10. East of the I-10, residences exist on the north and south sides of the rail ROW. Additionally, a park and the University of Redlands are located on the north side of the rail ROW.

The current rail line has occasional/intermittent freight traffic. Approximately 150 freight cars per year travel along the rail line between downtown San Bernardino and Tippecanoe Ave., at a typical rate of zero to two trains per week. The typical configuration of these trains is one or two locomotives and two to five cars (Medina pers. comm.). No rail service currently exists east of Tippecanoe Ave...

San Bernardino International Airport (SBD) is approximately 1.2 miles north of the nearest portion of the project study area. SBD is the site of the former Norton Air Force Base, which was placed on the Department of Defense's base closure list in 1989. The last of the military facilities were closed in 1995. Currently, aircraft operations take place on an irregular basis: The U.S. Customs Service uses the airport on an on-call basis, the U.S. Forest Service uses the airport as a base for planes when fighting forest fires; and several hangars are used by civilian-owned aircraft maintenance companies. In addition, a fixed-base operator operates a private charter terminal at the airport. Although SBD has a renovated passenger terminal and is capable of handling scheduled commercial service, no passenger or cargo operations use the terminal. Given the information above, as well as critical listening/observations during site visits by project staff, the project study area is not affected on a regular basis by aircraft noise from SBD.

3.1 Noise-/Vibration-Sensitive Land Uses and Site Geometry

As the first step in the noise and vibration analysis process, a screening analysis is conducted to identify locations where a project may cause noise impacts. The procedure itself is explained in greater detail in Section 5.1.1. For the proposed Project, FRA's horn noise model (also known as the FRA Grade Crossing Noise Model) was used to determine the maximum distances from the project alignment at which noise impacts could occur. Receivers within the indicated screening distance of the Project are identified. If no receivers are within the screening distance, the Project is unlikely to have a severe impact, and no further noise analysis would be required. If receivers exist within the screening distance, that distance defines the study area for the general and/or detailed noise assessment. Using these screening distances, residential, transient residential (Category 2), schools, a day care facility, parks, and churches (Category 3) land uses were identified as being within the screening distances.

The topography of the area is generally flat, and the rail line is generally at-grade with the surrounding terrain.

4.0 EXISTING CONDITIONS

For information describing the characteristics, associated terms, and noise metrics used for transportation-related noise and vibration, please see Appendix A.

4.1 NOISE MEASUREMENTS

The existing noise conditions in the project study area were documented through measurements at representative noise-sensitive locations during a series of noise measurements. The goal of the measurements was to document the existing noise conditions in the project study area and estimate existing noise levels as the baseline for the noise impact analysis. Measurements were conducted from Wednesday, May 2, 2012, to Thursday, May 10, 2012, within the residential neighborhoods and other noise-sensitive locations near the rail alignment. Weather throughout the measurement period was acceptable for field noise measurements.

Appendix B contains a list of the instruments used for noise measurements. Field noise measurement data sheets are contained in Appendix C. The noise measurement locations are shown in Figure 4-1.

Noise measurements were conducted at eleven locations throughout the project alignment. Each of the measurements (designated LT to signify a "long term" noise measurement) collected continuous hour-by-hour sound level data for a minimum period of 24 hours. Eight of the LT noise measurements (LT-1 through LT-5, LT-8, LT-9, and LT-11) were conducted in or adjacent to exterior residential yards adjacent to the project alignment. LT-6 was conducted at a motel, and LT-7 and LT-10 were conducted at parks. LT noise data were used as the basis for the impact analysis of the noise-sensitive land uses.

A "general purpose" (Type 2) sound level meter was used to conduct the noise measurements. All of the measurements were performed by persons with training and experience in measuring environmental sound. The laboratory calibration of the sound measurement instruments was verified in the field before and after each measurement period using a reference acoustical calibrator. The accuracy of each acoustical calibrator is maintained through a program established by the manufacturer and is traceable to the National Institute of Standards and Technology. The sound measurement instruments meet the requirements of American National Standard S1.4-1983 and International Electrotechnical Commission Publications 804 and 651.

For the LT measurements, the sound level meter was locked in a case with the microphone and windscreen connected via an extended microphone cable. The microphone was attached to a fence or tree branch such that the microphone was approximately 5 feet above the ground. The sound level meter was located more than 15 feet from the nearest wall or other acoustically reflective surface during the measurements. For each measurement, field personnel completed a field measurement data sheet with information such as the site location and description, weather conditions, calibration parameters, noise level data, and sound sources.

The LT noise measurement data, including locations, are summarized in Table 4-1. Noise associated with typical urban/residential land use activities dominates the noise environment in the project study area (e.g., local and distant traffic, children playing, people talking, dogs barking, birds, and rustling leaves).

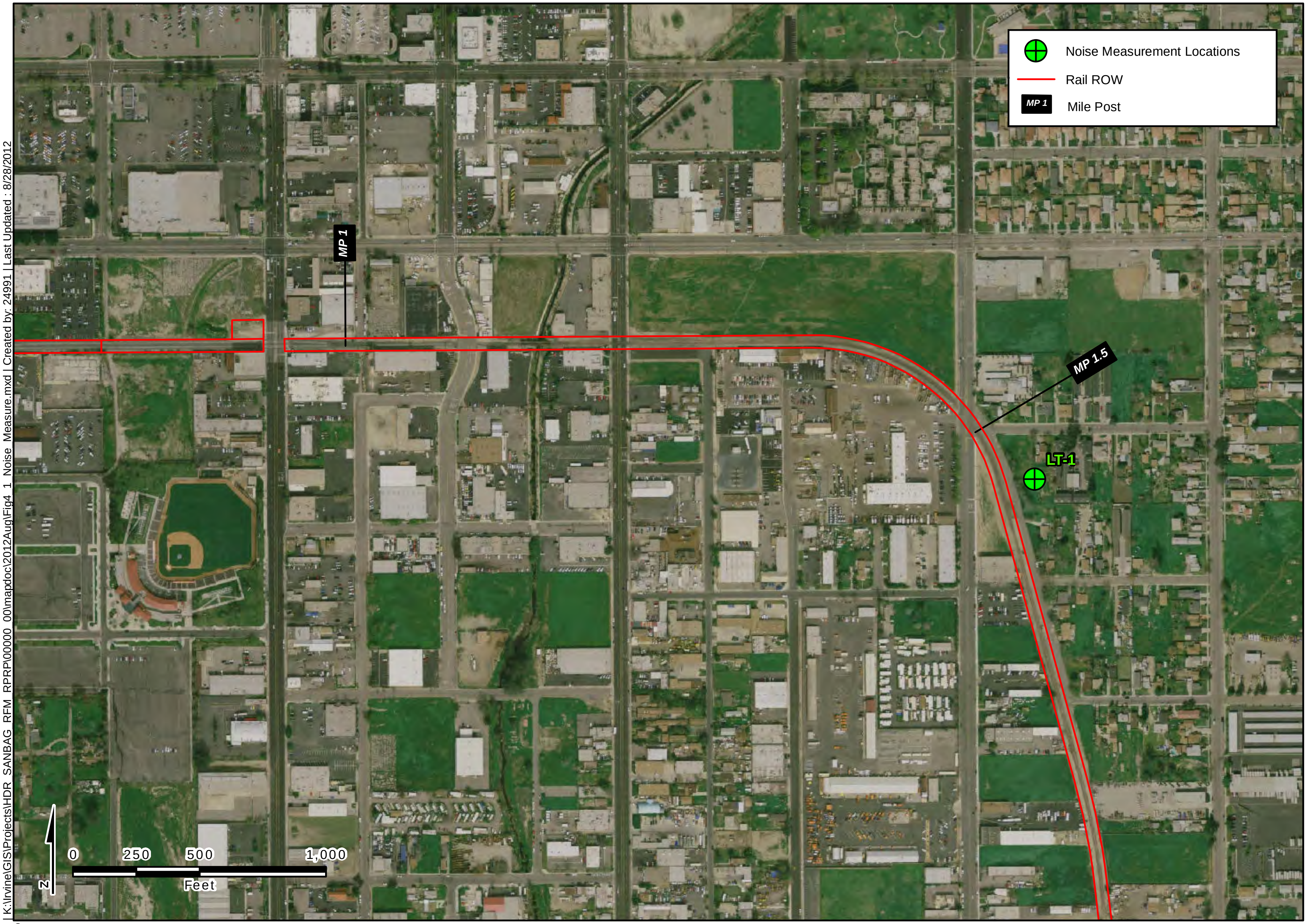
LT-1 was conducted adjacent to residences in and around 134 Julia St. in San Bernardino. The sound level meter was located on a tree near the residents' rear yard. The day-night average sound level at location LT-1 was 55 dBA. The LT data plot presented in Appendix C shows the diurnal noise levels from hour to hour for LT-1 as well as the other LT measurements. The quietest hours of the 24-hour period occurred between 2 a.m. and 4 a.m. The lowest 1-hour L_{eq} measured was 39 dBA, occurring between 1 a.m. and 2 a.m. The loudest hourly noise level (56 dBA L_{eq}) occurred between 4 p.m. and 5 p.m.

Table 4-1. Long-Term Noise Measurement Data Summary

Site ID	Location	Noise Measurement Results			
		Measurement Dates / Times	L_{dn}	Minimum 1-Hour L_{eq} (dBA)	Maximum 1-Hour L_{eq} (dBA)
LT-1	Near residences, in open field behind 134 Julia St.	5/2/20102 11 a.m. to 5/3/2012 10 a.m.	55.2	38.8	55.9
LT-2	Near residences, in open field between 1038 and 1018 Lincoln St.	5/2/20102 12a.m. to 5/3/2012 11 a.m.	52.2	39	53.7
LT-3	Rear yard of 380 Hardt St.	5/3/20102 3 p.m. to 5/4/2012 2 p.m.	63.7	46.2	68.2
LT-4	Rear yard of 1924 E. Hardt St.	5/3/20102 3 p.m. to 5/4/2012 2 p.m.	57.9	41.9	62.6
LT-5	Rear of Rosewood Apartments, 26232 Redlands Blvd.	5/3/20102 4 p.m. to 5/4/2012 3 p.m.	71.4	61.1	68.4
LT-6	Hanson Motel 1291 Redlands Blvd.	5/7/20102 3 p.m. to 5/8/2012 2 p.m.	67.2	53.2	69.8
LT-7	Jennie Davis Memorial Park, New York St. at Redlands Blvd.	5/7/20102 3 p.m. to 5/8/2012 2 p.m.	64.4	49.9	74
LT-8	Mixed residential and commercial area, 701 W. Stuart St.	5/7/20102 4 p.m. to 5/8/2012 3 p.m.	62.3	50.7	60
LT-9	Near residences, in lot next to 610 Stuart St.	5/9/20102 5 a.m. to 5/10/2012 4 a.m.	66.8	56.6	64.1
LT-10	Sylvan Park, 601 North University St.	5/9/20102 6 a.m. to 5/10/2012 5 a.m.	64.1	52.4	68.6
LT-11	Near residences in lot on University of Redlands Campus, North of the rail alignment, west of Cook St.	5/9/20102 6 a.m. to 5/10/2012 5 a.m.	60.7	48.5	59

LT-2 was conducted adjacent to residences in and around 1038 Lincoln St. in San Bernardino. The sound level meter was located on a fence adjacent to the residential property line. The L_{dn} at location LT-2 was 52 dBA. The quietest hours of the 24-hour period occurred between 1 a.m. and 3 a.m. The lowest 1-hour L_{eq} measured was 39 dBA L_{eq}. The loudest hourly noise level (54 dBA L_{eq}) occurred between 3 p.m. and 4 p.m. and between 6 p.m. and 7 p.m.

LT-3 was conducted in the rear yard of 380 East Hardt St. in San Bernardino. The sound level meter was located on a tree. The L_{dn} at location LT-3 was 64 dBA. The quietest hours of the 24-hour period occurred between 2 a.m. and 3 a.m. The lowest 1-hour L_{eq} measured was 46 dBA L_{eq}. The loudest hourly noise level (68 dBA L_{eq}) occurred between 8 a.m. and 9 a.m.



Sources

HDR
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Noise Measurement Locations
Figure 4-1 A
SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

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Sources

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Noise Measurement Locations

Figure 4-1 B

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

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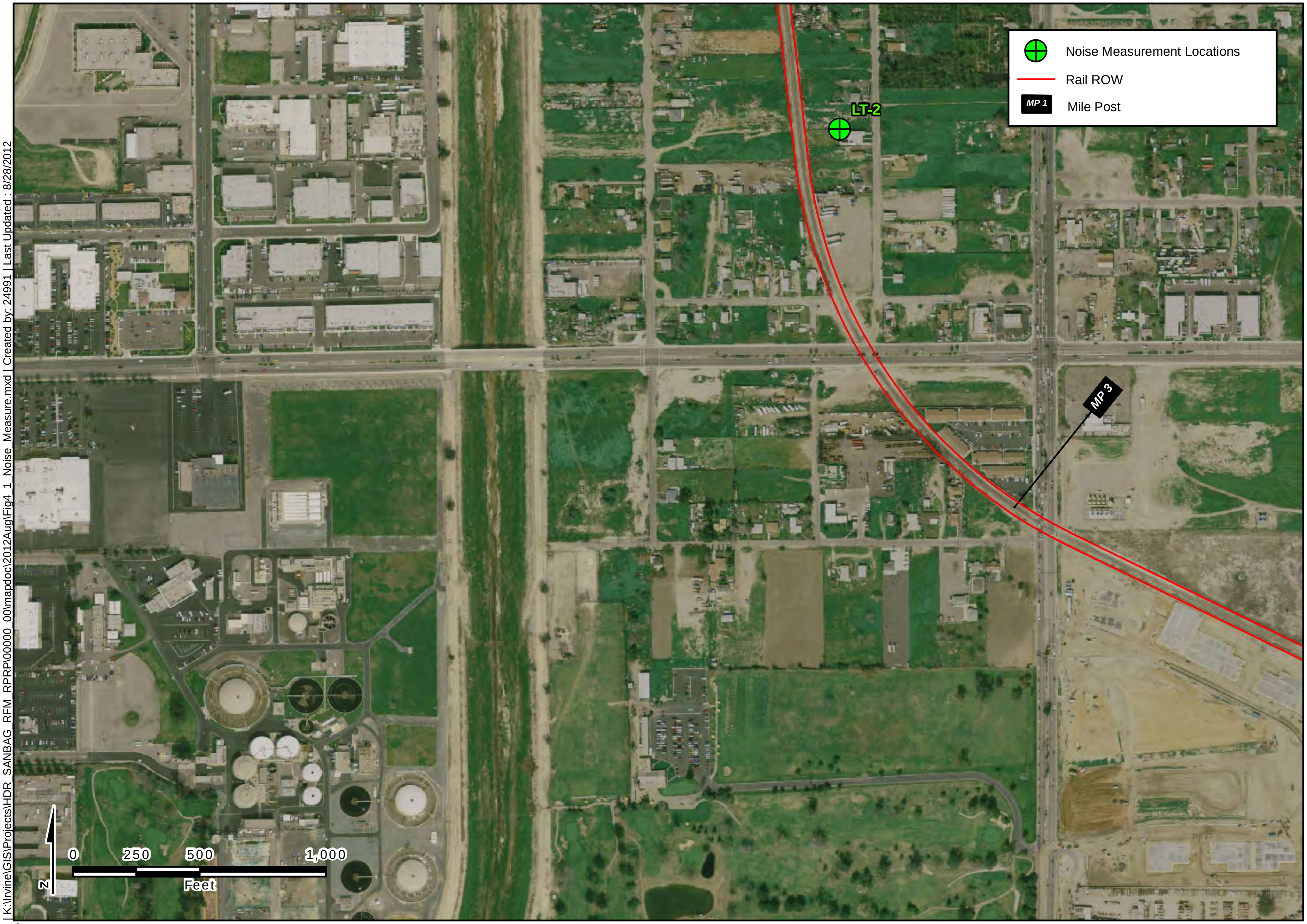

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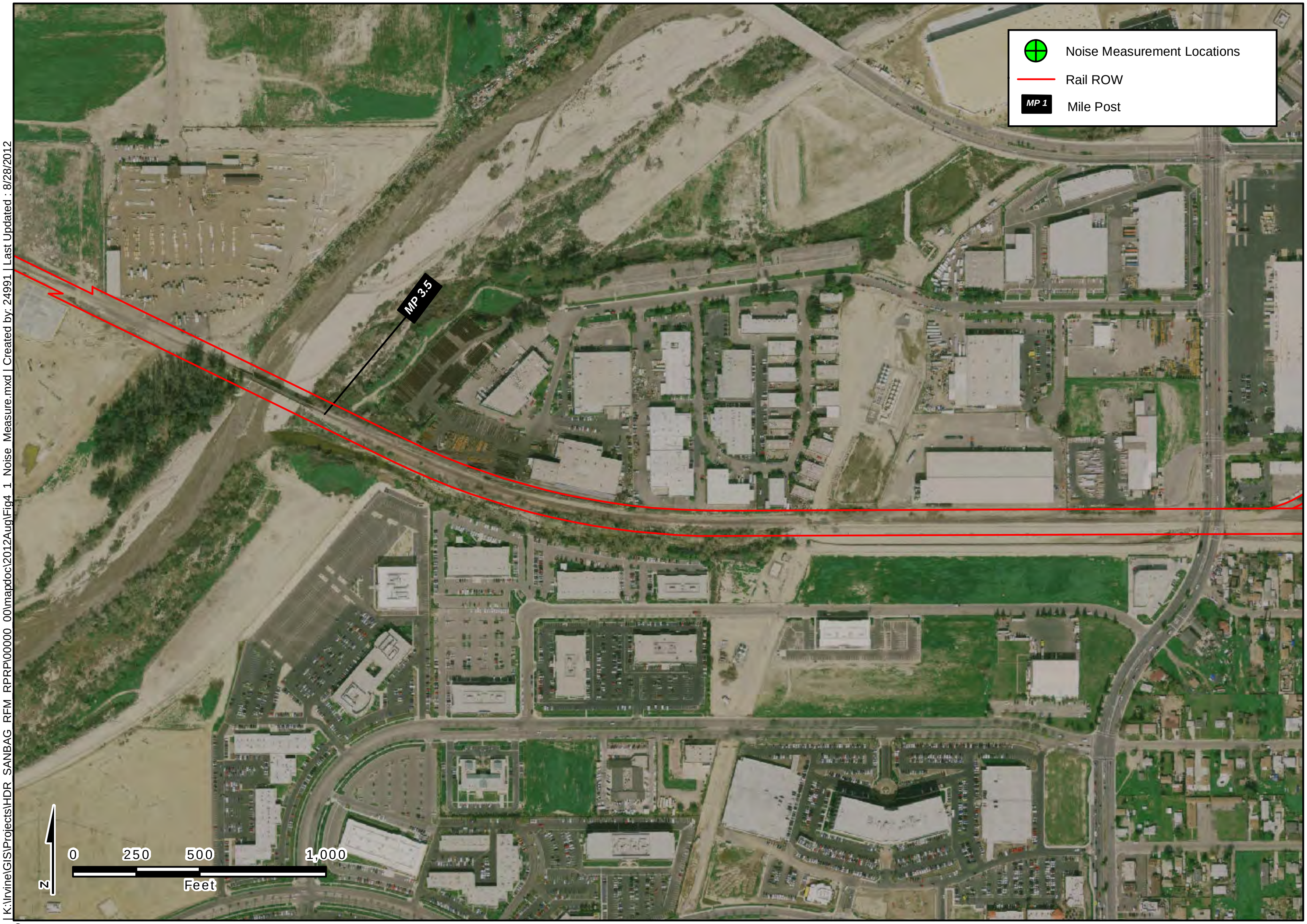
Noise Measurement Locations

Figure 4-1 C

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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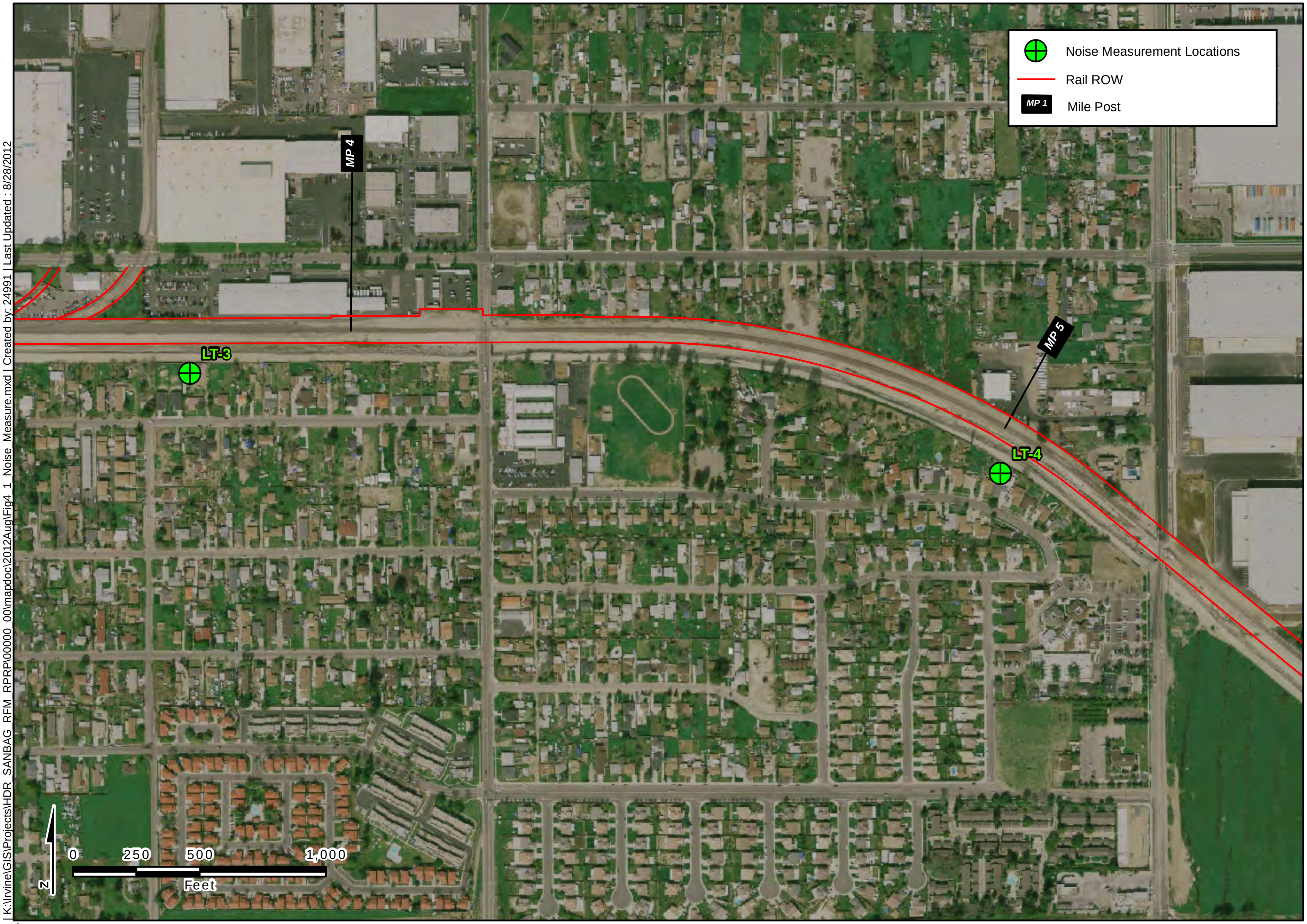
Noise Measurement Locations
Figure 4-1 D
SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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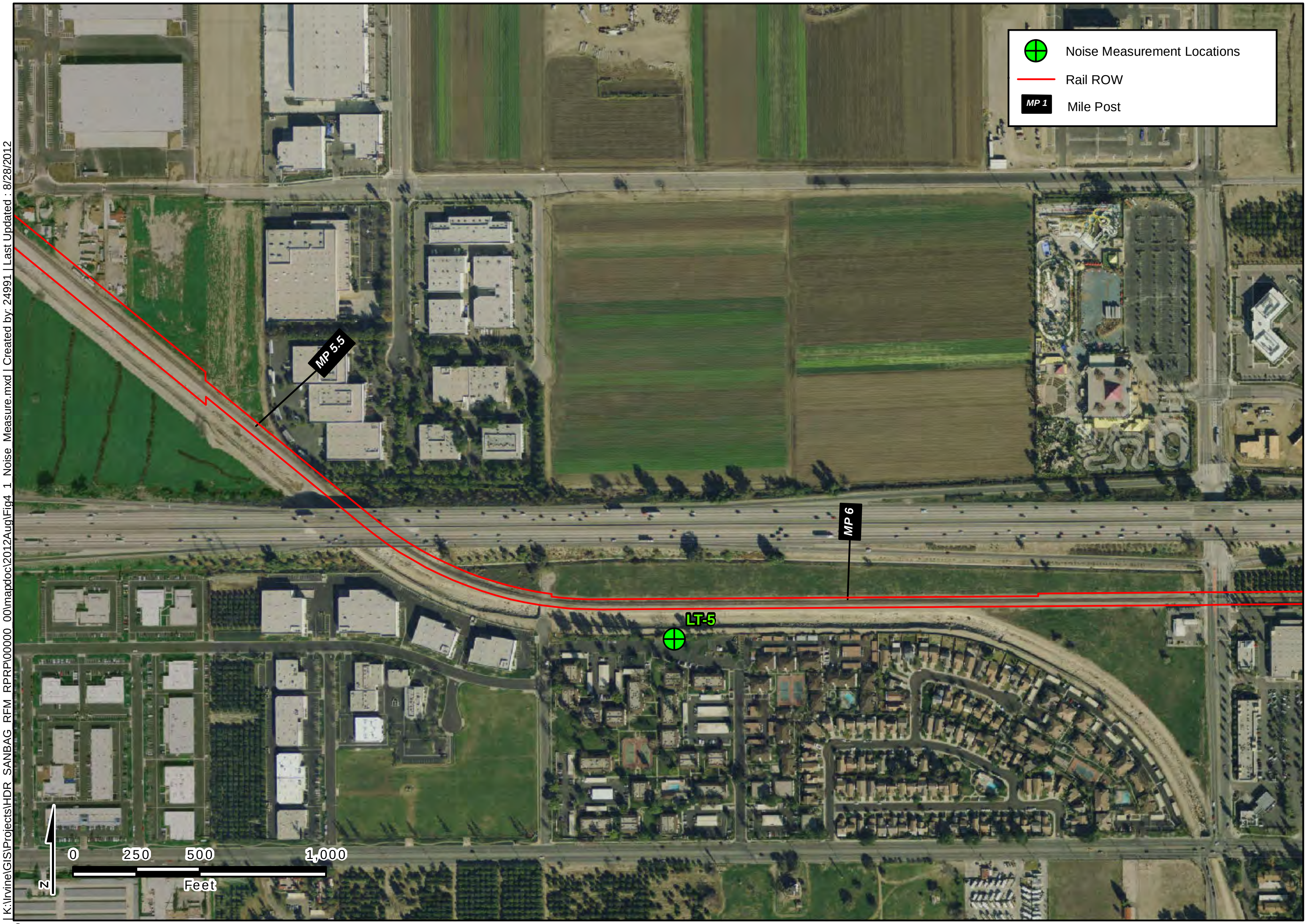
Noise Measurement Locations

Figure 4-1 E

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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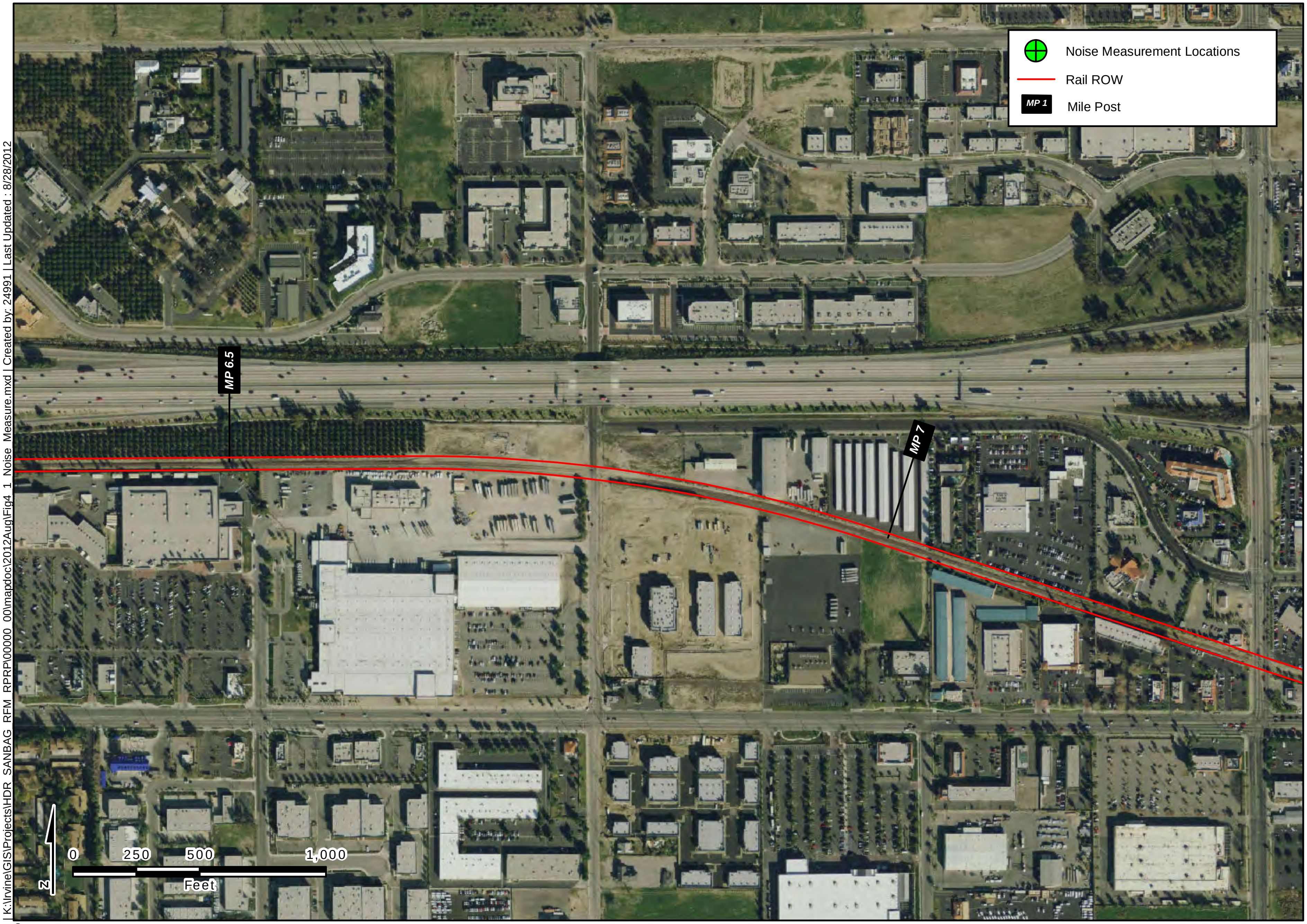
Noise Measurement Locations

Figure 4-1 F

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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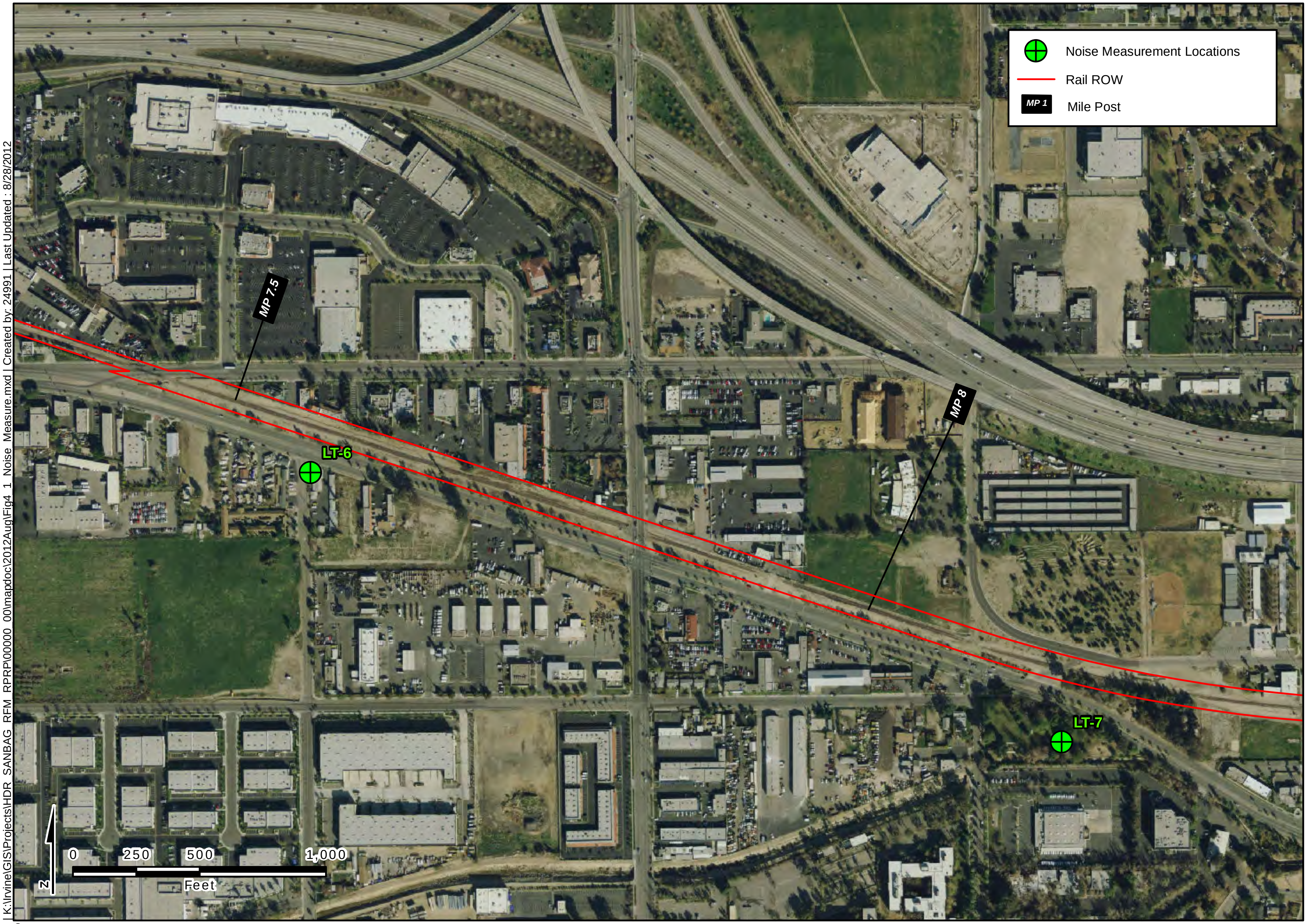
Noise Measurement Locations

Figure 4-1 G

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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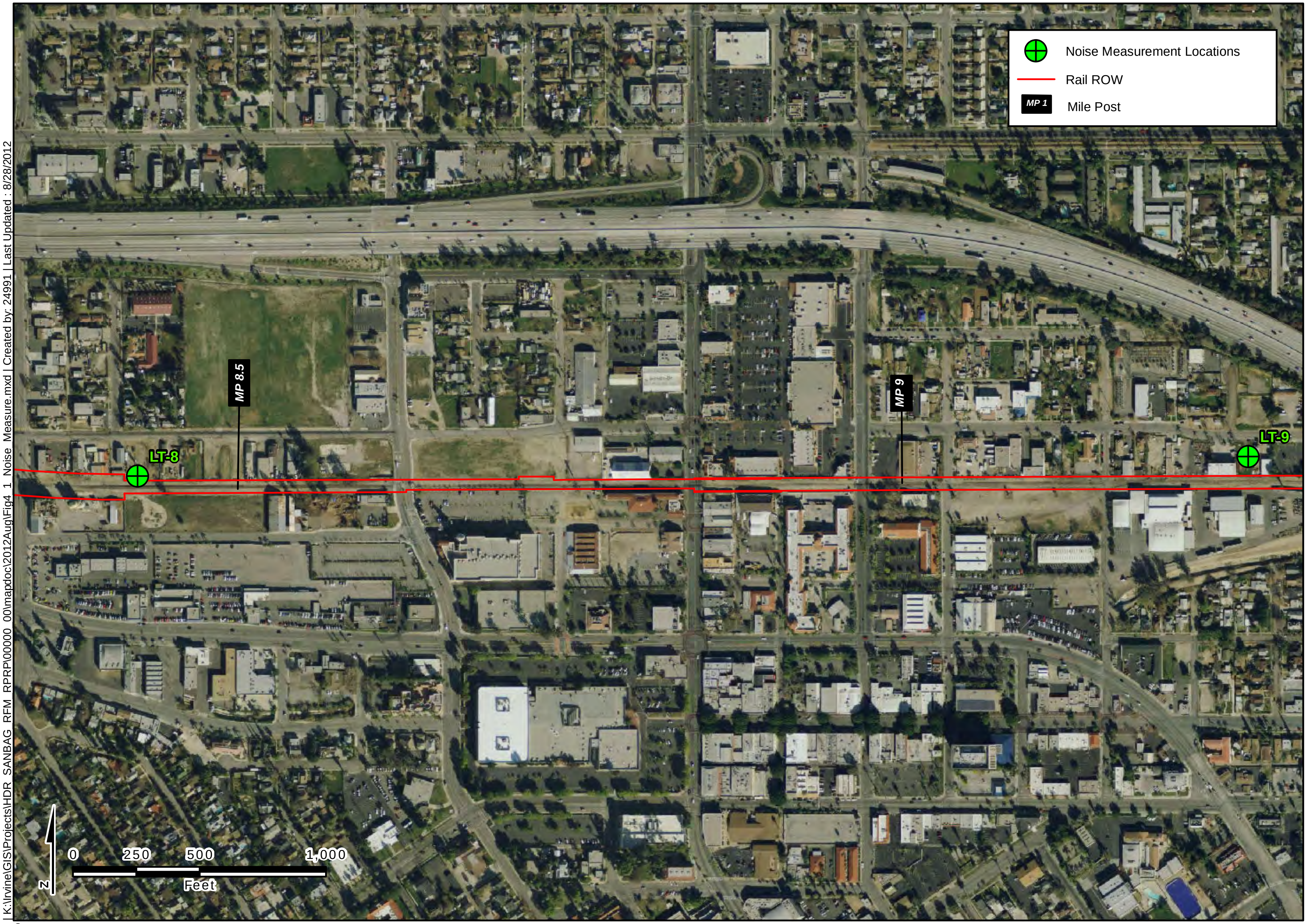
Noise Measurement Locations

Figure 4-1 H

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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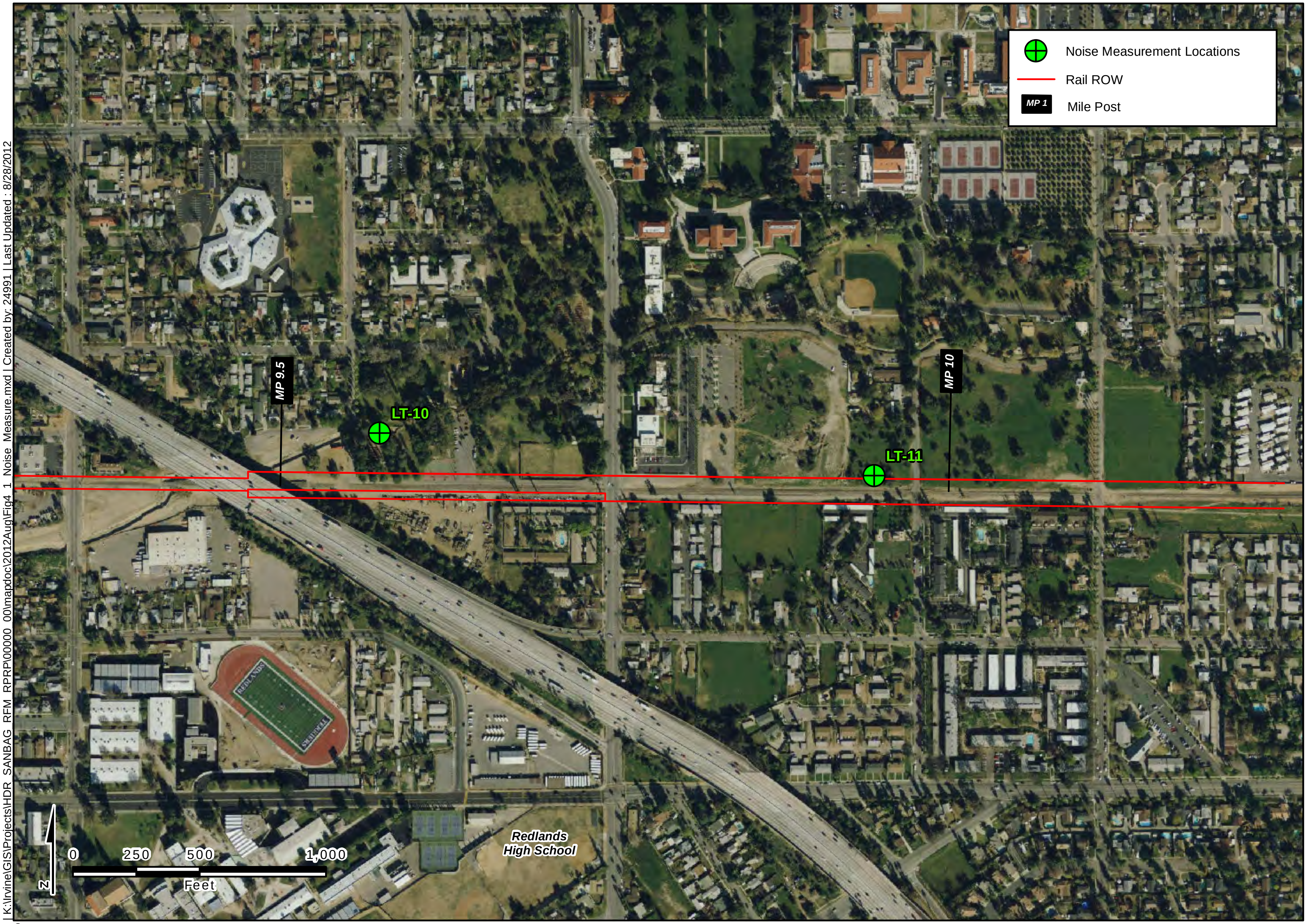
Noise Measurement Locations
Figure 4-1 I
SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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Noise Measurement Locations

Figure 4-1 J

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

LT-4 was conducted in the rear yard of 1924 East Hardt St. in San Bernardino. The sound level meter was located on a fence adjacent to the property line. The L_{dn} at location LT-4 was 58 dBA. The quietest hours of the 24-hour period occurred between 12 a.m. and 1 a.m. The lowest 1-hour L_{eq} measured was 42 dBA L_{eq}. The loudest hourly noise level (63 dBA L_{eq}) occurred between 6 p.m. and 7 p.m.

LT-5 was conducted at an apartment complex located at 26232 Redlands Blvd. in Redlands. The sound level meter was located on a tree adjacent to the residential property line. The L_{dn} at location LT-5 was 71 dBA. The quietest hours of the 24-hour period occurred between 1 a.m. and 3 a.m. The lowest 1-hour L_{eq} measured was 61 dBA L_{eq}. The loudest hourly noise level (68 dBA L_{eq}) occurred between 4 p.m. and 7 p.m. and between 6 a.m. and 9 a.m.

LT-6 was conducted adjacent to a motel located at 1291 Redlands Blvd. in Redlands. The sound level meter was located on a tree. The L_{dn} at location LT-6 was 67 dBA. The quietest hours of the 24-hour period occurred between 2 a.m. and 3 a.m. The lowest 1-hour L_{eq} measured was 53 dBA L_{eq}. The loudest hourly noise level (70 dBA L_{eq}) occurred between 11 a.m. and 12 a.m.

LT-7 was conducted at Jenny Davis Memorial Park in Redlands. The sound level meter was located on a tree. The L_{dn} at location LT-7 was 64 dBA. The quietest hours of the 24-hour period occurred between 1 a.m. and 3 a.m. The lowest 1-hour L_{eq} measured was 50 dBA L_{eq}. The loudest hourly noise level (74 dBA L_{eq}) occurred between 2 p.m. and 3 p.m.

LT-8 was conducted in the mixed use area at 701 West Stuart St. in Redlands. The sound level meter was located on a tree. The L_{dn} at location LT-8 was 62 dBA. The quietest hours of the 24-hour period occurred between 1 a.m. and 2 a.m. The lowest 1-hour L_{eq} measured was 51 dBA L_{eq}. The loudest hourly noise level (60 dBA L_{eq}) occurred between 10 a.m. and 3 p.m.

LT-9 was conducted in the mixed use area at 610 East Stuart St. in Redlands. The sound level meter was located on a tree. The L_{dn} at location LT-9 was 67 dBA. The quietest hours of the 24-hour period occurred between 1 a.m. and 2 a.m. The lowest 1-hour L_{eq} measured was 57 dBA L_{eq}. The loudest hourly noise level (64 dBA L_{eq}) occurred between 6 a.m. and 7 a.m.

LT-10 was conducted Sylvan Park in Redlands. The sound level meter was located on a tree. The L_{dn} at location LT-10 was 64 dBA. The quietest hours of the 24-hour period occurred between 1 a.m. and 2 a.m. The lowest 1-hour L_{eq} measured was 52 dBA L_{eq}. The loudest hourly noise level (68 dBA L_{eq}) occurred between 1 p.m. and 2 p.m.

LT-11 was conducted in a lot located on the University of Redlands campus, just north of the proposed rail alignment. Residences are located directly to the south. The sound level meter was located on a tree. The L_{dn} at location LT-11 was 61 dBA. The quietest hours of the 24-hour period occurred between 9 p.m. and 10 p.m. The lowest 1-hour L_{eq} measured was 49 dBA L_{eq}. The loudest hourly noise level (59 dBA L_{eq}) occurred between 6 a.m. and 7 a.m. and again between 2 p.m. and 4 p.m.

4.2 Vibration Measurements

Vibration measurements were not conducted at this stage of the Project. Existing vibration sources in the project study area include motor vehicle traffic along local roads and I-10 as well as infrequent freight trains (as described in Section 3.0) on the existing tracks.

5.0 METHODOLOGY

5.1 METHODS FOR ASSESSING OPERATIONAL NOISE SOURCES

5.1.1 Rail Noise

The steps described in the FTA manual were used to evaluate the environmental effects of the Project. The FTA methodology identifies a screening procedure, a general noise assessment, and a detailed noise assessment.

Under the noise screening procedure, the project type is identified, (e.g., commuter rail mainline, commuter rail station, light rail transit station, busway). Project-to-receiver screening distances are given in the manual for each type of project, and adjustments to the generic screening distances are made to suit the project using the methodology in Chapter 5, the FTA spreadsheet model and, where horns and warning bells are used (as is the case with the proposed Project), the FRA's horn noise model (also known as the FRA Grade Crossing Noise Model). Receivers within the indicated screening distance of the Project are identified. If no receivers are within the screening distance[1], the Project is unlikely to have an effect, and no further noise analysis is called for. If receivers exist within the screening distance, then that distance defines the study area for the general and/or detailed noise assessment. Pursuant to the screening method steps, the FTA spreadsheet model and the FRA's horn noise model were used. The input assumptions and output are shown in Appendix D. As shown in Appendix D, the results are presented in terms of perpendicular distances from and lateral distances along the rail alignment, which define the zone of effect. The perpendicular distance is referred to as the impact distance and the lateral distance (from the grade crossing) is referred to as the zone length. The resultant screening model results are summarized in Table 5-1. As shown in Table 5-1, the screening-level impact distance at grade crossings varies from 265 to 530 feet, while screening impact distances in areas far from grade crossings varies from 130 to 250 feet. The intermediate impact distance away from the grade crossing (referred to as the ½ zone length) would vary from 205 to 430 feet, while the zone lengths would vary from 400 to 720 feet. The variation in impact distances is a result of differences in estimated train speed and land use type. Figure 5-1 shows the screening distances and the receivers located within the screening area.

In the general noise assessment method, the existing noise level and the project noise level are estimated and compared with the impact criteria contained in the manual. The estimations include parameters such as project type and location of alternatives, representative noise-source levels, design speed, and time and frequency of operation. Because severe noise impacts were identified as the general noise assessment for rail noise proceeded, the analysis proceeded to the more involved detailed noise assessment.

The FTA detailed noise assessment method quantifies impacts through an in-depth analysis. The methodologies outlined in Chapter 6 of the FTA manual were used to calculate the Ldn noise levels due to train operations on the rail alignment under the existing, future-no-project, and future-with-project scenarios. Receivers of interest were selected using the guidance provided in Chapter 6 and Appendix C of the FTA manual (see Table 5-1).

The modeling accounted for the number of trains anticipated to pass along the alignment during daytime and nighttime hours (22 and 3, respectively), the typical train speed along the alignment (20 to 35 miles per hour), the typical future train consist (one engine and two cars for the Redlands Passenger Rail Project and two engines and six cars for the Metrolink Express), and the use of locomotive horns at crossings near noise-sensitive land uses. Additionally, wayside signal bells at crossings were accounted for as part of the detailed noise analysis.

[1] ROW or alignment centerline distance.

Table 5-1. Rail Noise Screening Distances

Grade Crossing Segments		FTA spread-sheet model screening distance (in the absence of horns) (feet)	FRA horn noise model screening distance at crossing (feet)	FRA horn noise model screening distance at half zone length (feet)	FRA horn noise model screening distance zone length (feet)
To	From				
E St.	D St.	130	265	205	700
D St.	Arrowhead Ave.	130	265	205	700
Arrowhead Ave.	Sierra Ave.	175	520	410	720
Sierra Ave.	Mill St.	175	520	410	720
Mill St.	Central Ave.	175	520	410	720
Central Ave.	Orange Show Rd.	175	520	410	720
Orange Show Rd.	Waterman Ave.	175	520	410	720
Waterman Ave.	Tippecanoe Ave.	175	520	410	720
Tippecanoe Ave.	S. Richardson St.	175	520	410	720
S. Richardson St.	Mountain View Ave.	175	520	410	720
Mountain View Ave.	California St.	175	520	410	720
California St.	Nevada St.	175	520	410	720
Nevada St.	Alabama St.	175	520	410	720
Alabama St.	Redlands Blvd./ Colton Ave.	175	520	410	720
Redlands Blvd./ Colton Ave.	Tennessee St.	175	520	410	720
Tennessee St.	New York St.	250	530	430	400
New York St.	Stuart Ave.	250	530	430	400
Stuart Ave.	Texas St.	250	530	430	400
Texas St.	Eureka St.	250	530	430	400
Eureka St.	Orange St.	250	270	215	400
Orange St.	N. 6th St.	250	270	215	400
N. 6th St.	7th St.	200	265	210	560
7th St.	9th St.	200	525	420	560
9th St.	Church St.	200	525	420	560
Church St.	N. University St.	200	525	420	560
N. University St.	Cook St.	200	525	420	560
Cook St.	Grove St. (end)	200	n/a	n/a	n/a

A summary of the fundamental equations used for this analysis and the input and output of the rail noise analysis is contained in Appendix D of this report.

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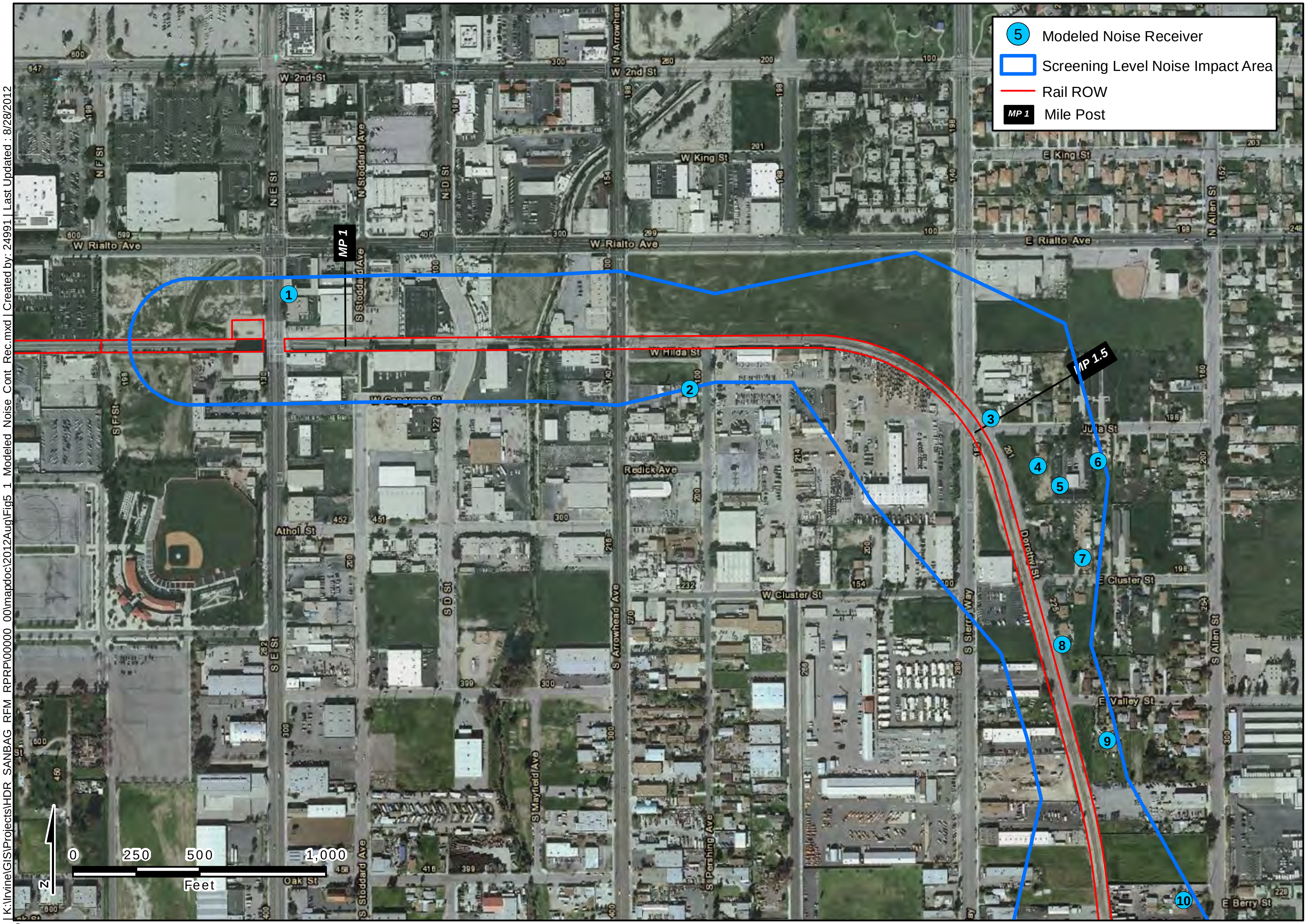


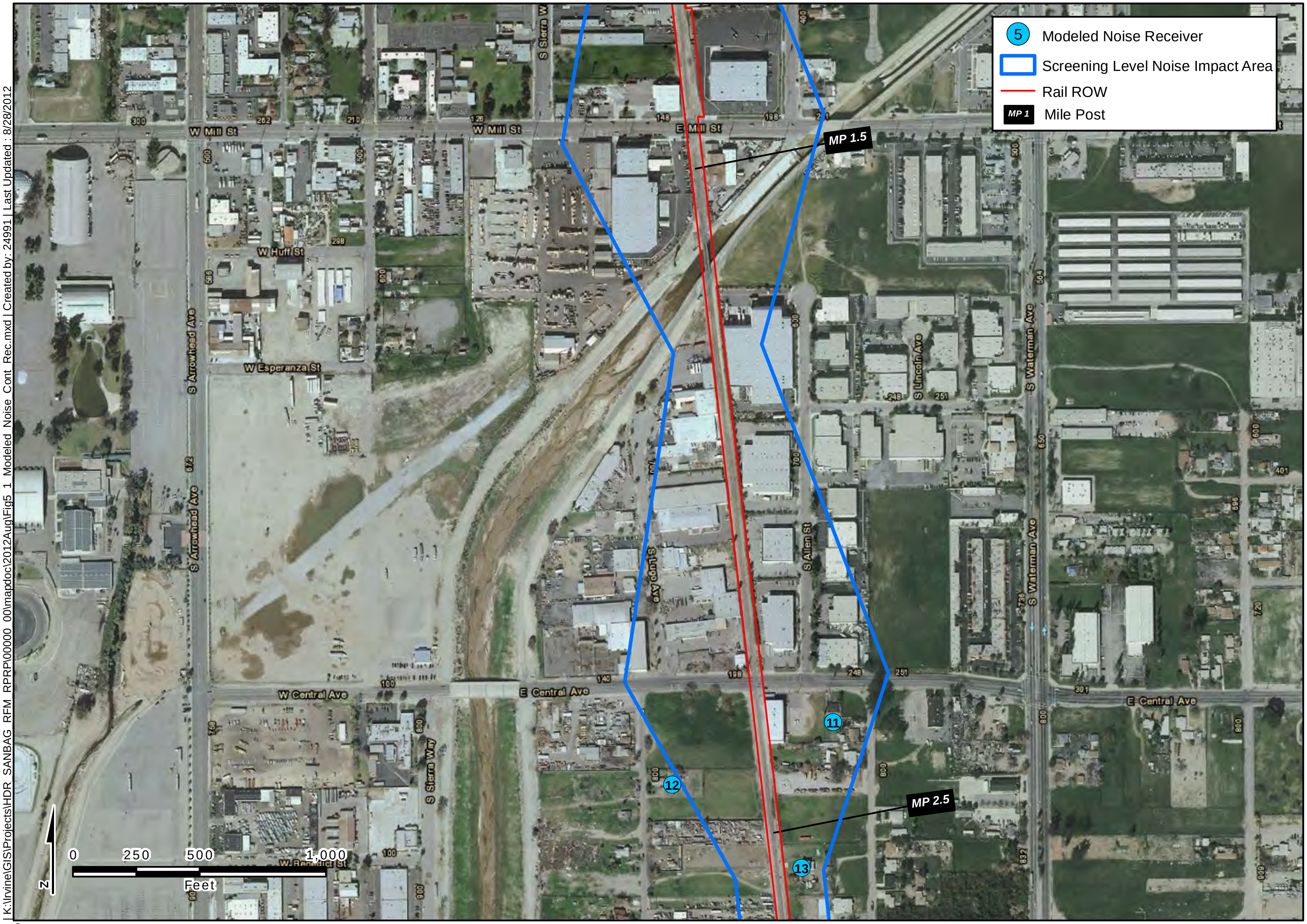
Sources

HDR ONE COMPANY | Many Solutions℠

Screening Level Area of Potential Impact and Modeled Receiver Locations

Figure 5-1 A

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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Sources

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Screening Level Area of Potential Impact and Modeled Receiver Locations

Figure 5-1 B

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

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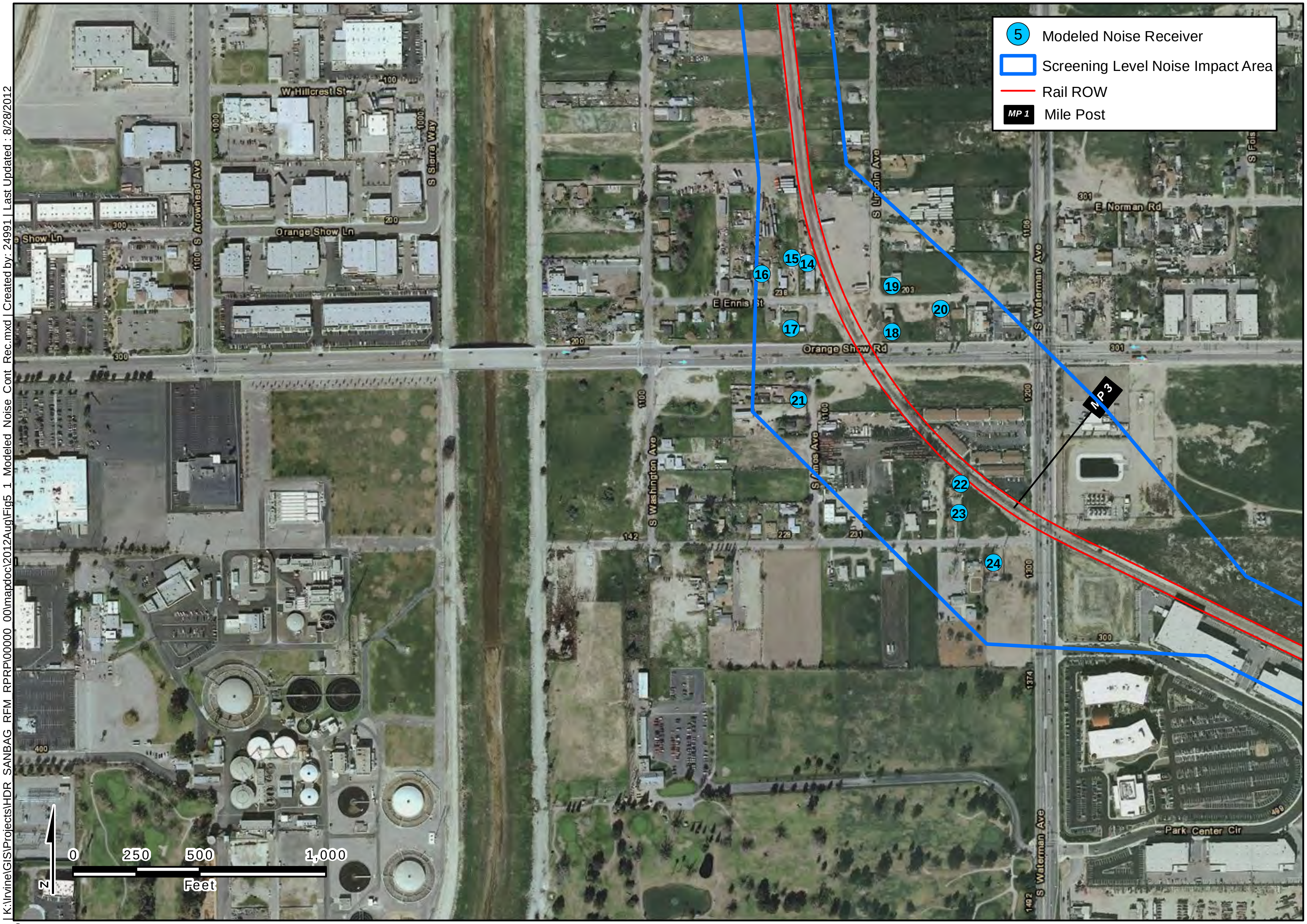

Sources

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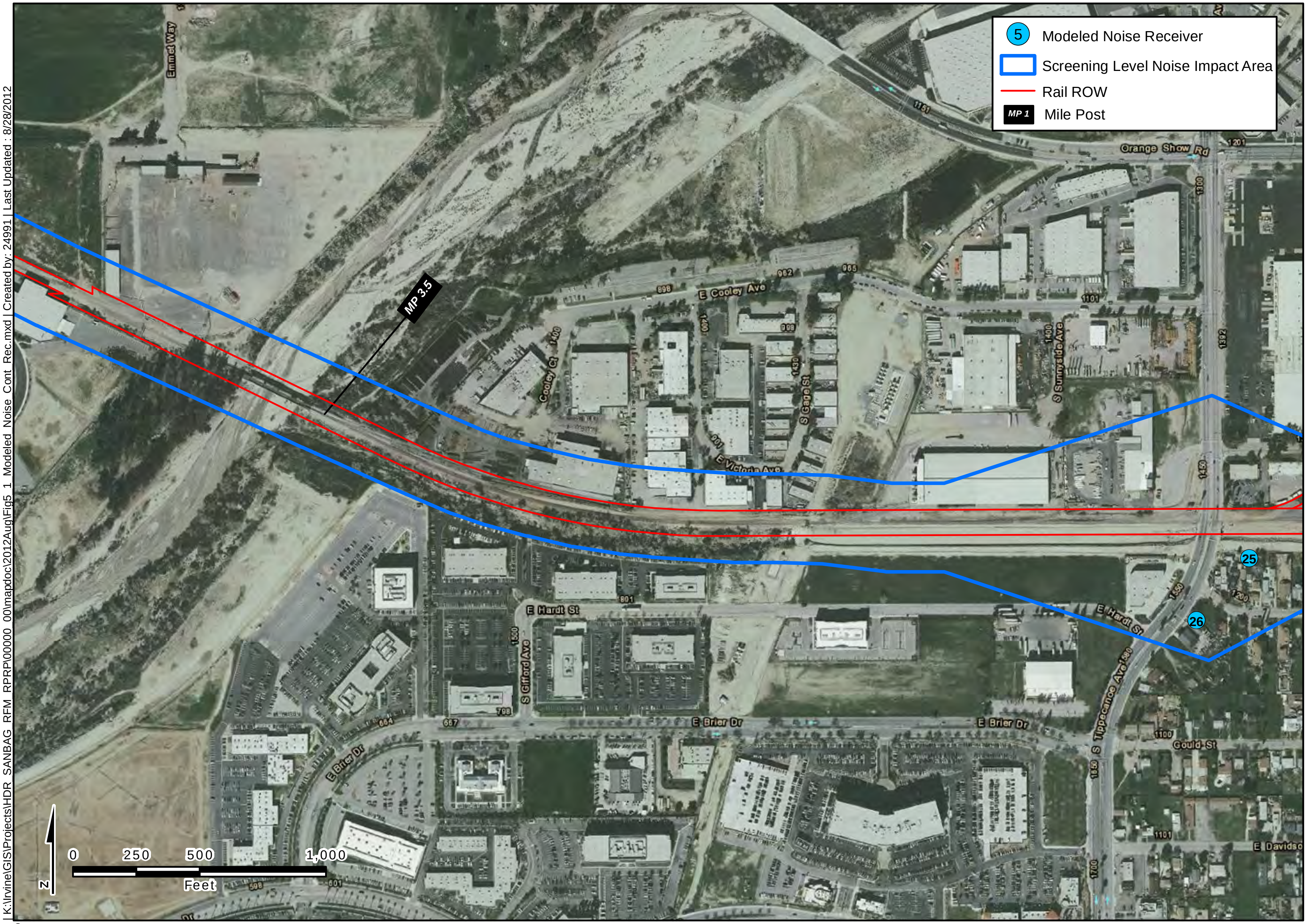
Screening Level Area of Potential Impact and Modeled Receiver Locations

Figure 5-1 C

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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Sources

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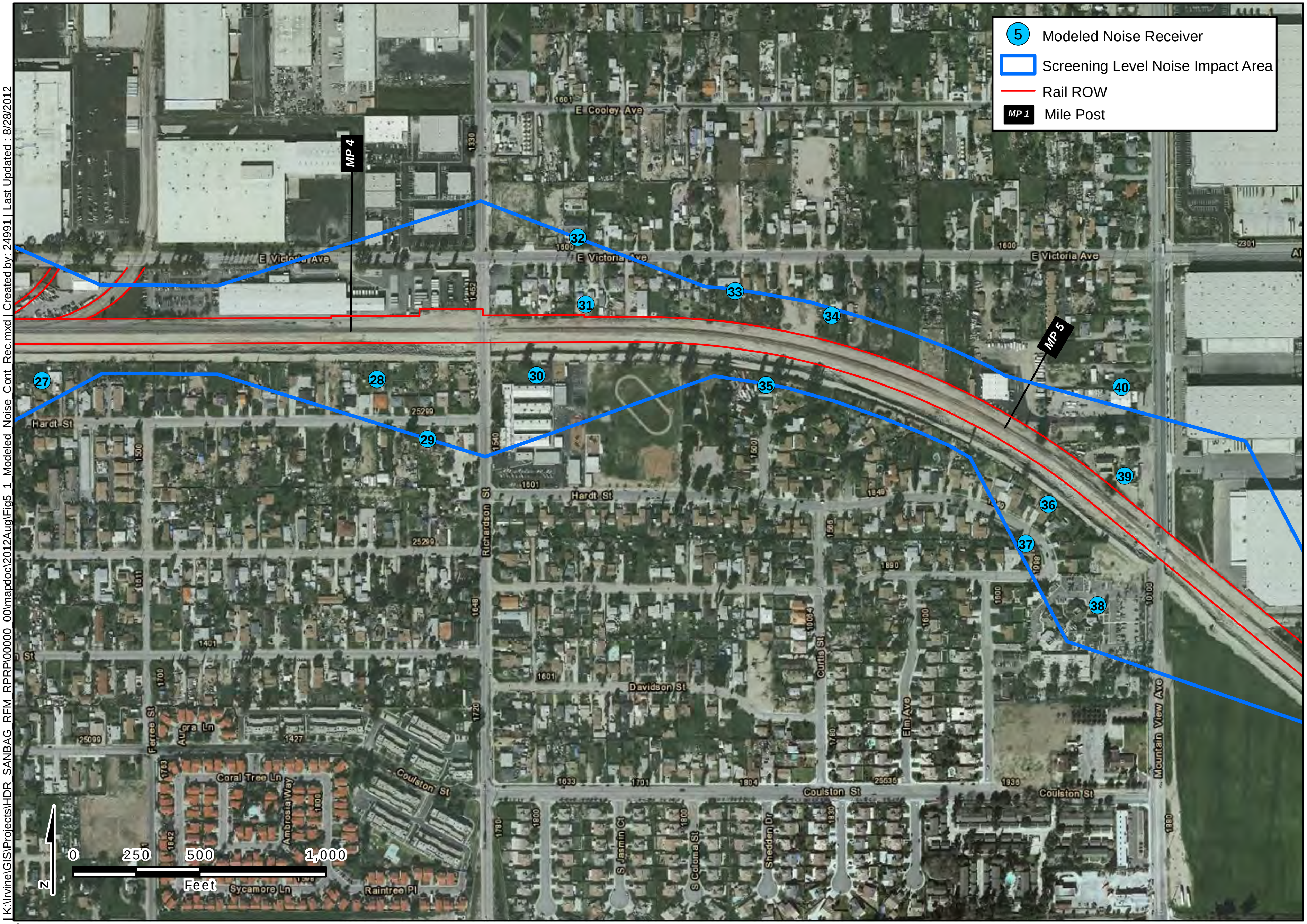
Screening Level Area of Potential Impact and Modeled Receiver Locations

Figure 5-1 D

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



Sources

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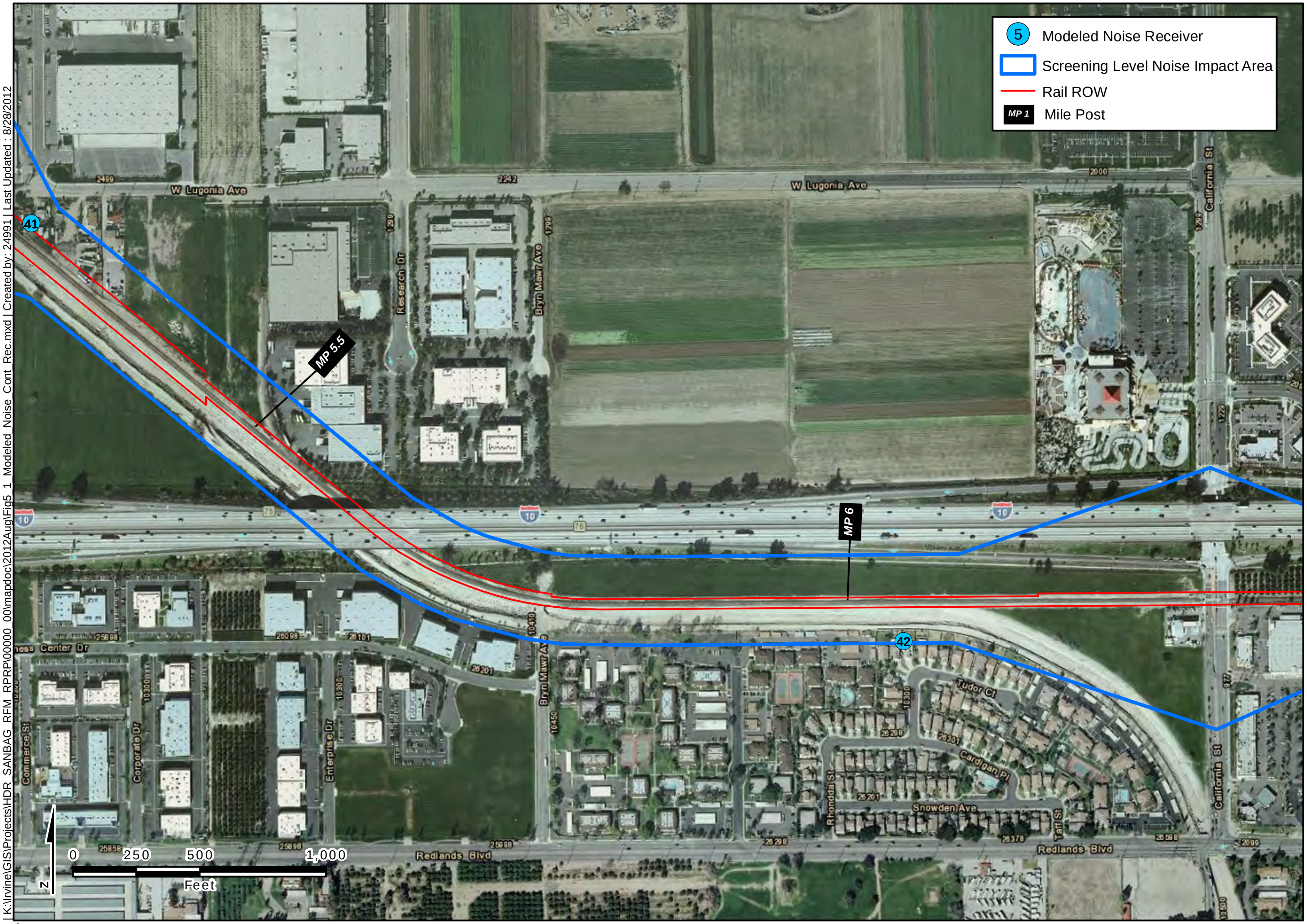
Screening Level Area of Potential Impact and Modeled Receiver Locations

Figure 5-1 E

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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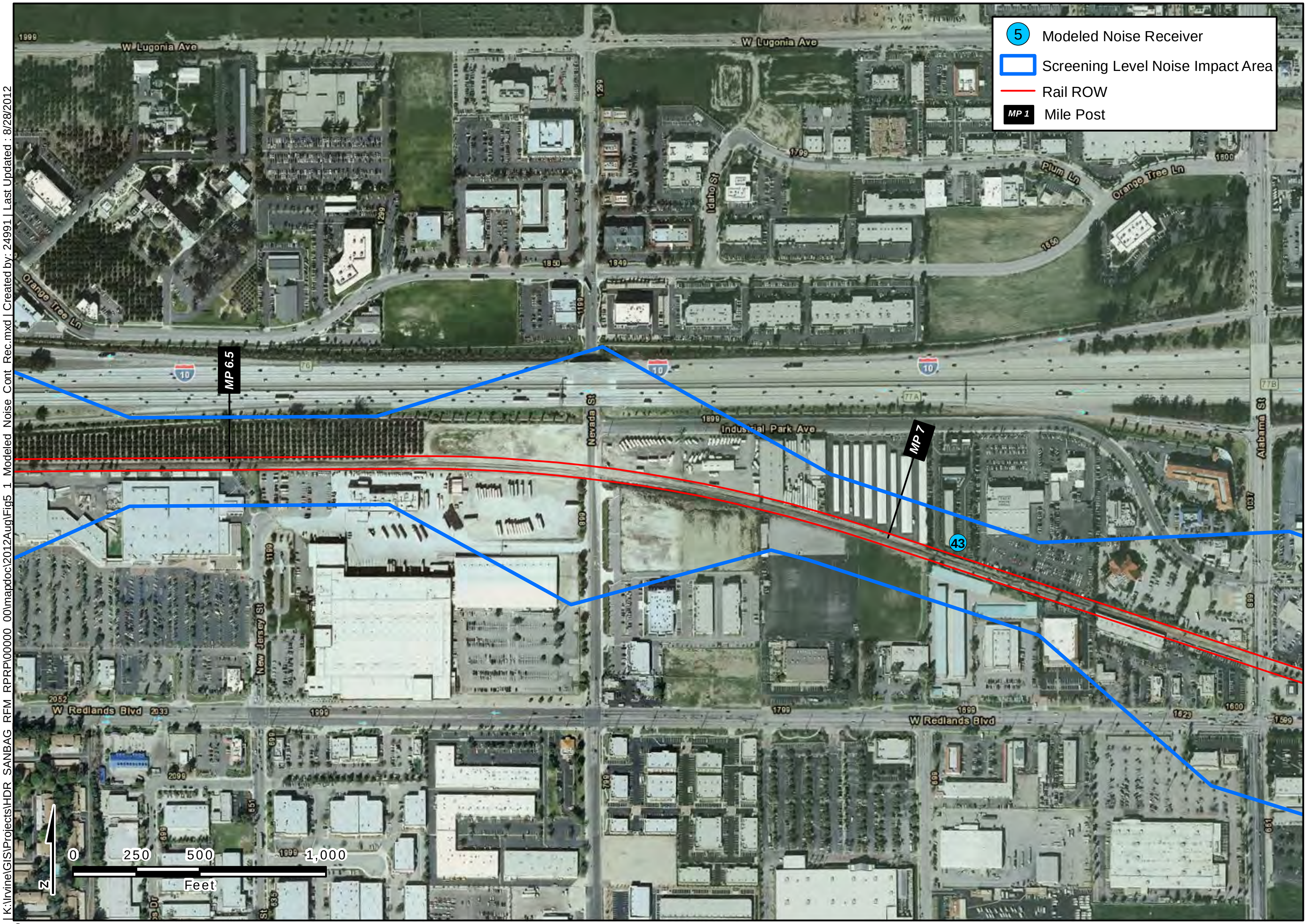
Screening Level Area of Potential Impact and Modeled Receiver Locations

Figure 5-1 F

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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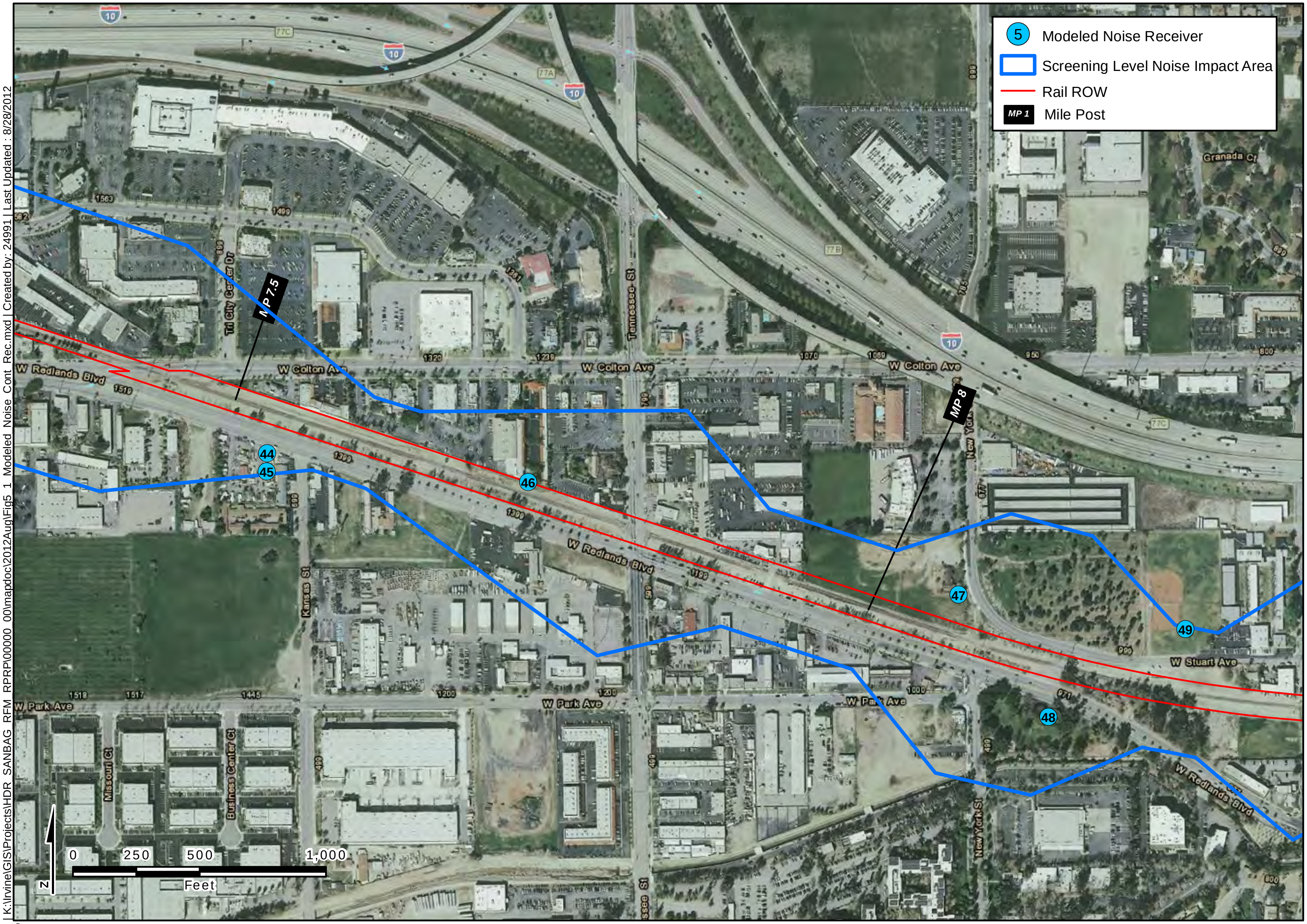
Screening Level Area of Potential Impact and Modeled Receiver Locations

Figure 5-1 G

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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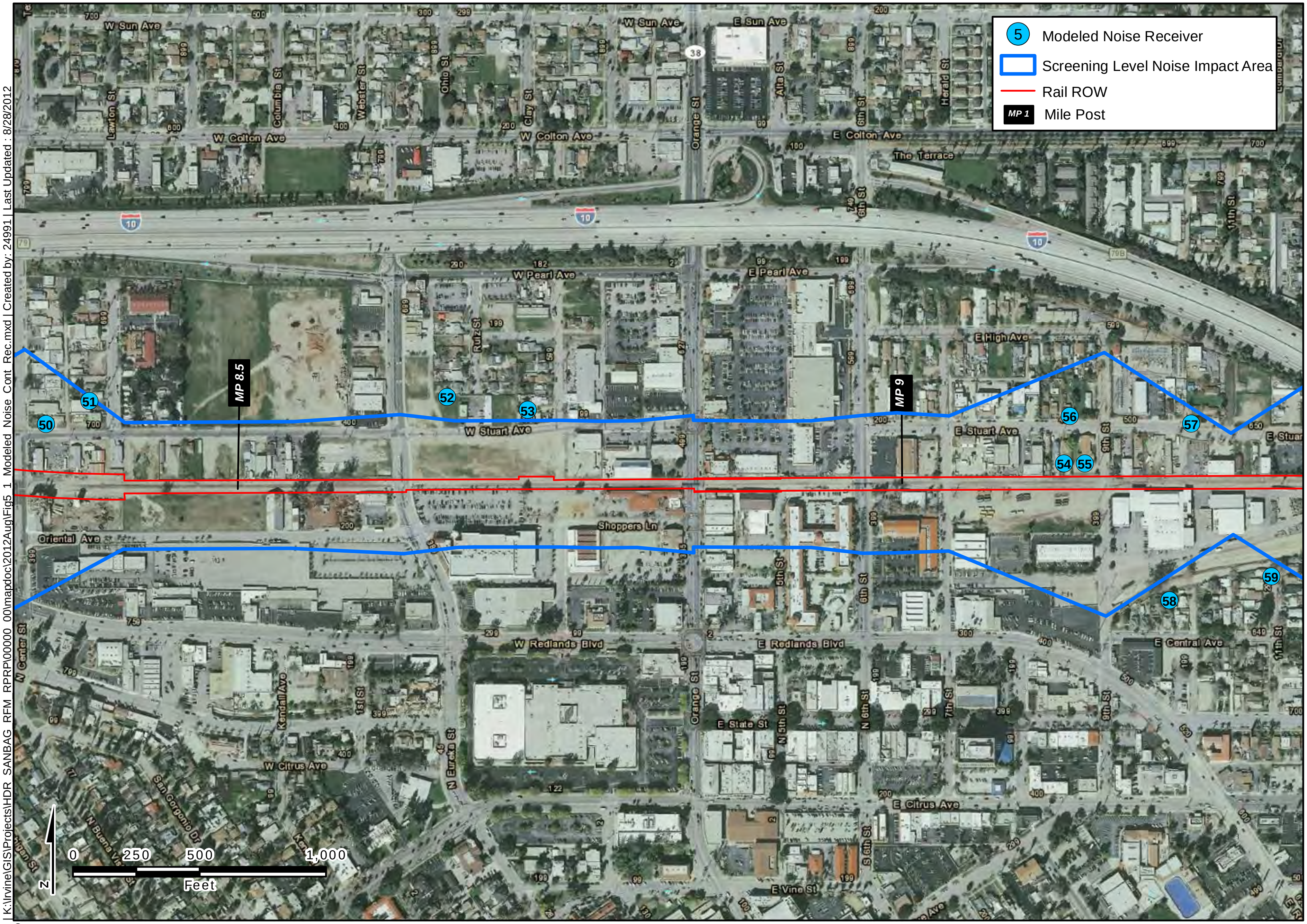
Screening Level Area of Potential Impact and Modeled Receiver Locations

Figure 5-1 H

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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Screening Level Area of Potential Impact and Modeled Receiver Locations

Figure 5-1 I

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

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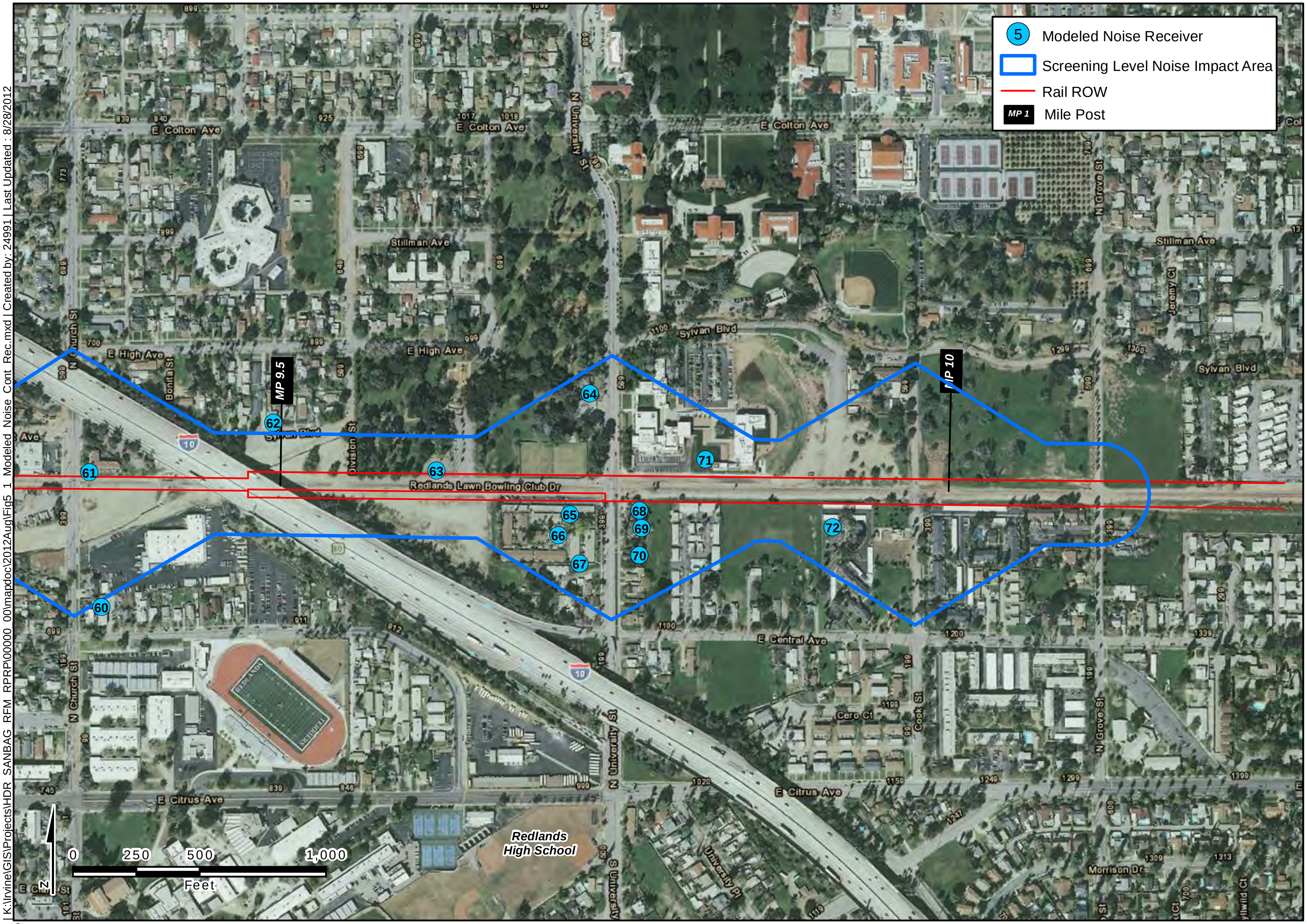

Sources

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Screening Level Area of Potential Impact and Modeled Receiver Locations

Figure 5-1 J

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

5.1.2 Traffic Noise

Traffic noise associated with the proposed Project was assessed using the Federal Highway Administration's (FHWA's) Traffic Noise Model (TNM), version 2.5. Inputs to the TNM include the locations of roadways, shielding features (e.g., topography and buildings), noise barriers, and receivers as well as ground type. For the purposes of this analysis (i.e., a comparison of potential effects from changes in project-related motor vehicle traffic volumes on the local roadways), a simple grid-type model was constructed. Shielding effects from structures or topography were not included in the model; however, because most of the exterior use areas have some acoustical shielding from either a fence or a building, a uniform 5-decibel (dB) reduction was assumed and deducted from all of the modeled results. Distances from receiver to roadway represent typical representative noise-sensitive receiver distances in the area. Posted traffic speed limits were used in the model for all project scenarios. Acoustically "hard" site conditions were assumed. Traffic volumes provided by the Project's traffic consultant (HDR) were used to estimate traffic noise levels at noise-sensitive receivers in the project study area for the following scenarios (HDR 2013):

- Existing.
- Future Year 2018 project-only traffic.
- Future Year 2038 project-only traffic.

The resulting project-related noise levels were then assessed for potential severe impacts using the same impact criteria used for rail noise (i.e., Figure 3-1, Noise Impact Criteria for Transit Projects, of the FTA manual, included in this report as Table 2-1). The modeled traffic volumes, as well as TNM model inputs and outputs, are contained in Appendix E. The traffic input to the TNM model consisted of peak-hour traffic volumes and, therefore, the model calculated peak-hour L_{eq} noise levels. These peak-hour levels were converted to L_{dn} noise levels using the 24-hour noise data of the nearest LT measurement sited (i.e., the difference between the measured peak-hour noise level L_{eq} and the L_{dn}).

5.1.3 Rail Station Parking Lot Noise

As described earlier, the Project proposes to construct up to four new rail stations with accommodation for parking (the E St. station will be constructed as part of the DSBPRP and the EA/EIR prepared for that project has been incorporated by reference into the RPRP environmental document). The FTA spreadsheet model was used to arrive at the adjusted screening distances, using the inputs for numbers of autos as shown in Appendix F. Screening distances for the respective station stops are as follows: 325 feet for the E St. station, 60 feet for the Tippecanoe St. station, 55 feet for the New York St. station, 80 feet for the Downtown Redlands station, and 50 feet for the University St. station. The input and output are included in Appendix F. Comparing the resultant adjusted screening distances to the nearest noise-sensitive receiver locations, it was determined that for each of the five stations, no noise-sensitive receivers are located within the applicable screening area. Therefore, the noise effects from these elements of the Project were not analyzed further.

5.1.4 Layover Facility Noise

The FTA spreadsheet model was used to arrive at the adjusted screening distances, using information provided by the project sponsor. The input and output are included in Appendix G. The resultant adjusted screening distance for the layover facility (85 feet) was compared with the distance to the nearest noise-sensitive receivers for the Preferred Project layover site location, the Design Option 1 location (Train Layover Facility at Waterman Ave.), and the Design Option 2 location (Use of Existing Train Layover Facilities location) (IEMF). It was found that for each of the three potential locations, no noise-sensitive receivers are located within the applicable screening area. Therefore, the noise effects from these elements of the Project were not analyzed further.

5.1.5 Wheel/Rail Noise

Wheel squeal is the noise produced by wheel-rail interaction, particularly on a curve where the radius of curvature is smaller than allowed by the separation of the axles in a wheel set. Wheel squeal has not been included in the noise projections, because wheel squeal is highly variable, which makes accurate projections difficult. Measures are included in Section 8.0, “Noise/Vibration Mitigation,” to minimize wheel squeal in areas of the Project with short radius curves.

5.2 Operational Vibration

The FTA procedure for a general operational vibration assessment (as outlined in Chapter 10 of the FTA manual) was used for this analysis. The FTA assessment procedure requires the following data:

- Number of daily vibration events.
- Receiver land use designation (categories specified above).
- Vibration source levels.
- Distance from source to receiver (building) footprints.
- Train speed, suspension, wheel condition (worn or flat-spots), track condition.
- Number of floors above grade to the receiver.
- Soil characteristics of ground between the vibration source and receiver.
- Receiver construction/foundation type and description, including whether it is fragile or extremely fragile.

For the operational vibration analysis, the number of daily events was classified as “occasional” because there would be between 30 and 70 vibration events of the same kind per day. Category 2 (for the residences) or Category 3 (parks, schools, churches) land use designations were used for all of the receivers analyzed, with the exception of the historic Redlands Depot and other historic properties, which are addressed below. The source levels were derived from Figure 10-1 of the FTA manual using the curve for “locomotive powered passenger or freight.” The distance between the source (i.e., rail centerline) and the receiver was measured using scaled aerial photographs showing the existing and proposed project alignment. Train speed estimates by segment were provided by the project proponent. Because the train type is a commuter train, the train’s wheels were assumed to be in good condition (i.e., no flat spots). Soil propagation characteristics were assumed to be “normal” (rather than “efficient”), and typical vibration-sensitive structures were assumed to be of wood-frame construction, based on field observations. Using the generalized ground surface vibration curve, the RMS velocity level data at the receiver distance of interest is adjusted based on the factors affecting the source, factors affecting the vibration path, and factors affecting the receiver, as specified in Table 10-1 of the FTA manual. The calculation spreadsheets are contained in Appendix H of this report.

The potential for damage to adjacent architectural resources from project-related operational vibration was investigated, in addition to the modeled noise- and vibration-sensitive receivers discussed above. The historic Redlands Depot, along with three other National Register–eligible or –listed buildings (the Cope Commercial Company Warehouse, Haight Packing House, and the brick warehouse at 440 Oriental Ave.), is located adjacent to the proposed alignment and, thus, is subject to potential vibration effects. Using assumptions[2] provided by the Project engineers (HDR) and the FTA methodology, as outlined above, the potential for vibration damage to the Depot (and, by extension, the other three historic structures) was analyzed.

[2] For the purposes of the potential damage assessment to the Depot, a distance of 42 feet from track centerline was used.

5.3 Construction Noise

Noise and vibration related to construction would result from operation of heavy equipment needed to implement the Project.

The FTA manual (Chapter 12) contains several sets of tables listing suggested construction noise impact criteria, depending upon the level of detail/understanding of the construction phase. For the more detailed approach (which is applicable to the Project), the following set of impact criteria are suggested (Table 5-2). Table 5-2 provides different impact criteria levels for daytime and nighttime construction. Daytime is defined as 7 a.m. to 10 p.m., and nighttime is defined as 10 p.m. to 7 a.m.

Table 5-2. Prescriptive FTA Construction Noise Impact Guidelines

Land Use	8-Hour L_{eq} (dBA)		30-Day Average L_{dn} (dBA)
	Day	Night	
Residential	80	70	75[a]
Commercial	85	85	80[b]
Industrial	90	90	85[b]

a. In urban areas with very high ambient noise levels (L_{dn} > 65 dB), L_{dn} from construction operations should not exceed existing ambient + 10 dB.

b. 24-hour L_{eq}, not L_{dn}.

Source: FTA 2006.

Noise from construction activity is generated by the broad array of powered noise-producing mechanical equipment used in the construction process. This equipment ranges from hand-held pneumatic tools to excavators, loaders, a variety of trucks, and tie and rail handling equipment. The complement of noise-producing construction equipment and construction scheduling information was provided by the project sponsor and has been used to estimate worst-case construction noise levels.

To assess potential noise effects from construction, this noise analysis used the methodology in Chapter 12 of the FTA manual. For the proposed Project, the construction work schedule/phasing and equipment information provided by the project sponsor was used to estimate noise levels for the construction activities having the most daily equipment usage (i.e., daily engine-hours). The noise exposure at a receiver location was calculated from the decibel addition of all operating construction equipment using the equations and methodology detailed in Appendix I. For example, the attenuation rate used as a point source was 6 decibels per doubling of distance. The intervening ground was generally hard surfaced, thus, any additional reduction from ground effects was negligible. Where applicable, shielding effects from intervening structures were accounted for using the same shielding calculations used in the rail noise analysis (i.e., Table 6-9 of the FTA manual). Table 12-1 of the FTA Manual (page 12-6), presents the construction source noise emission levels at a reference distance of 50 feet. Construction equipment used in the analysis included trucks, loaders, rollers, mobile cranes, ballast tampers, generators, and other items, as detailed in Appendix I. The range in noise levels typically generated by the equipment assumed for the analysis ranges from 74 dBA L_{eq} to 90 dBA L_{eq} at a distance of 50 feet.

5.4 Construction Vibration

Vibrations resulting from activities with the potential to result in an effect during project construction were analyzed, using the methodology contained in Section 12.2 of the FTA manual. Vibration source levels for a variety of typical construction equipment types are supplied in Table 12-2 of the manual (reproduced here as Table 5-3, below) in terms of PPV in inches per second at a reference distance of 25 feet from the source and RMS velocity in decibels[3] (VdB) at 25 feet. For this analysis, the source vibration level for a vibratory roller (0.210 inch per second PPV) was utilized for all of the receivers analyzed, with the exception of the historic Redlands Depot and three other historic properties, which are addressed below.

The potential for damage to adjacent architectural resources from project-related construction vibration was investigated, in addition to the modeled noise- and vibration-sensitive receivers discussed above. The historic Redlands Depot, along with three other National Register–eligible or –listed buildings (the Cope Commercial Company Warehouse, Haight Packing House, and the brick warehouse at 440 Oriental Ave.), is located adjacent to the proposed alignment and, thus, is subject to potential vibration effects. Using assumptions[4] provided by the Project engineers (HDR) and the FTA methodology, as outlined above, the potential for construction vibration damage to the Depot (and, by extension, the other three historic structures) was analyzed.

5.5 Alternatives Analysis

The analysis herein is specific to the proposed Project, except as noted. Under Alternative 1 (the No Build Alternative), the Project would not be constructed or operated; thus, no project-related noise or vibration effects would occur. The main distinguishing feature under Design Option 1 that differentiates it from the Preferred Project (Alternative 2) is the relocation of the proposed train layover facility at an alternate site location, east of Waterman Ave., west of the Santa Ana River, and immediately north of the rail corridor. Design Option 2 would integrate layover operations with existing train layover facilities at Metrolink's EMF and IEMF. Under Alternative 3 (Reduced Project Footprint), the Project would be constructed within a reduced footprint to minimize disturbances to biological and cultural resources that border and intersect the rail corridor. Noise from construction and operation of the project would be equivalent to that of the Preferred Project.

Therefore, with the exception of the assessment of the layover facility, noise and vibration effects would essentially be the same or similar for the Preferred Project (Alternative 2), Design Options 1 and 2, and Alternative 3.

Table 5-3. Typical Construction Equipment Vibration Levels

Equipment/Source		Peak Particle Velocity at 25 Feet (in/sec)	Approximate L_v[a] at 25 Feet
Pile Driver (Impact)	Upper range	1.518	112
	Typical	0.644	104
Pile Driver (Vibratory)	Upper range	0.734	105
	Typical	0.170	93
Clam Shovel Drop (Slurry Wall)	--	0.202	94
Hydromill (Slurry Wall)	In soil	0.008	66
	In rock	0.017	75
Vibratory Roller	--	0.210	94
Hoe Ram	--	0.089	87
Large Bulldozer	--	0.089	87

[3] One micro-inch per second.
[4] Assumptions for the historic structures analysis for construction activities were as follows: Source vibration level of 0.089 inch per second PPV for a loaded truck or a large bulldozer. Source-receiver distance could be within 5 feet or less of structure. For the purposes of the potential damage assessment, a distance of 5 feet was used.

Equipment/Source		Peak Particle Velocity at 25 Feet (in/sec)	Approximate L_v[a] at 25 Feet
Caisson Drilling	--	0.089	87
Loaded Trucks	--	0.076	86
Jackhammer	--	0.035	79
Small Bulldozer	--	0.003	58

[a] Root mean square (RMS) velocity in decibels (VdB) reference 1 micro-inch per second.

Source: FTA manual, Table 12-3, 2006.

6.0 IMPACT ASSESSMENT

6.1 OPERATIONAL NOISE

6.1.1 Rail Noise

The results of the rail noise impact assessment are summarized in Table 6-1 and shown graphically in Figure 6-1. There would be increased rail noise resulting in moderate or severe impacts at Category 2 (residential, hotel/motel) and Category 3 (parks, a school, day care facility, church) land uses along the project alignment, as described below by MP segment.

In summary, the impact would be considered moderate at a total of 21 receivers, representing 115 Category 2 and three Category 3 land uses. The impact would be considered severe at a total of 22 receivers, representing 83 Category 2 land uses. Mitigation measures for reducing these moderate and severe rail noise impacts are presented in Section 8.0.

MP 1 to MP 2 (E St. to southeast of Sierra Way). As depicted in Figure 6-1A and summarized in Table 6-1, moderate impacts from project-related rail noise are predicted to occur at two receivers (Receivers[5] 5 and 9) representative of a total of 32 residential (Category 2) land uses in the area. As depicted in Figure 6-1A and summarized in Table 6-1, severe impacts from project-related rail noise are predicted to occur at four receivers (Receivers 2, 3, 4 and 8) representative of a total of 13 residential (Category 2) land uses in the area. No Category 3 land uses would be affected in the area.

MP 2 to MP 3.5 (southeast of Sierra Way to southeast of South Waterman Ave.). As depicted in Figures 6-1B and 6-1C and summarized in Table 6-1, moderate impacts from project-related rail noise are predicted to occur at five receivers (Receivers 11, 12, 16, 20 and 21) representative of a total of 10 residential (Category 2) land uses in the area. As depicted in Figures 6-1B and 6-1C and summarized in Table 6-1, severe impacts from project-related rail noise are predicted to occur at nine receivers (Receivers 13,14, 15, 17, 18, 19, 22, 23, and 24) representative of a total of 21 residential (Category 2) land uses in the area. No Category 3 land uses would be affected in the area.

MP 3.5 to MP 6 (Southeast of South Waterman Ave. to Bryn Mawr Ave.). As depicted in Figures 6-1D and 6-1E and summarized in Table 6-1, moderate impacts from project-related rail noise are predicted to occur at four receivers (Receivers 25, 27, 28, and 40) representative of a total of 32 residential (Category 2) land uses in the area. As depicted in Figures 6-1E and 6-1F and summarized in Table 6-1, severe impacts from project-related rail noise are predicted to occur at five receivers (Receivers 31, 33, 36, 39, and 41), representative of a total of 33 residential (Category 2) land uses in the area. No Category 3 land uses would be affected in the area.

MP 6 to MP 8.5 (Bryn Mawr Ave. to east of Texas St.). As depicted in Figure 6-1H and summarized in Table 6-1, moderate impacts from project-related rail noise are predicted to occur at two receivers (Receivers 44and 47) representative of a total of 7 Category 2 land uses in the area. As depicted in Figure 6-1H and summarized in Table 6-1, severe impacts from project-related rail noise are predicted to occur at one receiver (Receiver 46), representative of a total of one Category 2 (hotel/motel) land use. No Category 3 land uses would be affected in the area.

MP 8.5 to MP 10 (East of Texas St. to east of North University St.). As depicted in Figure 6-1J and summarized in Table 6-1, moderate impacts from project-related rail noise are predicted to occur at five receivers (Receivers 62, 64, 65, 69 and 72) representative of a total of 29 residential (Category 2) land

[5] Modeled receiver locations are shown in Figures 5-1 and 6-1.

uses in the area. As depicted in Figures 6-1I and 6-1J and summarized in Table 6-1, moderate impacts from project-related rail noise are predicted to occur at three receivers (Receivers 55, 63, and 71), representative of a total of three Category 3 land uses (a church, a park, and a school [University of Redlands]). As depicted in Figures 6-1I and 6-1J and summarized in Table 6-1, severe impacts from project-related rail noise are predicted to occur at three receivers (Receivers 54, 61, and 68), representative of a total of 15 Category 2 land uses in the area.

Table 6-1. Rail Noise Assessment Inventory Table

Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Existing Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	Closest Distance to Project (Feet)[1]	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	FTA Level of Noise Impact[2]
MP 1 to MP 2: E St. to southeast of Sierra Way							
1	Commercial/Transient Residential use east of N. E St. and north of alignment (includes horn noise)	Transient Residential / Commercial (Motel) / 2	1	69	200	57	No Impact
2	200' to 400' south of alignment, west of Pershing Ave.	Residential / 2	2	55	200	62	Severe Impact
3	50' to 100' east of alignment, east of Dorothy St.	Residential / 2	3	55	75	68	Severe Impact
4	100 to 200' east of alignment, east of Dorothy St.	Residential / 2	3	55	150	64	Severe Impact
5	200 to 400' east of alignment, east of Dorothy St.	Residential / 2	32	55	220	61	Moderate Impact
6	400 to 800' east of alignment, east of Dorothy St.	Residential / 2	8	55	400	51	No Impact
7	200 to 400' east of alignment, east of Dorothy St.	Residential / 2	3	55	250	55	No Impact
8	50' to 100' east of alignment, east of Dorothy St.	Residential / 2	5	55	75	68	Severe Impact
9	100 to 200' east of alignment, east of Dorothy St.	Residential / 2	1	55	150	56	Moderate Impact
10	200 to 400' east of alignment, east of Dorothy St.	Residential / 2	1	55	300	54	No Impact
MP 2 to MP 3.5: Southeast of Sierra Way to southeast of South Waterman Ave.							
11	200 to 400' east of alignment, east of Lincoln Ave.	Residential / 2	3	52	275	55	Moderate Impact
12	200' to 400' west of alignment, east of S. Washington Ave.	Residential / 2	1	52	350	58	Moderate Impact
13	100 to 200' east of alignment, east of Lincoln Ave.	Residential / 2	6	52	100	66	Severe Impact

Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Existing Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	Closest Distance to Project (Feet)[1]	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	FTA Level of Noise Impact[2]
14	50' to 100' west of alignment, east of S. Washington Ave.	Residential / 2	1	52	75	68	Severe Impact
15	100' to 200' west of alignment, east of S. Washington Ave.	Residential / 2	2	52	125	65	Severe Impact
16	200' to 400' west of alignment, east of S. Washington Ave.	Residential / 2	3	52	250	55	Moderate Impact
17	200' to 400' west of alignment, east of S. Washington Ave.	Residential / 2	2	52	200	62	Severe Impact
18	100' to 200' east of alignment, south of Ennis St.	Residential / 2	1	52	150	64	Severe Impact
19	200' to 400' east of alignment, east of Lincoln Ave.	Residential / 2	2	52	200	62	Severe Impact
20	200' to 400' east of alignment, east of Lincoln Ave.	Residential / 2	2	52	350	58	Moderate Impact
21	400' to 800' west of alignment, south of Orange Show Rd.	Residential / 2	1	52	325	59	Moderate Impact
22	50' to 100' southwest of alignment, north of Dumas St.	Residential / 2	1	52	50	71	Severe Impact
23	100' to 200' southwest of alignment, north of Dumas St.	Residential / 2	2	52	140	64	Severe Impact
24	200' to 400' southwest of alignment, north of Dumas St.	Residential / 2	4	52	220	61	Severe Impact
MP 3.5 to MP 6: Southeast of South Waterman Ave. to Bryn Mawr Ave.							
25	100' to 200' south of alignment, east of Tippecanoe Ave.	Residential / 2	3	64	140	64	Moderate Impact
26	200' to 400' south of alignment, east of Tippecanoe Ave.	Residential / 2	8	64	380	58	No Impact
27	100' to 200' south of alignment, east of Tippecanoe Ave.	Residential / 2	8	64	175	63	Moderate Impact
28	100' to 200' south of alignment, west of S. Richardson St.	Residential / 2	18	64	175	63	Moderate Impact
29	200' to 400' south of alignment, west of S. Richardson St.	Residential / 2	4	64	390	53	No Impact
30	100' to 200' south of alignment, east of S. Richardson St.	Recreation (School Athletic Fields) and School / 3	1	55	175	60	No Impact (Category 3)

Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Existing Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	Closest Distance to Project (Feet)[1]	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	FTA Level of Noise Impact[2]
31	100' to 200' north of alignment, east of S. Richardson St.	Residential / 2	6	58	100	66	Severe Impact
32	200' to 400' north of alignment, east of S. Richardson St.	Residential / 2	5	58	320	54	No Impact
33	100' to 200' north of alignment, south of Victoria Ave.	Residential / 2	8	58	150	64	Severe Impact
34	100' to 200' north of alignment, south of Victoria Ave.	Residential / 2	4	58	150	56	No Impact
35	100' to 200' south of alignment, north of E. Gould St.	Residential / 2	8	58	175	55	No Impact
36	100' to 200' south of alignment, north of E. Gould St.	Residential / 2	10	58	150	64	Severe Impact
37	200' to 400' south of alignment, west of Mountain View Ave.	Residential / 2	7	58	350	53	No Impact
38	200' to 400' south of alignment, west of Mountain View Ave.	Day Care Facility / 3	1	55	340	56	No Impact (Category 3)
39	100' to 200' north of alignment, south of Victoria Ave.	Residential / 2	3	58	125	65	Severe Impact
40	200' to 400' north of alignment, south of Victoria Ave.	Residential / 2	3	58	350	58	Moderate Impact
41	50' to 100' north of alignment, east of Mountain View Ave.	Residential / 2	6	58	50	71	Severe Impact
MP 6 to MP 8.5: Bryn Mawr Ave. to east of Texas St.							
42	100' to 200' south of alignment, east of Bryn Mawr Ave.	Residential / 2	8	71	150	56	No Impact
43	50' to 100' north of alignment, east of Nevada St.	Transient Residential / Commercial (Motel)	1	67	75	60	No Impact
44	100' to 200' south of alignment, south of Redlands Blvd.	Residential / 2	6	67	150	64	Moderate Impact
45	200' to 400' south of alignment, south of Redlands Blvd.	Residential / 2	22	67	225	55	No Impact
46	0' to 100' north of alignment, west of Tennessee St.	Transient Residential / Commercial (Motel) / 2	1	67	75	68	Severe Impact
47	100' to 200' north of alignment, west of New York St.	Residential / 2	1	62	175	63	Moderate Impact

Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Existing Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	Closest Distance to Project (Feet)[1]	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	FTA Level of Noise Impact[2]
48	200' to 400' south of alignment, south of Redlands Blvd.	Recreation (Park) / 3	1	60	200	60	No Impact (Category 3)
49	200' to 400' north of alignment, west of Texas St.	Recreation (School Athletic Fields) and School / 3	1	57	250	58	No Impact (Category 3)
50	200' to 400' north of alignment, east of Texas St.	Residential / 2	6	62	240	56	No Impact
51	200' to 400' north of alignment, east of Texas St.	Residential / 2	1	62	350	51	No Impact
MP 8.5 to MP 10: East of Texas St. to east of North University St. (Project End)							
52	200' to 400' north of alignment, east of Eureka St.	Residential / 2	3	62	375	58	No Impact
53	200' to 400' north of alignment, east of Texas St.	Residential / 2	1	62	300	55	No Impact
54	50' to 100' north of alignment, west of 9th St.	Residential / 2	3	67	75	68	Severe Impact
55	50' to 100' north of alignment, west of 9th St.	Church / 3	1	61	80	66	Moderate Impact (Category 3)
56	200' to 400' south of alignment, west of Church St.	Residential / 2	4	67	475	52	No Impact
57	200' to 400' south of alignment, west of Church St.	Residential / 2	4	67	250	56	No Impact
58	200' to 400' north of alignment, east of 9th St.	Residential / 2	10	67	225	56	No Impact
59	200' to 400' north of alignment, east of 9th St.	Residential / 2	10	67	225	56	No Impact
60	200' to 400' south of alignment, east of Church St.	Residential / 2	3	67	475	52	No Impact
61	50' to 100' north of alignment, east of Church St.	Residential / 2	6	67	50	71	Severe Impact
62	200' to 400' north of alignment, north of Sylvan Blvd.	Residential / 2	7	64	250	61	Moderate Impact
63	50' to 100' north of alignment, north of Park Ave.	Recreation (Park) / 3	1	61	75	68	Moderate Impact (Category 3)
64	100' to 200' south of alignment, west of University St.	Residential / 2	1	64	100	62	Moderate Impact

Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Existing Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	Closest Distance to Project (Feet)[1]	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	FTA Level of Noise Impact[2]
65	100' to 200' south of alignment, west of University St.	Residential / 2	8	64	100	62	Moderate Impact
66	100' to 200' south of alignment, west of University St.	Residential / 2	10	64	175	56	No Impact
67	200' to 400' south of alignment, west of University St.	Residential / 2	4	64	300	52	No Impact
68	50' to 100' south of alignment, east of University St.	Residential / 2	6	61	75	69	Severe Impact
69	100' to 200' south of alignment, east of University St.	Residential / 2	7	61	150	59	Moderate Impact
70	200' to 400' south of alignment, east of University St.	Residential / 2	4	61	250	54	No Impact
71	100' to 200' north of alignment, east of University St.	School (University of Redlands) / 3	1	54	150	63	Moderate Impact (Category 3)
72	100' to 200' south of alignment, east of Cook St.	Residential / 2	6	61	125	60	Moderate Impact

[1] As measured from the ROW centerline.

[2] Represents FTA impact criteria.

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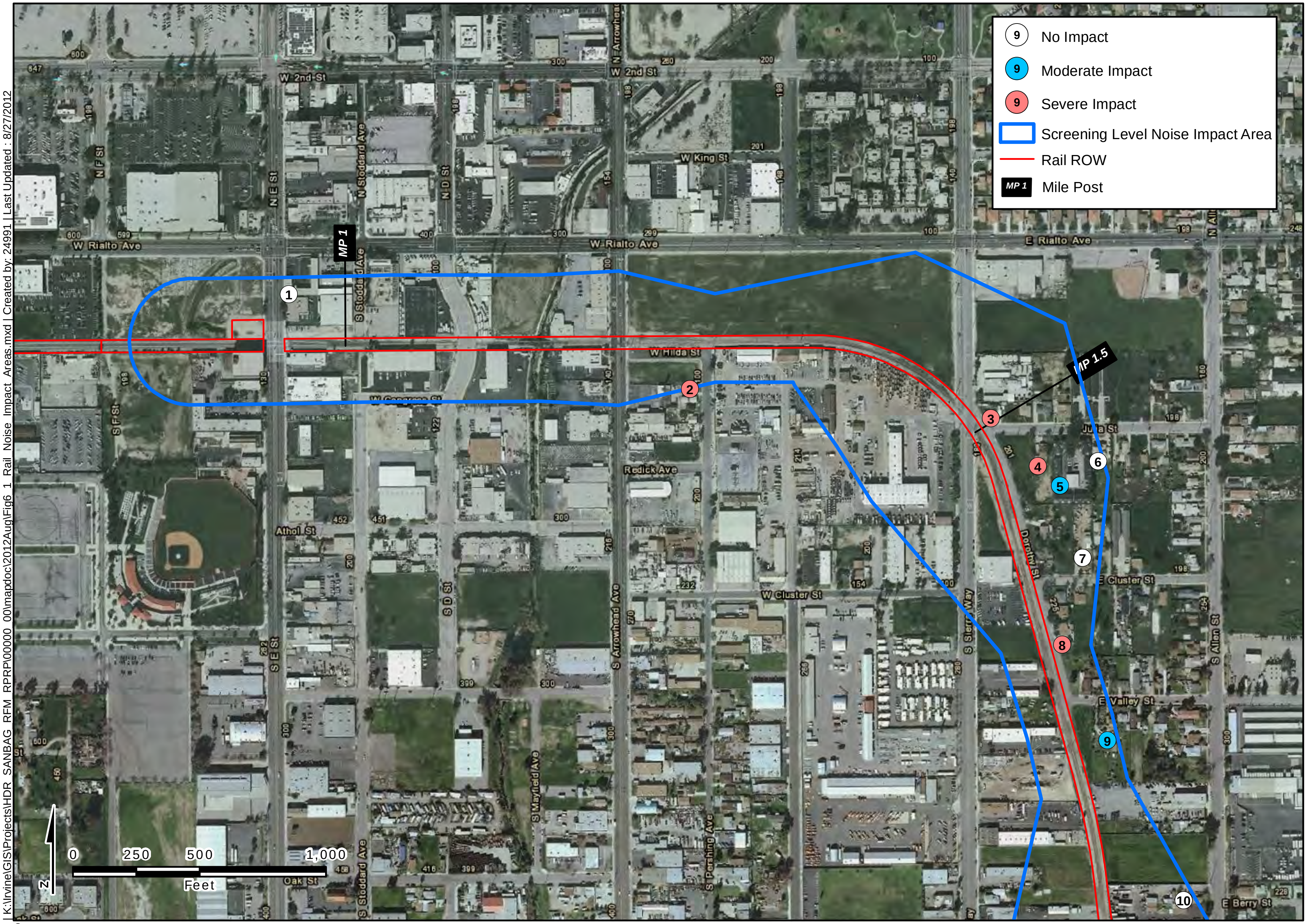

Sources

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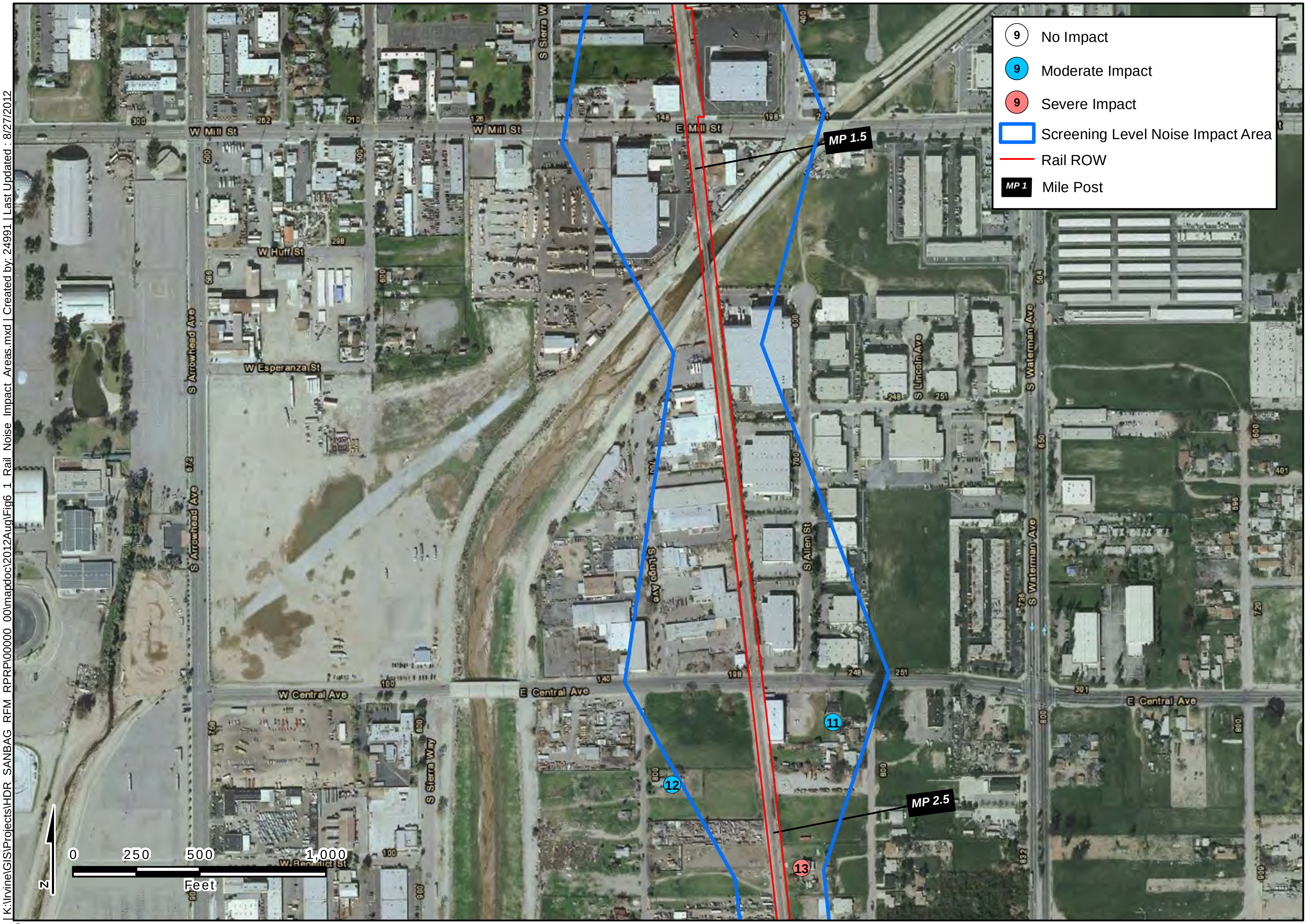
Rail Noise Impact Areas

Figure 6-1 A

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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Sources

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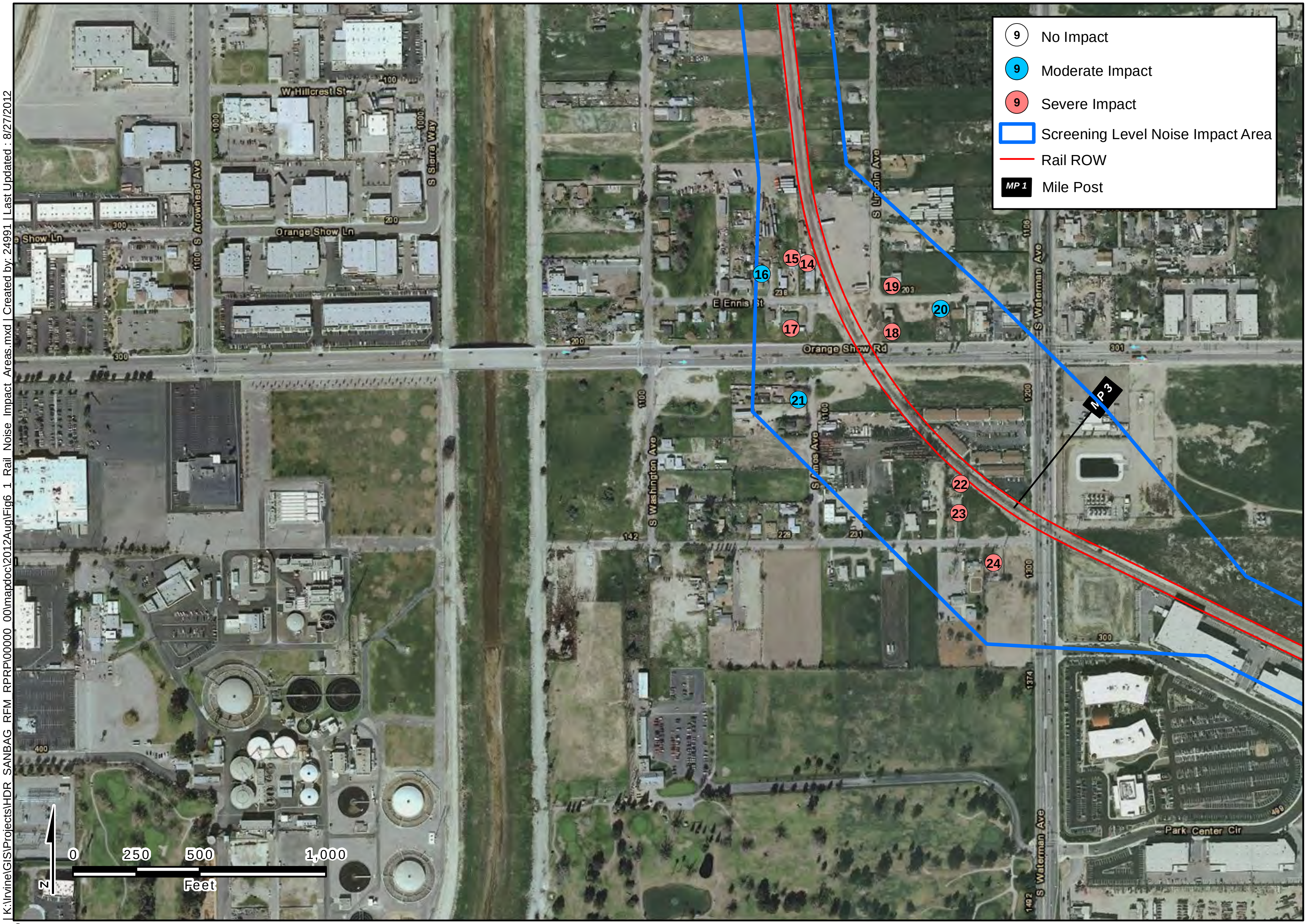
Rail Noise Impact Areas

Figure 6-1 B

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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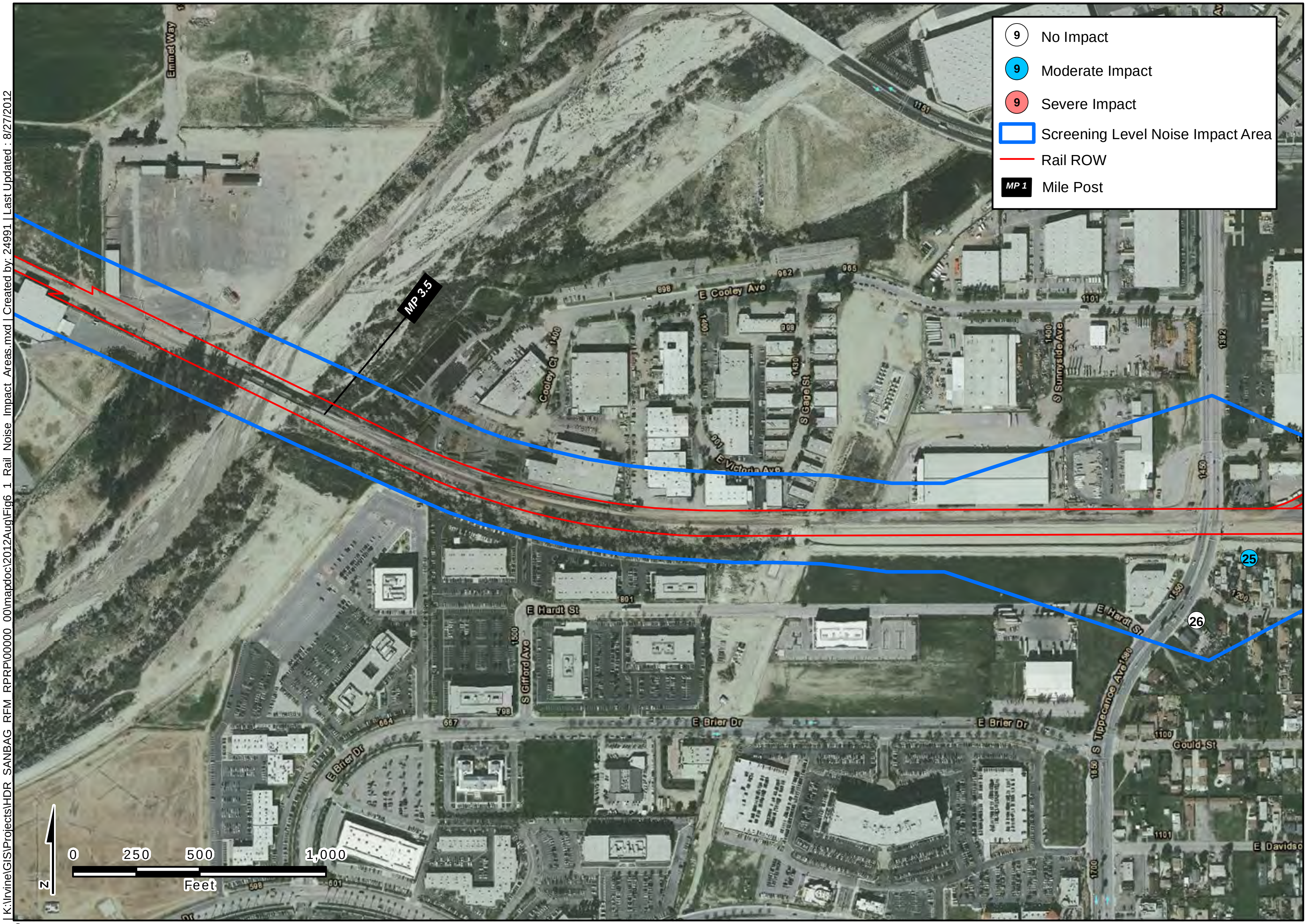
Rail Noise Impact Areas

Figure 6-1 C

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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Rail Noise Impact Areas

Figure 6-1 D

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

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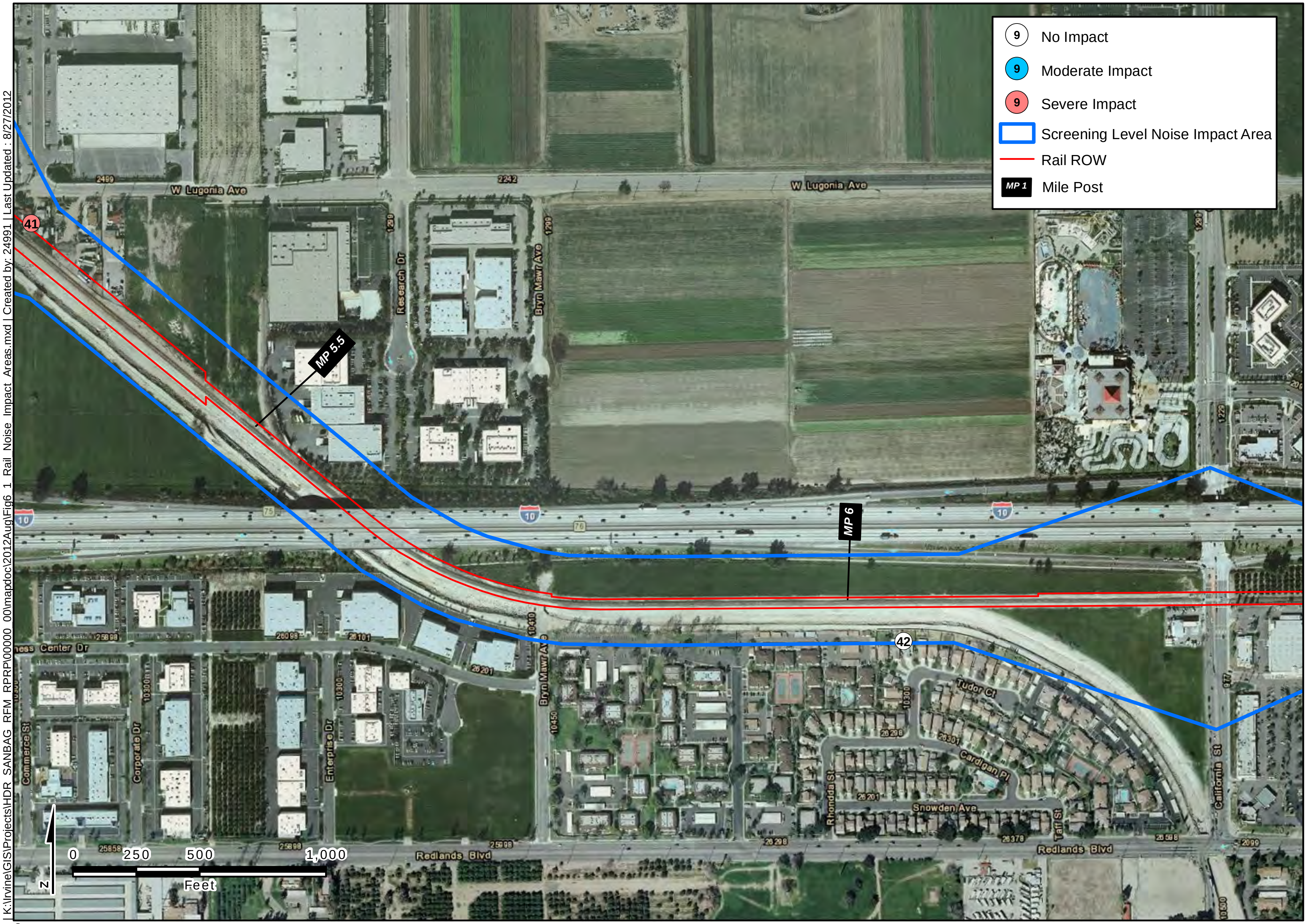
Rail Noise Impact Areas

Figure 6-1 E

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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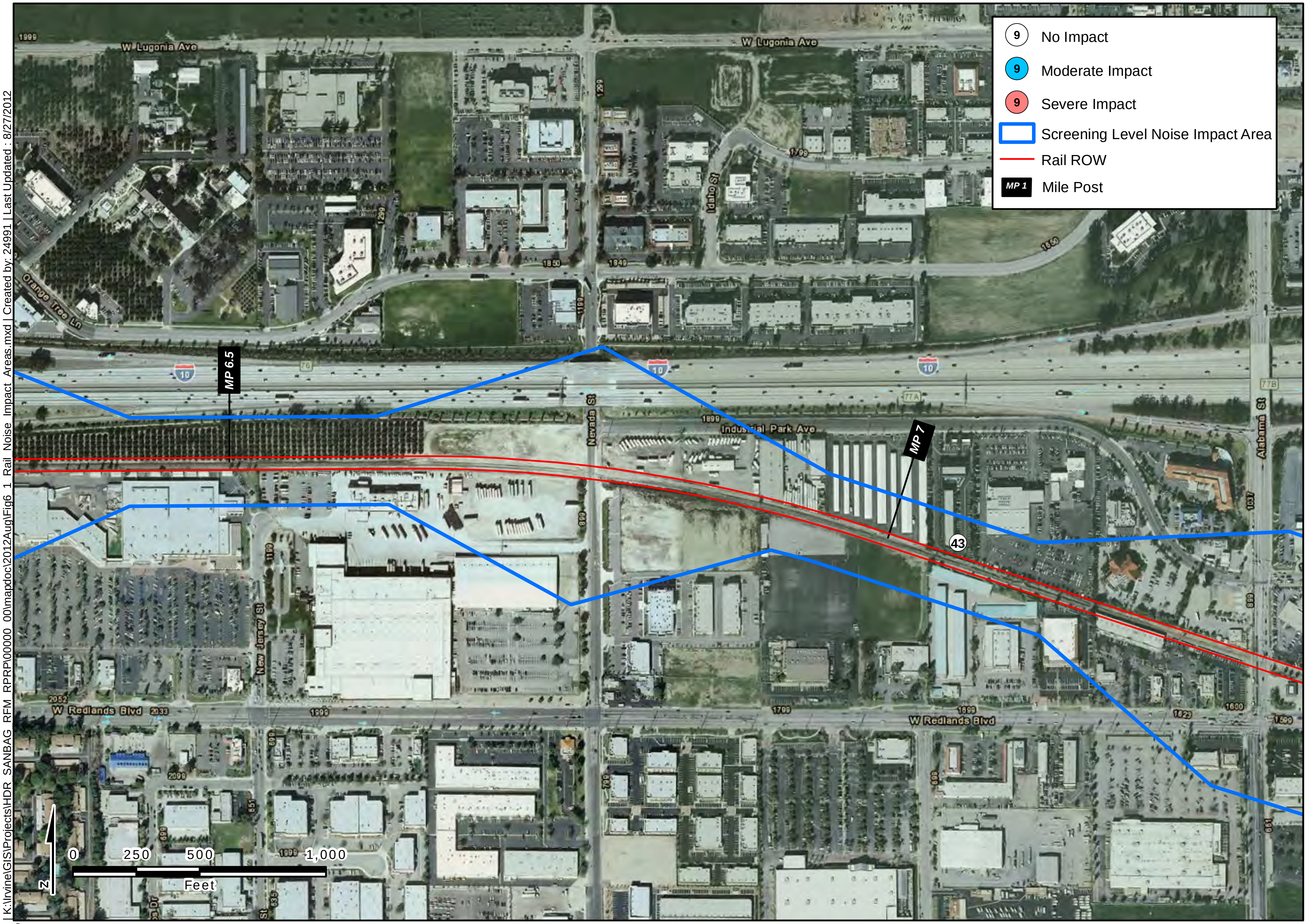
Rail Noise Impact Areas

Figure 6-1 F

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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Rail Noise Impact Areas

Figure 6-1 G

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

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Rail Noise Impact Areas

Figure 6-1 H

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

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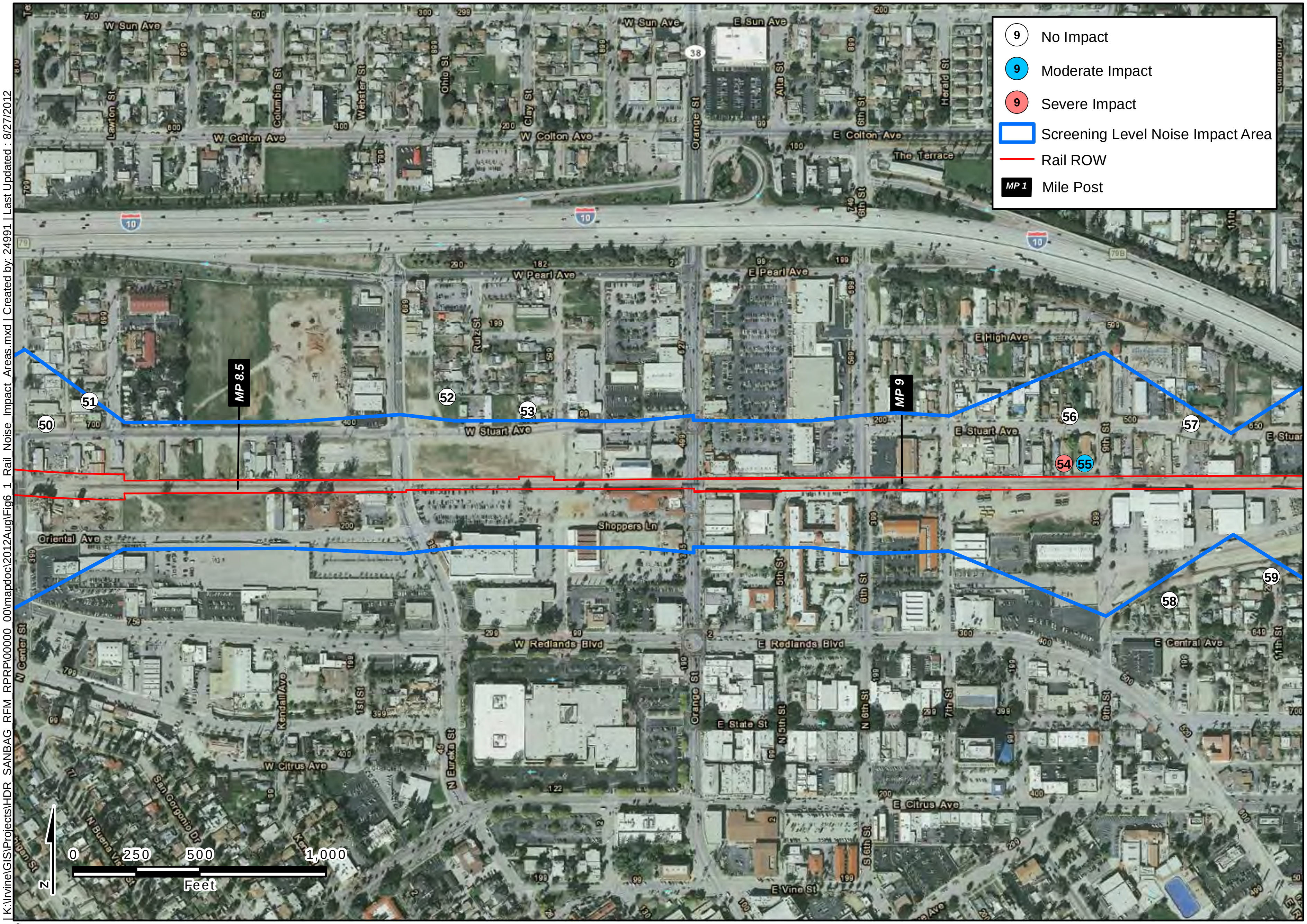

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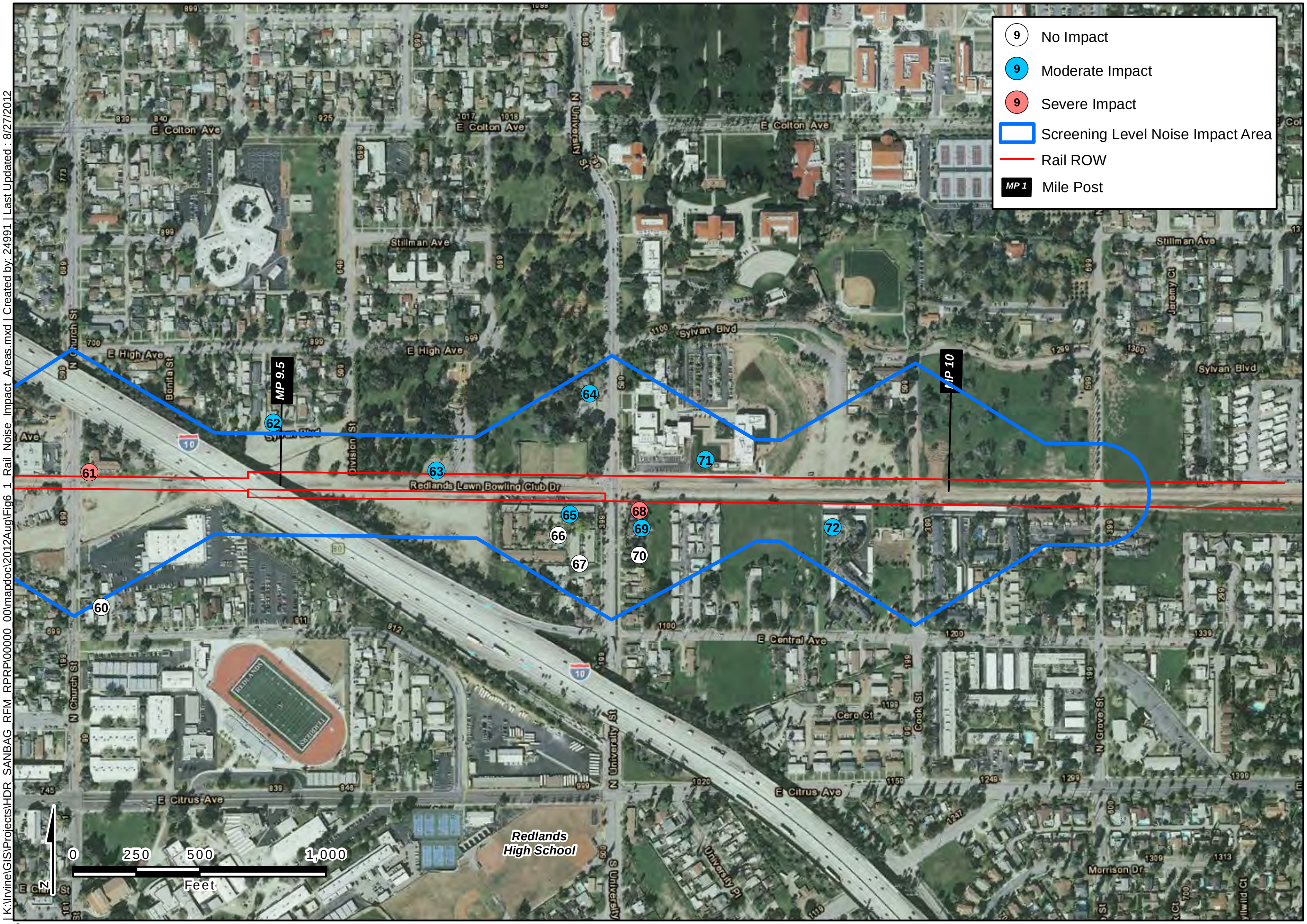
Rail Noise Impact Areas

Figure 6-1 l

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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Rail Noise Impact Areas

Figure 6-1 J

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

6.1.2 Traffic Noise

The results of the traffic noise impact assessment are summarized in Table 6-2. As shown in Table 6-2, none of the representative modeled receivers would experience an increase in traffic noise equating to a severe impact. Therefore, no impact would occur and no mitigation is required.

Table 6-2. Summary of Traffic Noise Modeling Results – dBA L_{dn}

Receiver	Land Use Category	Existing	Project Only 2018	FTA Impact?	Project Only 2038	FTA Impact?
Sierra Way and Mill St. NW Quadrant	Residential / 2, School / 3	56	0[a]	No Impact	0	No Impact
Waterman Ave. and 9th St. NW Quadrant	Residential / 2	56	37	No Impact	0	No Impact
Waterman Ave. and Orange Show Rd. NW Quadrant	Residential / 2	57	28	No Impact	0	No Impact
Waterman Ave. and Dumas St. SW Quadrant	Residential / 2	51	0	No Impact	0	No Impact
Waterman Ave. and Washington St. NW Quadrant	Residential / 2	60	38	No Impact	37	No Impact
Tippecanoe Ave. and Hospitality Lane SE Quadrant	Residential / 2	55	36	No Impact	0	No Impact
Anderson Ave. and Academy Drive NE Quadrant	Residential / 2	53	35	No Impact	38	No Impact
California St. and Redlands Blvd. NW Quadrant	Residential / 2	61	0	No Impact	0	No Impact
Alabama St. and I-10 West Ramps NE Quadrant	Transient Residential / 2	54	30	No Impact	31	No Impact
Alabama St. and I-10 East Ramps SW Quadrant	Transient Residential / 2	60	42	No Impact	34	No Impact
Texas St. and Stuart Ave. SW Quadrant	Residential / 2	54	0	No Impact	0	No Impact
Eureka St. and Pearl Ave. SE Quadrant	Residential / 2	54	28	No Impact	33	No Impact
Eureka St. and Stuart Ave. NE Quadrant	Residential / 2	52	37	No Impact	39	No Impact
Orange St. and Colton Ave. SW Quadrant]	Residential / 2	58	0	No Impact	31	No Impact

Receiver	Land Use Category	Existing	Project Only 2018	FTA Impact?	Project Only 2038	FTA Impact?
6th St. and I-10 West Ramps NE Quadrant	Residential / 2	54	24	No Impact	0	No Impact
6th St. and Pearl Ave. SE Quadrant	Residential / 2	58	33	No Impact	0	No Impact
Redlands Blvd. and Citrus Ave. NE Quadrant	Residential / 2	58	0	No Impact	0	No Impact
Church St. and Stuart Ave. SW Quadrant	Residential / 2	49	37	No Impact	0	No Impact
University St. and I-10 West Ramps NE Quadrant	Residential / 2	63	0	No Impact	0	No Impact
University St. and I-10 East Ramps SE Quadrant	Residential / 2	63	0	No Impact	0	No Impact
a. 0 dBA L_{dn} indicates that the Project would contribute no new traffic volumes or would reduce the traffic volumes at the indicted intersection.						

6.1.3 Rail Station Parking Lot Noise

Noise from the Project's proposed parking lots adjacent to the rail stations was evaluated, as described in Section 5.1.3. The input and output are included in Appendix F. The FTA's screening procedure calculations resulted in the finding that the nearest noise-sensitive land uses are outside the adjusted screening distances for the parking lots, as summarized in Table 6-3. Therefore, there would be no impact from the proposed parking lots. No mitigation is required.

Table 6-3. Summary of Station Noise Assessment

Station Name	Number of Parking Spaces[1]	FTA Screening Distance	Distance from Platform Parking Lot (Centroid) to Nearest Sensitive Land Use	Sensitive Land Uses within Screening Distance?
E St. Station	265	325	800	No
Tippecanoe St. Station	82	60	225	No
New York St. Station	60	55	100	No
Downtown Redlands Station	200	80	300	No
University St. Station	42	50	100	No

[1] Parking space quantities are from Table 5.7 of the Draft Technical Memorandum, Redlands Passenger Rail Project Model Application and Ridership Forecasts. The highest peak-hour (AM or PM) value was used.

6.1.4 Layover Facility Noise

Noise from the Project's proposed layover facility was evaluated as described in Section 5.1.4. The input and output are included in Appendix G. The FTA's screening procedure calculations resulted in the finding that the nearest noise-sensitive land uses are outside the adjusted screening distance for the layover facility, for either the Preferred Alternative layover site location, the alternate layover site location (Alternative 1) or the IEMF (Alternative 2). Therefore, there would be no impact from the proposed parking lot. No mitigation is required.

6.2 Operational Vibration

Operation of the Project would result in ground-borne vibration along the alignment, as described below by MP segment, summarized in Table 6-3 with receiver locations shown previously on Figure 5-1 (Screening Level Area of Potential Impact and Modeled Receiver Locations).

MP 1 to MP 2 (E St. to southeast of Sierra Way). Effects are predicted to occur at two receivers (Receivers 3 and 8), representative of a total of seven residential (Category 2) land uses in the area, with specific locations described below:

- 50' to 100' east of alignment, east of Dorothy St., north of Julia St., 75 feet from centerline (Residential)
- 50' to 100' east of alignment, east of Dorothy St., in between E. Cluster St. and E. Valley St., 75 feet from centerline (Residential)

MP 2 to MP 3.5 (southeast of Sierra Way to southeast of South Waterman Ave.). Effects are predicted to occur at two receivers (Receivers 14 and 22), representative of a total of two residential (Category 2) land uses in the area, with specific locations described below:

- 50' to 100' west of alignment, east of S. Washington Ave., north of E. Ennis St., 75 feet from centerline (Residential)
- 50' to 100' southwest of alignment, north of Dumas St., in between S. Amos Ave. and S. Waterman Ave., 50 feet from centerline (Residential)

MP 3.5 to MP 6 (Southeast of South Waterman Ave. to Bryn Mawr Ave.). Effects are predicted to occur at one receiver (Receiver 41), representative of a total of six residential (Category 2) land uses in the area, with specific locations described below:

- 50' to 100' north of alignment, east of Mountain View Ave., south of W. Lugonia Ave., 50 feet from centerline (Residential)

MP 6 to MP 8.5 (Bryn Mawr Ave. to east of Texas St.). Effects are predicted to occur at two receivers (Receivers 43 and 46), representative of a total of two Category 2 (hotel/motel) land uses in the area, with specific locations described below:

- 50' to 100' north of alignment, east of Nevada St., west of Alabama St., south of Industrial Ave., 75 feet from centerline (Transient Residential / Commercial (Motel))
- 0' to 100' north of alignment, west of Tennessee St., south of W. Colton Ave., 75 feet from centerline (Transient Residential / Commercial (Motel))

MP 8.5 to MP 10 (East of Texas St. to east of North University St.). Effects are predicted to occur at one receiver (Receiver 61), representative of a total of six residential (Category 2) land uses in the area, with specific locations described below:

- 50' to 100' north of alignment, east of Church St., west of the I-10 freeway, 50 feet from centerline (Residential)

As shown in Table 6-4, no adverse ground-borne noise effects are predicted from the Project (throughout the alignment) for either Category 2 or Category 3 land uses. Also, no project-related vibration effects are predicted at Category 3 land uses along the entire alignment (only Category 2 land uses are predicted to be affected by project-related ground-borne vibration).

The ground-borne vibration effects listed above and in Table 6-4 are considered adverse. According to the FTA manual, use of ballast mats or resiliently supported ties would reduce ground-borne vibration levels by 10 decibels. Implementation of Mitigation Measure NV-4 (Use Ballast Mats, Resiliently Supported Ties, or Measures of Comparable Effectiveness on Portions of the Rail near Sensitive Receivers) would minimize this effect. The data showing the impacts and mitigation results are contained in Appendix H.

Table 6-4. Ground-Borne Noise and Vibration Analysis Summary Table

Potentially Affected Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Distance to BNSF Track Centerline (feet)	Resultant Ground-borne Vibration Levels (VdB)	FTA Ground-borne Vibration Criteria[4] (VdB)	Impact?	Resultant Ground-borne Noise (VdB)	FTA Ground-borne Noise Criteria[4] (VdB)	Impact?
MP 1 to MP 2: E St. to southeast of Sierra Way										
1	Commercial/ Transient Residential use east of N. E St. and north of alignment	Transient Residential / Commercial (Motel) / 2	1	200	67	75	No Effect	17	38	No Impact
2	200' to 400' south of alignment, west of Pershing Ave.	Residential / 2	2	200	67	75	No Effect	17	38	No Impact
3	50' to 100'east of alignment, east of Dorothy St.	Residential / 2	3	75	76	75	Adverse Effect	26	38	No Impact
4	100 to 200' east of alignment, east of Dorothy St.	Residential / 2	3	150	70	75	No Effect	20	38	No Impact
8	50' to 100' east of alignment, east of Dorothy St.	Residential / 2	5	75	76	75	Adverse Effect	26	38	No Impact
9	100 to 200' east of alignment, east of Dorothy St.	Residential / 2	1	150	70	75	No Effect	20	38	No Impact

Potentially Affected Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Distance to BNSF Track Centerline (feet)	Resultant Ground-borne Vibration Levels (VdB)	FTA Ground-borne Vibration Criteria[4] (VdB)	Impact?	Resultant Ground-borne Noise (VdB)	FTA Ground-borne Noise Criteria[4] (VdB)	Impact?
MP 2 to MP 3.5: Southeast of Sierra Way to southeast of South Waterman Ave.										
13	100 to 200' east of alignment, east of Lincoln Ave.	Residential / 2	6	100	74	75	No Effect	24	38	No Impact
14	50' to 100' west of alignment, east of S. Washington Ave.	Residential / 2	1	75	76	75	Adverse Effect	26	38	No Impact
15	100' to 200' west of alignment, east of S. Washington Ave.	Residential / 2	2	125	72	75	No Effect	22	38	No Impact
17	200' to 400' west of alignment, east of S. Washington Ave.	Residential / 2	2	200	67	75	No Effect	17	38	No Impact
18	100' to 200' east of alignment, south of Ennis St.	Residential / 2	1	150	70	75	No Effect	20	38	No Impact
19	200' to 400' east of alignment, east of Lincoln Ave.	Residential / 2	2	200	67	75	No Effect	17	38	No Impact
22	50' to 100' southwest of alignment, north of Dumas St.	Residential / 2	1	50	80	75	Adverse Effect	30	38	No Impact
23	100' to 200' southwest of alignment, north of Dumas St.	Residential / 2	2	140	71	75	No Effect	21	38	No Impact
MP 3.5 to MP 6: Southeast of South Waterman Ave. to Bryn Mawr Ave.										
25	100' to 200' south of alignment, east of Tippecanoe Ave.	Residential / 2	3	140	71	75	No Effect	21	38	No Impact
27	100' to 200' south of alignment, east of Tippecanoe Ave.	Residential / 2	8	175	69	75	No Effect	19	38	No Impact
28	100' to 200' south of alignment, west of S. Richardson St.	Residential / 2	18	175	69	75	No Effect	19	38	No Impact
30	100' to 200' south of alignment, east of S. Richardson St.	Recreation (School Athletic Fields) and School / 3	1	175	69	78	No Effect	19	43	No Impact

Potentially Affected Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Distance to BNSF Track Centerline (feet)	Resultant Ground-borne Vibration Levels (VdB)	FTA Ground-borne Vibration Criteria[4] (VdB)	Impact?	Resultant Ground-borne Noise (VdB)	FTA Ground-borne Noise Criteria[4] (VdB)	Impact?
31	100' to 200' north of alignment, east of S. Richardson St.	Residential / 2	6	100	74	75	No Effect	24	38	No Impact
33	100' to 200' north of alignment, south of Victoria Ave.	Residential / 2	8	150	70	75	No Effect	20	38	No Impact
34	100' to 200' north of alignment, south of Victoria Ave.	Residential / 2	4	150	70	75	No Effect	20	38	No Impact
35	100' to 200' south of alignment, north of east Gould St.	Residential / 2	8	175	69	75	No Effect	19	38	No Impact
36	100' to 200' south of alignment, north of E. Gould St.	Residential / 2	10	150	70	75	No Effect	20	38	No Impact
39	100' to 200' north of alignment, south of Victoria Ave.	Residential / 2	3	125	72	75	No Effect	22	38	No Impact
41	50' to 100' north of alignment, east of Mountain View Ave.	Residential / 2	6	50	80	75	Adverse Effect	30	38	No Impact
MP 6 to MP 8.5: Bryn Mawr Ave. to east of Texas St.										
42	100' to 200' south of alignment, east of Bryn Mawr Ave.	Residential / 2	8	150	70	75	No Effect	20	38	No Impact
43	50' to 100' north of alignment, east of Nevada St.	Transient Residential / Commercial (Motel) / 2	1	75	76	75	Adverse Effect	26	38	No Impact
44	100' to 200' south of alignment, south of Redlands Blvd.	Residential / 2	6	150	70	75	No Effect	20	38	No Impact
46	0' to 100' north of alignment, west of Tennessee St.	Transient Residential / Commercial (Motel) / 2	1	75	76	75	Adverse Effect	26	38	No Impact
47	100' to 200' north of alignment, west of New York St.	Residential / 2	1	175	64	75	No Effect	14	38	No Impact

Potentially Affected Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Distance to BNSF Track Centerline (feet)	Resultant Ground-borne Vibration Levels (VdB)	FTA Ground-borne Vibration Criteria[4] (VdB)	Impact?	Resultant Ground-borne Noise (VdB)	FTA Ground-borne Noise Criteria[4] (VdB)	Impact?
48	200' to 400' south of alignment, south of Redlands Blvd.	Recreation (Park)	1	200	62	78	No Effect	12	43	No Impact
MP 8.5 to MP 10: East of Texas St. to east of North University St. (Project End)										
54	50' to 100' north of alignment, west of 9th St.	Residential / 2	3	75	74	75	No Effect	24	38	No Impact
55	50' to 100' north of alignment, west of 9th St.	Church / 3	1	80	75	78	No Effect	25	43	No Impact
61	50' to 100' north of alignment, east of Church St.	Residential / 2	6	50	78	75	Adverse Effect	28	38	No Impact
63	50' to 100' north of alignment, north of Park Ave.	Recreation (Park) / 3	1	75	74	78	No Effect	24	43	No Impact
64	100' to 200' south of alignment, west of University St.	Residential / 2	1	100	72	75	No Effect	22	38	No Impact
65	100' to 200' south of alignment, west of University St.	Residential / 2	8	100	72	75	No Effect	22	38	No Impact
66	100' to 200' south of alignment, west of University St.	Residential / 2	10	175	67	75	No Effect	17	38	No Impact
68	50' to 100' south of alignment, east of University St.	Residential / 2	6	75	74	75	No Effect	24	38	No Impact
69	100' to 200' south of alignment, east of University St.	Residential / 2	7	150	68	75	No Effect	18	38	No Impact
72	100' to 200' south of alignment, east of Cook St.	Residential / 2	6	125	67	75	No Effect	17	38	No Impact

1. Per Table 9-2 of the General Vibration Assessment, FTA *Transit Noise and Vibration Impact Assessment* manual, the screening distance for vibration assessment for conventional commuter rail is 600 feet for Category 1 land uses and 200 feet for Category 2 land uses. The nearest known Category 1 land use is located approximately 2000 feet away and is thus well beyond the applicable screening distance. Category 2 (residential) land uses existing within 200 feet of the alignment are addressed in this table.
2. Based on Figure 10-1, page 10-3, Chapter 10, ibid.
3. Based on Table 10-1, ibid.
4. Based on Table 8-1 (Category 2, Frequent Events), ibid.

6.2.1 Operational Vibration at Historic Properties

As shown in Table 6-5, the predicted vibration level from rail passbys at the Redlands Depot would be approximately 74 VdB, which would be substantially lower than the corresponding damage criteria level of 90 VdB. Therefore, operational vibration levels would not exceed the criteria threshold for fragile structures. There would be no effect.

Table 6-5. Summary of Operational Vibration Analysis at Redlands Depot

Receiver	Receiver Description	Distance to BNSF Track Centerline (feet)	Resultant Ground-borne Vibration Levels (VdB)	FTA Ground-borne Vibration Damage Criteria[1] (VdB)	Impact?
Redlands Depot	Historic Train Depot	42	74	90	No Effect

7.0 CONSTRUCTION IMPACTS

7.1 CONSTRUCTION NOISE

Construction of the Project would result in temporary but relatively high levels of noise along the alignment. The noise levels from construction activities were estimated using the method described in Section 5.3, and the results are summarized in Table 7-1. Impacts are predicted to occur at Category 2 land uses along the project alignment at distances of up to approximately 325 feet under daytime impact criteria and approximately 500 feet under nighttime impact criteria. Although it is anticipated that most construction work would take place during daytime hours, some work may require nighttime work (such as work at major street crossings).

Table 7-1. Construction Noise Data Summary

Receiver Distance (Perpendicular Distance to Alignment [feet])	Estimated Construction Noise Levels 8-Hour L_{eq}	FTA Criteria for Residential Land Uses (8-Hour L_{eq})		FTA Criteria Exceeded?[1]	
		Day	Night	Day	Night
50	93	80	70	Yes	Yes
75	91	80	70	Yes	Yes
80	91	80	70	Yes	Yes
100	89	80	70	Yes	Yes
125	88	80	70	Yes	Yes
140	86	80	70	Yes	Yes
150	86	80	70	Yes	Yes
175	85	80	70	Yes	Yes
200	84	80	70	Yes	Yes
225	78	80	70	No	Yes
250	77	80	70	No	Yes
275	77	80	70	No	Yes
300	76	80	70	No	Yes
325 *	80	80	70	Yes	Yes
350 *	80	80	70	No	Yes
375 *	79	80	70	No	Yes
400	72	80	70	No	Yes
475	72	80	70	No	Yes
500	70	80	70	No	Yes
550	68	80	70	No	No

* Noise levels at these distances represent receivers which have direct line of sight (i.e. no shielding) to the proposed Project.

Residential (i.e., Category 2) land uses exist within the respective daytime and nighttime impact distances (325 feet and 500 feet). Therefore, the construction noise impact is considered severe. Implementation of Mitigation Measures NV-5 (Employ Noise-Reducing Measures during Construction) and NV-6 (Prepare a Community Awareness Program for Project Construction) would minimize this effect.

MP 1 to MP 2 (E St. to southeast of Sierra Way). Impacts from daytime construction are predicted to occur at eight receivers (Receivers 1, 2, 3, 4, 5, 7, 8, and 9), representative of a total of 50 residential (Category 2) land uses in the area. Impacts from nighttime construction are predicted to occur at nine receivers (Receivers 1, 2, 3, 4, 5, 6, 7, 8, and 9), representative of a total of 58 Category 2 land uses in the area.

MP 2 to MP 3.5 (southeast of Sierra Way to southeast of South Waterman Ave.). Impacts from daytime construction are predicted to occur at 13 receivers (Receivers 10, 11, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, and 24), representative of a total of 29 Category 2 land uses in the area. Impacts from nighttime construction are predicted to occur at 15 receivers (Receivers 10 through 24), representative of a total of 32 Category 2 land uses in the area.

MP 3.5 to MP 6 (Southeast of South Waterman Ave. to Bryn Mawr Ave.). Impacts from daytime construction are predicted to occur at 13 receivers (Receivers 25, 27, 28, 30, 31, 32, 33, 34, 35, 36, 39, 41, and 42), representative of a total of 86 Category 2 and two Category 3 land uses in the area. Impacts from nighttime construction are predicted to occur at 16 receivers (Receivers 25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 36, 37, 39, 40, 41, and 42), representative of a total of 109 Category 2 land uses in the area.

MP 6 to MP 8.5 (Bryn Mawr Ave. to east of Texas St.). Impacts from daytime construction are predicted to occur at six receivers (Receivers 43 through 48), representative of a total of 31 Category 2 and one Category 3 land uses in the area. Impacts from nighttime construction are predicted to occur at five receivers (Receivers 43 through 47), representative of a total of 31 Category 2 land uses in the area.

MP 8.5 to MP 10 (East of Texas St. to east of North University St.). Impacts from daytime construction are predicted to occur at 20 receivers (Receivers 49, 50, 53, 54, 55, 57, 58, 59, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, and 72), representative of a total of 93 Category 2 and four Category 3 land uses in the area. Impacts from nighttime construction are predicted to occur at 20 receivers (Receivers 50, 51, 52, 53, 54, 56, 57, 58, 59, 60, 61, 62, 64, 65, 66, 67, 68, 69, 70, and 72), representative of a total of 104 Category 2 land uses in the area.

7.2 CONSTRUCTION VIBRATION

Construction of the Project would result in temporary vibration along the alignment from use of heavy equipment and machinery. The vibration levels from construction activities were estimated using the method described in Section 5.4, and the results are summarized in Table 7-2.

MP 1 to MP 2 (E St. to southeast of Sierra Way). Effects are predicted to occur at two receivers (Receivers 3 and 8), representative of a total of eight residential (Category 2) land uses in the area. No vibration effects from project construction are predicted at Category 3 land uses in the area.

MP 2 to MP 3.5 (southeast of Sierra Way to southeast of South Waterman Ave.). Effects are predicted to occur at three receivers (Receivers 13, 14 and 22), representative of a total of eight residential (Category 2) land uses in the area. No vibration effects from project construction are predicted at Category 3 land uses in the area.

MP 3.5 to MP 6 (Southeast of South Waterman Ave. to Bryn Mawr Ave.). Effects are predicted to occur at two receivers (Receivers 31 and 41), representative of a total of 12 residential (Category 2) land uses in the area. No vibration effects from project construction are predicted at Category 3 land uses in the area.

MP 6 to MP 8.5 (Bryn Mawr Ave. to east of Texas St.). Effects are predicted to occur at two receivers (Receivers 43 and 46), representative of a total of two (2) Category 2 (hotel/motel) land uses in the area. No vibration effects from project construction are predicted at Category 3 land uses in the area.

MP 8.5 to MP 10 (East of Texas St. to east of North University St.). Effects are predicted to occur at five receivers (Receivers 54, 61, 64, 65 and 68), representative of a total of 24 residential (Category 2) land uses in the area. Effects are predicted to occur at two receivers (Receivers 55 and 63), representative of a total of two Category 3 land uses (a church and a park, respectively) in the area.

FTA construction vibration damage thresholds were not exceeded at any of the representative receiver locations (with the exception of the Redlands Depot, which is addressed separately, below), indicating that potential for damage to any of the structures along the alignment is low. FTA construction annoyance criteria were exceeded at representative receivers as far as 100 feet from the alignment, as measured from the project centerline, and therefore, the effect is considered adverse. Implementation of Mitigation Measure NV-6 (Prepare a Community Awareness Program for Project Construction) would minimize this impact.

Table 7-2. Construction Vibration Data Summary

Potentially Affected[1] Receiver #	Receiver Location Description	Land Use Description	Number of Noise-Sensitive Sites Represented	Distance to BNSF Track Centerline (feet)	Damage Assessment – Peak Particle Velocity (in/sec)2	Annoyance Assessment – RMS Velocity Level (VdB re 1 micro in/sec)[2]	FTA Construction Vibration Damage Criteria (PPV in/sec)[3]	FTA Damage Criteria Exceeded?	FTA Construction Vibration Annoyance Criteria RMS Velocity Level (VdB re 1 micro in/sec)[3]	FTA Annoyance Criteria Exceeded?
MP 1 to MP 2: E St. to southeast of Sierra Way										
1	Commercial/ Transient Residential use east of N. E St. and north of alignment	Transient Residential / Commercial (Motel) / 2	1	200	0.009	67	0.2	No	75	No
2	200' to 400' south of alignment, west of Pershing Ave.	Residential / 2	2	200	0.009	67	0.2	No	75	No
3	50' to 100' east of alignment, east of Dorothy St.	Residential / 2	3	75	0.040	80	0.2	No	75	**Yes**
4	100 to 200' east of alignment, east of Dorothy St.	Residential / 2	3	150	0.014	71	0.2	No	75	No
8	50' to 100' east of alignment, east of Dorothy St.	Residential / 2	5	75	0.040	80	0.2	No	75	**Yes**

Potentially Affected[1] Receiver #	Receiver Location Description	Land Use Description	Number of Noise-Sensitive Sites Represented	Distance to BNSF Track Centerline (feet)	Damage Assessment – Peak Particle Velocity (in/sec)2	Annoyance Assessment – RMS Velocity Level (VdB re 1 micro in/sec)[2]	FTA Construction Vibration Damage Criteria (PPV in/sec)[3]	FTA Damage Criteria Exceeded?	FTA Construction Vibration Annoyance Criteria RMS Velocity Level (VdB re 1 micro in/sec)[3]	FTA Annoyance Criteria Exceeded?
9	100 to 200' east of alignment, east of Dorothy St.	Residential / 2	1	150	0.014	71	0.2	No	75	No
MP 2 to MP 3.5: Southeast of Sierra Way to southeast of South Waterman Ave.										
13	100 to 200' east of alignment, east of Lincoln Ave.	Residential / 2	6	100	0.026	76	0.2	No	75	**Yes**
14	50' to 100' west of alignment, east of S. Washington Ave.	Residential / 2	1	75	0.040	80	0.2	No	75	**Yes**
15	100' to 200' west of alignment, east of S. Washington Ave.	Residential / 2	2	125	0.019	73	0.2	No	75	No
17	200' to 400' west of alignment, east of S. Washington Ave.	Residential / 2	2	200	0.009	67	0.2	No	75	No
18	100' to 200' east of alignment, south of Ennis St.	Residential / 2	1	150	0.014	71	0.2	No	75	No
19	200' to 400' east of alignment, east of Lincoln Ave.	Residential / 2	2	200	0.009	67	0.2	No	75	No
22	50' to 100' southwest of alignment, north of Dumas St.	Residential / 2	1	50	0.074	85	0.2	No	75	**Yes**
23	100' to 200' southwest of alignment, north of Dumas St.	Residential / 2	2	140	0.016	72	0.2	No	75	No

Potentially Affected[1] Receiver #	Receiver Location Description	Land Use Description	Number of Noise-Sensitive Sites Represented	Distance to BNSF Track Centerline (feet)	Damage Assessment – Peak Particle Velocity (in/sec)2	Annoyance Assessment – RMS Velocity Level (VdB re 1 micro in/sec)[2]	FTA Construction Vibration Damage Criteria (PPV in/sec)[3]	FTA Damage Criteria Exceeded?	FTA Construction Vibration Annoyance Criteria RMS Velocity Level (VdB re 1 micro in/sec)[3]	FTA Annoyance Criteria Exceeded?
MP 3.5 to MP 6: Southeast of South Waterman Ave. to Bryn Mawr Ave.										
25	100' to 200' south of alignment, east of Tippecanoe Ave.	Residential / 2	3	140	0.016	72	0.2	No	75	No
27	100' to 200' south of alignment, east of Tippecanoe Ave.	Residential / 2	8	175	0.011	69	0.2	No	75	No
28	100' to 200' south of alignment, west of S. Richardson St.	Residential / 2	18	175	0.011	69	0.2	No	75	No
30	100' to 200' south of alignment, east of S. Richardson St.	Recreation (School Athletic Fields) and School / 3	1	175	0.011	69	0.2	No	78	No
31	100' to 200' north of alignment, east of S. Richardson St.	Residential / 2	6	100	0.026	76	0.2	No	75	**Yes**
33	100' to 200' north of alignment, south of Victoria Ave.	Residential / 2	8	150	0.014	71	0.2	No	75	No
34	100' to 200' north of alignment, south of Victoria Ave.	Residential / 2	4	150	0.014	71	0.2	No	75	No
35	100' to 200' south of alignment, north of E. Gould St.	Residential / 2	8	175	0.011	69	0.2	No	75	No
36	100' to 200' south of alignment, north of E. Gould St.	Residential / 2	10	150	0.014	71	0.2	No	75	No
39	100' to 200' north of alignment, south of Victoria Ave.	Residential / 2	3	125	0.019	73	0.2	No	75	No

Potentially Affected[1] Receiver #	Receiver Location Description	Land Use Description	Number of Noise-Sensitive Sites Represented	Distance to BNSF Track Centerline (feet)	Damage Assessment – Peak Particle Velocity (in/sec)2	Annoyance Assessment – RMS Velocity Level (VdB re 1 micro in/sec)[2]	FTA Construction Vibration Damage Criteria (PPV in/sec)[3]	FTA Damage Criteria Exceeded?	FTA Construction Vibration Annoyance Criteria RMS Velocity Level (VdB re 1 micro in/sec)[3]	FTA Annoyance Criteria Exceeded?
41	50' to 100' north of alignment, east of Mountain View Ave.	Residential / 2	6	50	0.074	85	0.2	No	75	**Yes**
MP 6 to MP 8.5: Bryn Mawr Ave. to east of Texas St.										
42	100' to 200' south of alignment, east of Bryn Mawr Ave.	Residential / 2	8	150	0.014	71	0.2	No	75	No
43	50' to 100' north of alignment, east of Nevada St.	Transient Residential / Commercial (Motel) / 2	1	75	0.040	80	0.2	No	75	**Yes**
44	100' to 200' south of alignment, south of Redlands Blvd.	Residential / 2	6	150	0.014	71	0.2	No	75	No
46	0' to 100' north of alignment, west of Tennessee St.	Transient Residential / Commercial (Motel) / 2	1	75	0.040	80	0.2	No	75	**Yes**
47	100' to 200' north of alignment, west of New York St.	Residential / 2	1	175	0.011	69	0.2	No	78	No
48	200' to 400' south of alignment, south of Redlands Blvd.	Recreation (Park)	1	200	0.009	67	0.2	No	78	No
MP 8.5 to MP 10: East of Texas St. to east of North University St. (Project End)										
54	50' to 100' north of alignment, west of 9th St.	Residential / 2	3	75	0.040	80	0.2	No	75	**Yes**
55	50' to 100' north of alignment, west of 9th St.	Church / 3	1	80	0.037	79	0.2	No	78	**Yes**

Potentially Affected[1] Receiver #	Receiver Location Description	Land Use Description	Number of Noise-Sensitive Sites Represented	Distance to BNSF Track Centerline (feet)	Damage Assessment – Peak Particle Velocity (in/sec)2	Annoyance Assessment – RMS Velocity Level (VdB re 1 micro in/sec)[2]	FTA Construction Vibration Damage Criteria (PPV in/sec)[3]	FTA Damage Criteria Exceeded?	FTA Construction Vibration Annoyance Criteria RMS Velocity Level (VdB re 1 micro in/sec)[3]	FTA Annoyance Criteria Exceeded?
61	50' to 100' north of alignment, east of Church St.	Residential / 2	6	50	0.074	85	0.2	No	75	**Yes**
63	50' to 100' north of alignment, north of Park Ave.	Recreation (Park) / 3	1	75	0.040	80	0.2	No	78	**Yes**
64	100' to 200' south of alignment, west of University St.	Residential / 2/ 2	1	100	0.026	76	0.2	No	75	**Yes**
65	100' to 200' south of alignment, west of University St.	Residential / 2	8	100	0.026	76	0.2	No	75	**Yes**
66	100' to 200' south of alignment, west of University St.	Residential / 2	10	175	0.011	69	0.2	No	75	No
68	50' to 100' south of alignment, east of University St.	Residential / 2	6	75	0.040	80	0.2	No	75	**Yes**
69	100' to 200' south of alignment, east of University St.	Residential / 2	7	150	0.014	71	0.2	No	75	No
72	100' to 200' south of alignment, east of Cook St.	Residential / 2	6	125	0.019	73	0.2	No	75	No

[1] Category 2 (residential) land uses existing within 200 feet of the alignment are addressed in this table.
[2] Assuming PPV level of 0.210 in/sec and 94 VdB as for a vibratory roller (i.e., worst-case for the Project).
[3] Based on Table 12-3 (nonengineered timber and masonry buildings) and Table 8-1 (Categories 2 and 3, Frequent Events) of the FTA Transit Noise and Vibration Impact Assessment manual.

7.2.1 Construction Vibration at Historic Properties

As shown in Table 7-3, the predicted worst-case vibration level from project construction activities near the Redlands Depot would be approximately 0.995 inch/second PPV, which would be substantially higher than the corresponding damage criteria level of 0.12 inch/second PPV for fragile structures. Therefore, construction vibration levels would exceed the criteria threshold for fragile buildings. The effect is considered adverse.

Table 7-3. Summary of Construction Vibration Analysis at Redlands Depot

Potentially Affected Receiver	Receiver Description	Distance to Equipment (feet)	Damage Assessment – Peak Particle Velocity (in/sec)[1]	Annoyance Assessment – RMS Velocity Level (VdB re 1 micro in/sec)[1]	FTA Construction Vibration Damage Criteria (PPV in/sec)[2]	FTA Damage Criteria Exceeded?	FTA Construction Vibration Annoyance Criteria RMS Velocity Level (VdB re 1 micro in/sec)[2]	FTA Annoyance Criteria Exceeded?
Redlands Depot	Historic Structure	5	0.995	115	0.12	Yes	75	Yes

[1] Assuming PPV level of 0.089 in/sec and 87 VdB for a large bulldozer or a loaded truck.

[2] Based on Table 12-3 (Buildings Extremely Susceptible to Vibration Damage) and Table 8-1 (Categories 2 and 3, Occasional Events) of Transit Noise and Vibration Impact Assessment Manual.

8.0 MITIGATION

8.1 MITIGATION MEASURES FOR PROJECT-RELATED NOISE IMPACTS

To minimize severe noise impacts associated with the Project, the following combination of mitigation measures should be incorporated into the Project:

Mitigation Measure NV-1: Establish Quiet Zones

At-grade crossings shall be designed and constructed to be compatible with the formation of Quiet Zones. Prior to the Project's operation, SANBAG shall coordinate and assist the Cities of San Bernardino, Loma Linda, and Redlands in establishing quiet zones at the following grade crossings:

- South Arrowhead Ave.,
- South Sierra Way,
- West Central Ave.,
- East Orange Show Rd.,
- South Waterman Ave.,
- South Tippecanoe Ave.,
- South Richardson St.,
- Mountain View Ave.,
- West Colton Ave.,
- Tennessee St.,
- Church St., and
- North University St.

Following implementation of the Quiet Zones, residual impacts (moderate and severe) would remain, as detailed in Section 8.2 (Figure 8-1).

Mitigation Measure NV-2: Construct Sound Barriers

Sound barriers will be constructed along portions of the rail alignment to reduce noise levels at receivers with severe or moderate noise impacts. Barrier locations and details (e.g., required wall height to achieve the noise reduction requisite for a "no effect" project level, barrier length) are contained in Tables 8-2 and 8-3 and shown in Figures 8-2 and 8-3.

Following construction of the sound barriers under either scenario, as described in Table 8-2 and 8-3 and shown in Figures 8-2 and 8-3, no residual impacts (moderate and severe impacts) would remain. Residual impacts from rail noise would be moderate and less than significant.

Mitigation Measure NV-3: Wayside Rail Lubrication

Wayside applicators will be installed for all tight-radius curves (curves of less than a 1,000 foot radius) on the project alignment. If the wayside applicators are not able to reduce squeal to an acceptable level, additional reduction may be possible through customized profiling of the rail to reduce the forces required for trains to negotiate the curve.

Mitigation Measure NV-4: Use Ballast Mats, Resiliently Supported Ties, or Measures of Comparable Effectiveness on Portions of the Rail near Sensitive Receivers

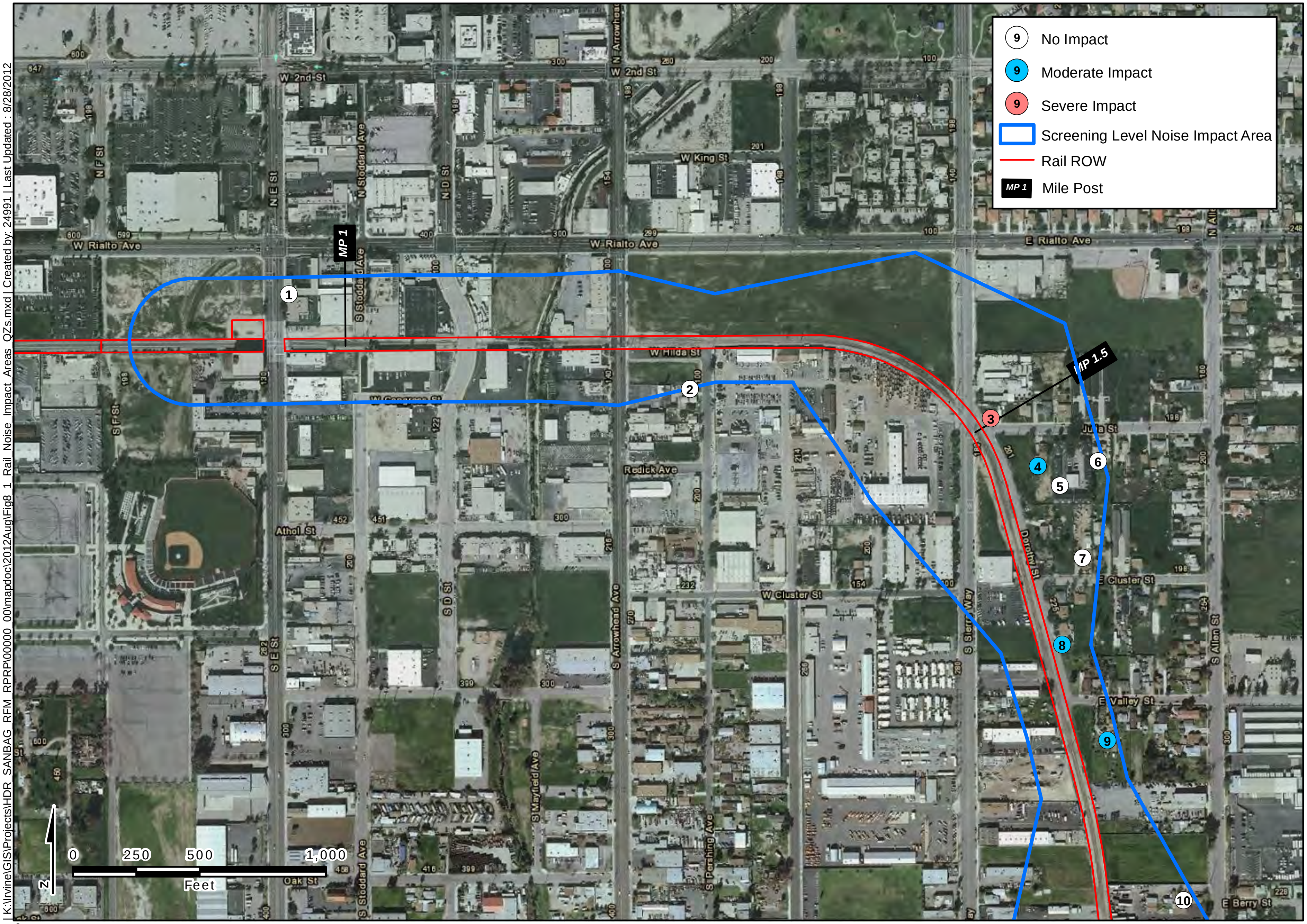
The project design team will ensure the track design specifications include the use of ballast mats or resiliently supported ties on portions of the track near sensitive receivers to minimize project-related ground-borne vibration generated when the trains pass sensitive receivers. Specific locations are provided below:

- **MP 1 to MP 2 (E St. to southeast of Sierra Way):**
  - 50' to 100' east of alignment, east of Dorothy St., north of Julia St. (Residential)
  - 50' to 100' east of alignment, east of Dorothy St., in between E. Cluster St. and E. Valley St. (Residential)
- **MP 2 to MP 3.5 (southeast of Sierra Way to southeast of South Waterman Ave.):**
  - 50' to 100' west of alignment, east of S. Washington Ave., north of E. Ennis St. (Residential)
  - 50' to 100' southwest of alignment, north of Dumas St., in between S. Amos Ave. and S. Waterman Ave. (Residential)
- **MP 3.5 to MP 6 (Southeast of South Waterman Ave. to Bryn Mawr Ave.):**
  - 50' to 100' north of alignment, east of Mountain View Ave., south of W. Lugonia Ave. (Residential)
- **MP 6 to MP 8.5 (Bryn Mawr Ave. to east of Texas St.):**
  - 50' to 100' north of alignment, east of Nevada St., west of Alabama St., south of Industrial Ave. (Transient Residential / Commercial (Motel))
  - 0' to 100' north of alignment, west of Tennessee St., south of W. Colton Ave. (Transient Residential / Commercial (Motel))
- **MP 8.5 to MP 10 (East of Texas St. to east of North University St.):**
  - 50' to 100' north of alignment, east of Church St., west of the I-10 freeway (Residential)

Mitigation Measure NV-5: Employ Noise-Reducing Measures during Construction

The project sponsor will require its construction contractors to employ measures to minimize and reduce construction noise. Measures that will be implemented to reduce construction noise to acceptable levels include the following:

- Comply with local noise regulations and limit construction hours to the extent practicable (i.e., between the hours of 7 a.m. and 8 p.m.).
- Use available noise suppression devices and techniques, including:
  - Equipping all internal combustion engine-driven equipment with mufflers, air-inlet silencers, and any other shrouds, shields, or other noise-reducing features that are in good operating condition and appropriate for the equipment (5- to 10-dB reduction possible).
  - Using “quiet” models of air compressors and other stationary noise sources where such technology exists.
  - Using electrically powered equipment instead of pneumatic or internal combustion-powered equipment, where feasible.



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Sources

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Noise Impact Areas with Quiet Zones

Figure8-1 A

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

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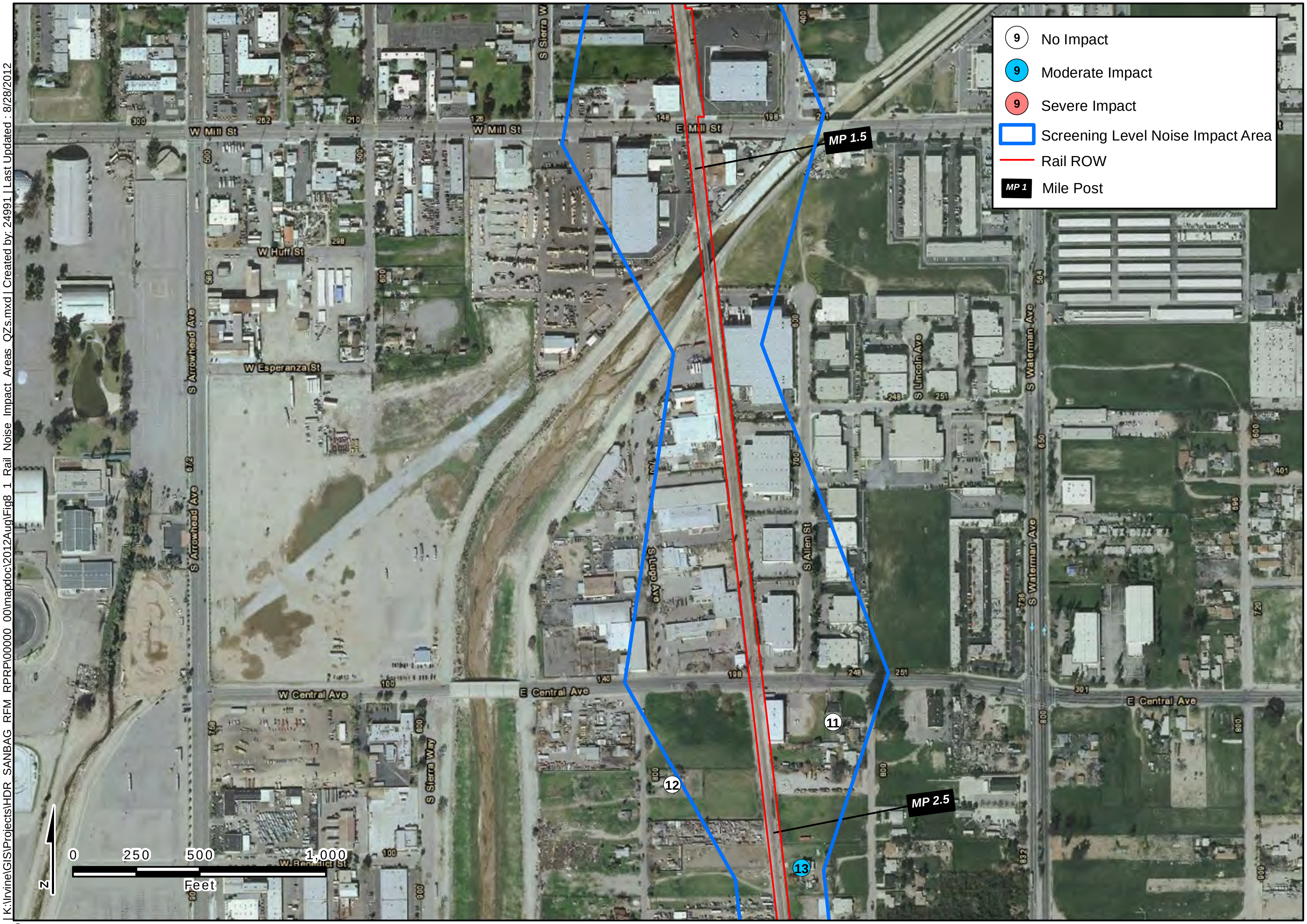

Sources

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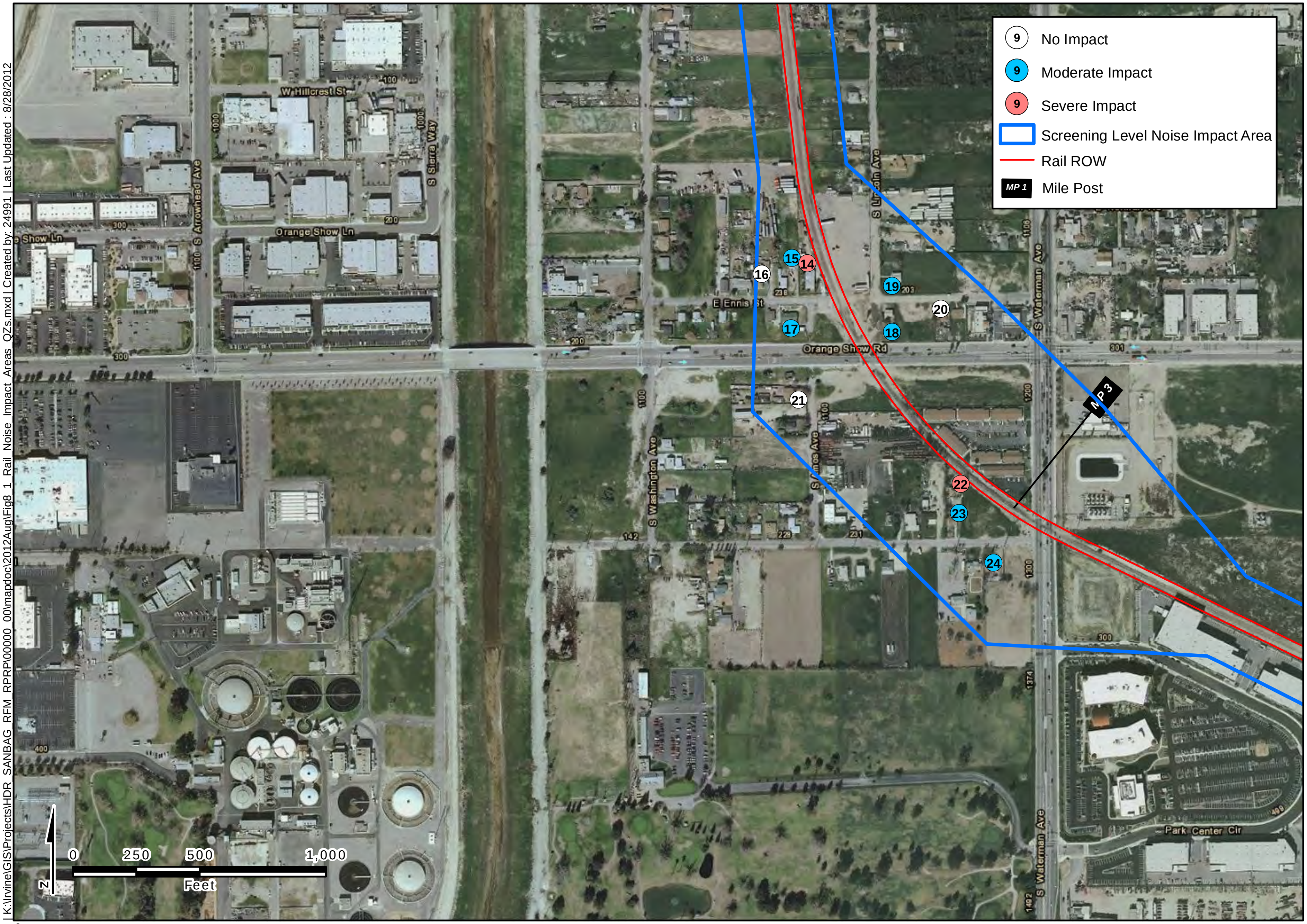
Noise Impact Areas with Quiet Zones

Figure8-1 B

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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Noise Impact Areas with Quiet Zones

Figure8-1 C

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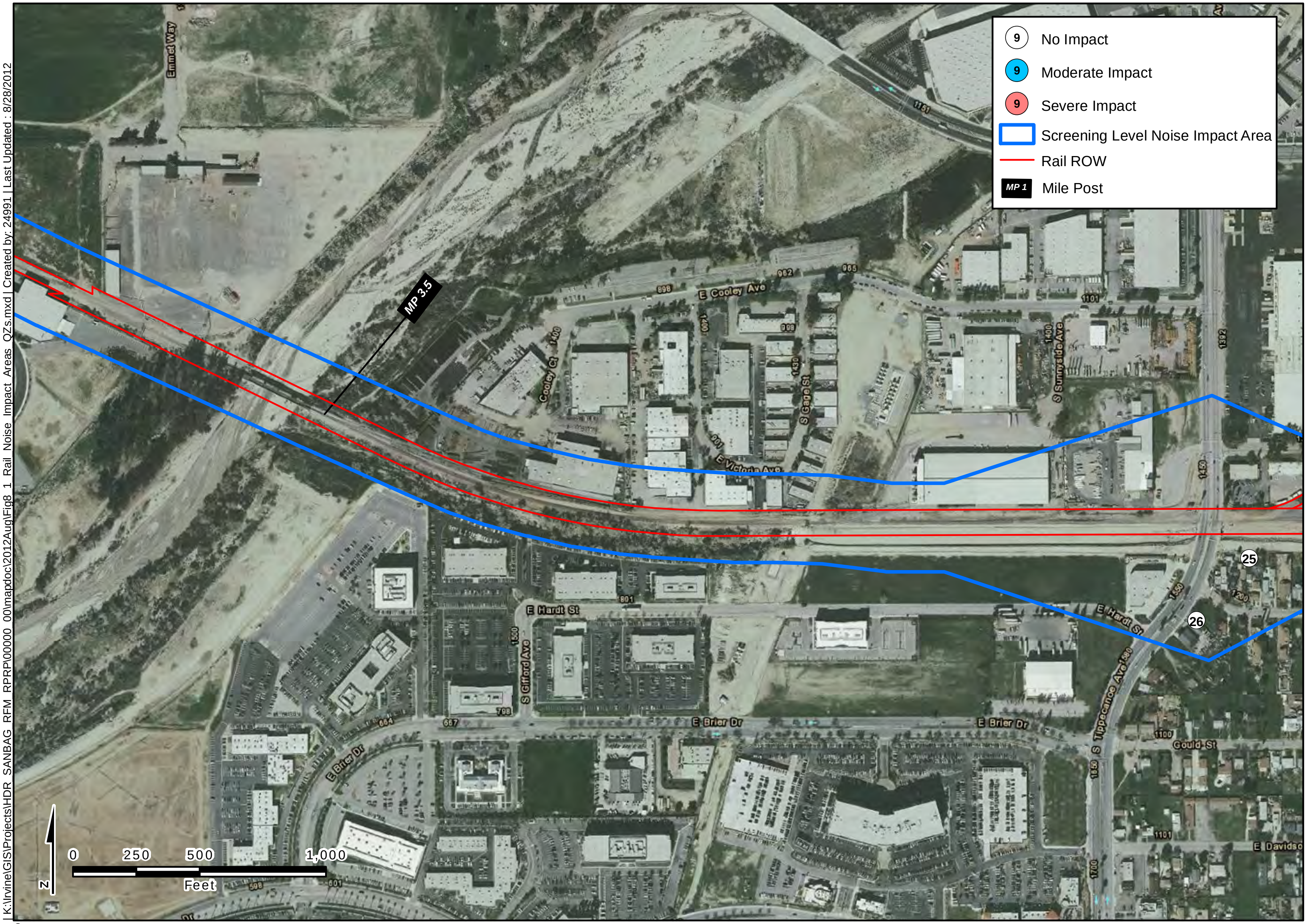

Sources

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Noise Impact Areas with Quiet Zones

Figure8-1 D

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

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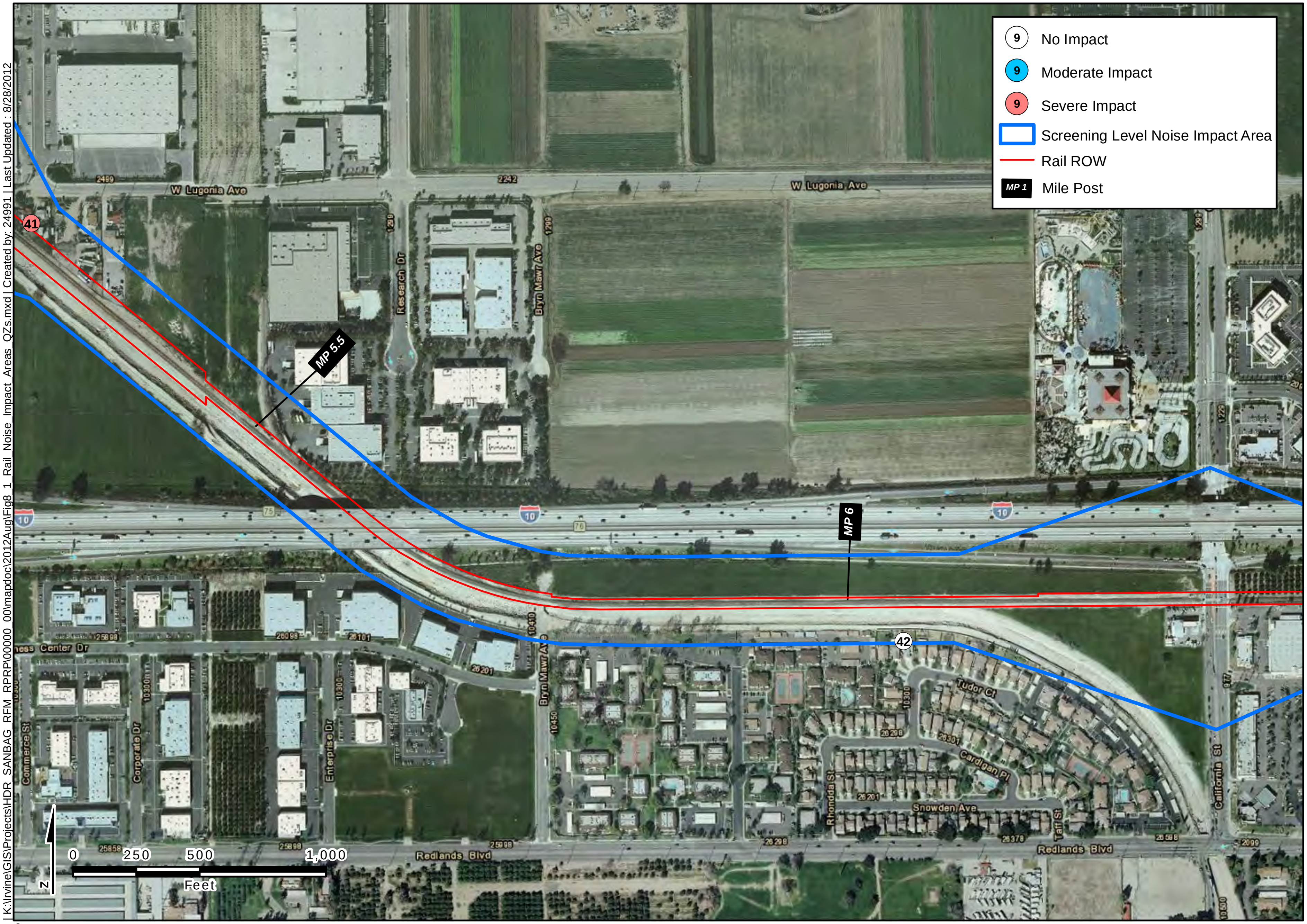
Noise Impact Areas with Quiet Zones

Figure8-1 E

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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Sources

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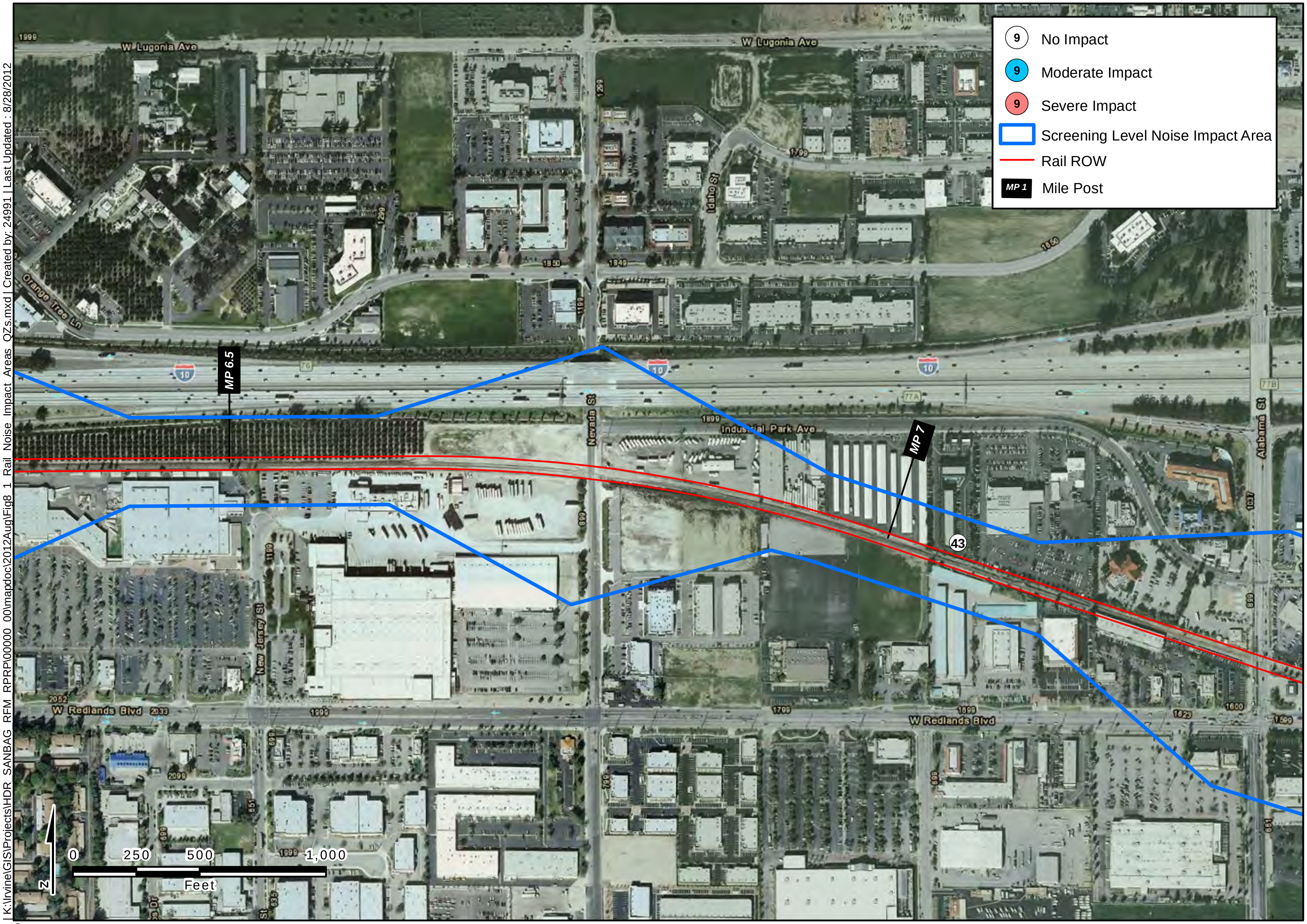
Noise Impact Areas with Quiet Zones

Figure8-1 F

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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Sources

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Noise Impact Areas with Quiet Zones

Figure8-1 G

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Sources

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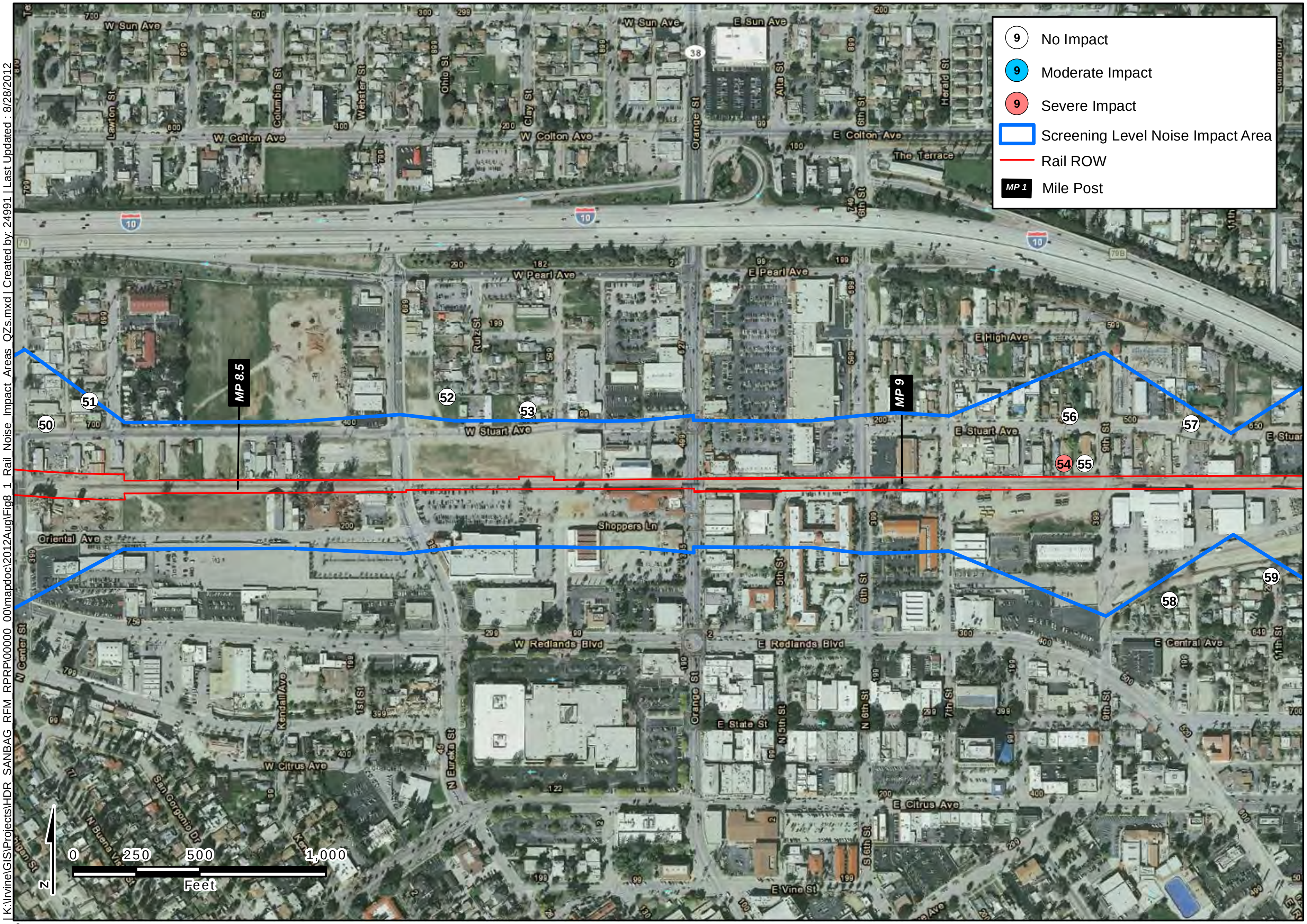
Noise Impact Areas with Quiet Zones

Figure8-1 H

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



Sources

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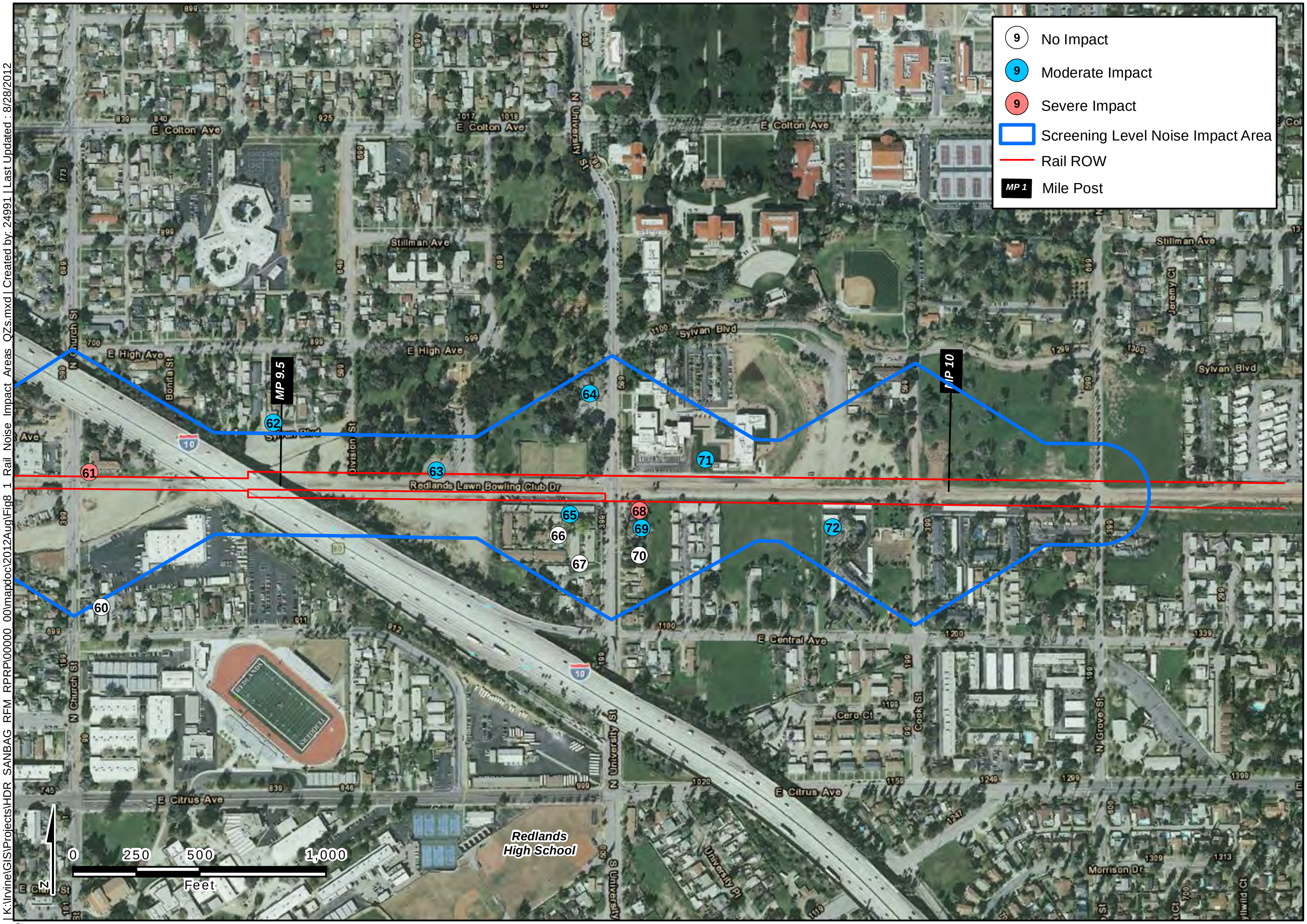
Noise Impact Areas with Quiet Zones

Figure8-1 I

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



Sources

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Noise Impact Areas with Quiet Zones

Figure8-1 J

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

Sources

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Evaluated Soundwall Locations

Figure 8-2 A

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

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Evaluated Soundwall Locations

Figure 8-2 B

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Evaluated Soundwall Locations

Figure 8-2 C

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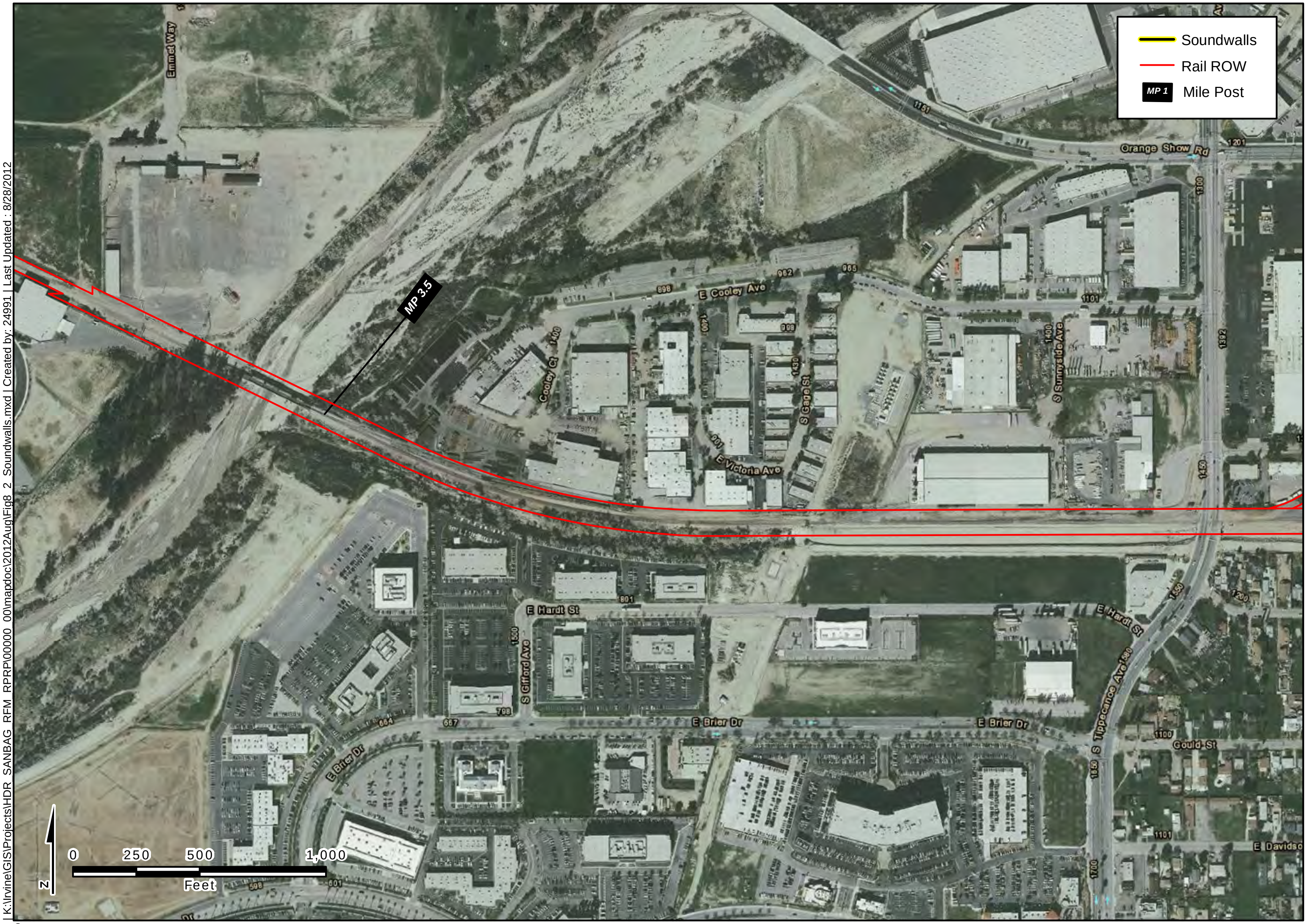

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Evaluated Soundwall Locations

Figure 8-2 D

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

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Evaluated Soundwall Locations

Figure 8-2 E

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA

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Evaluated Soundwall Locations

Figure 8-2 F

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Evaluated Soundwall Locations

Figure 8-2 G

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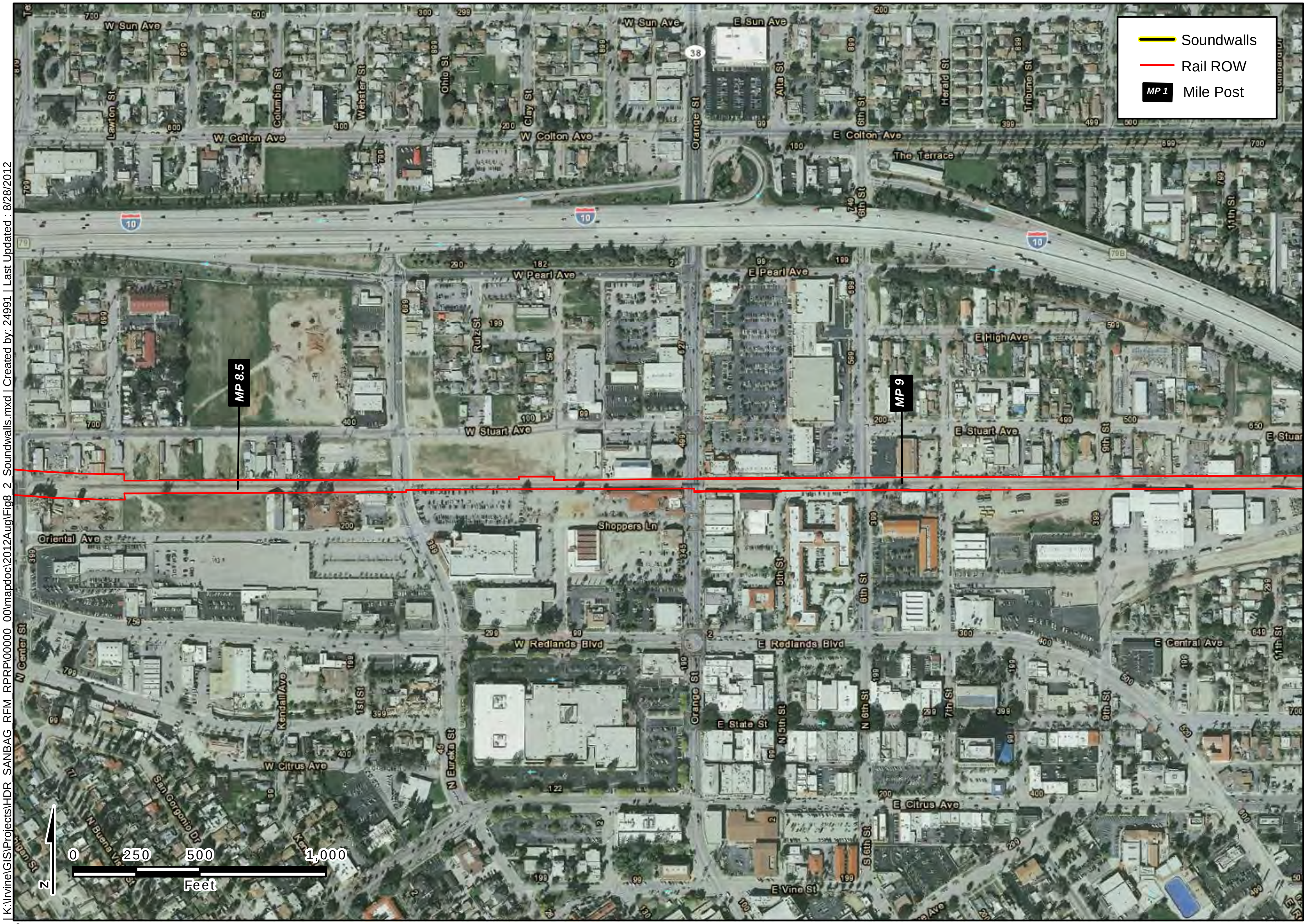
Evaluated Soundwall Locations

Figure 8-2 H

SANBAG/FTA | Redlands Passenger Rail Project | EIR/EA



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Evaluated Soundwall Locations

Figure 8-2 I

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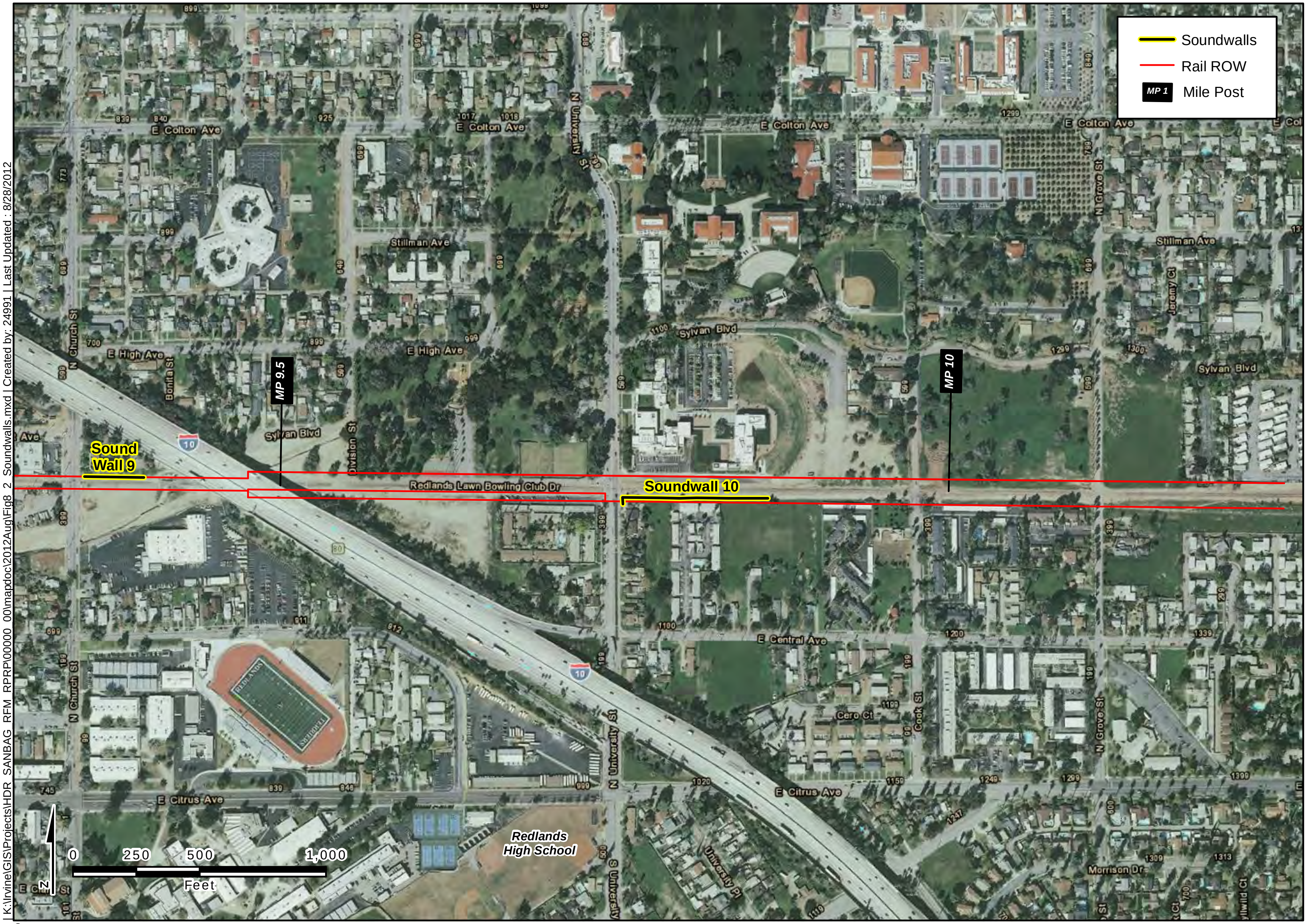

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Figure 8-2 J

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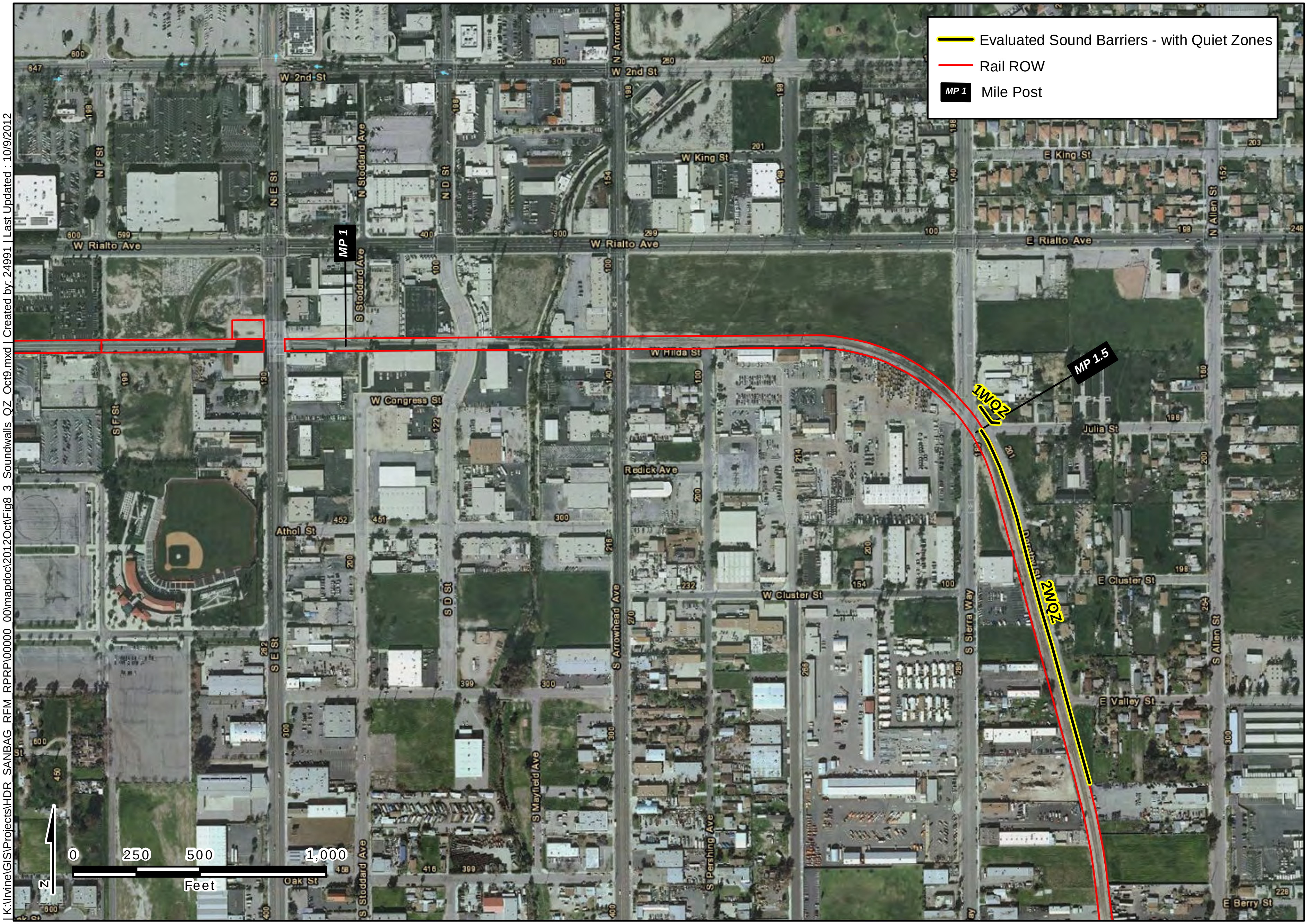

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Sources

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Evaluated Sound Barrier Locations - Scenario with Implementation of Quiet Zones

Figure 8-3 A

SANBAG/FTA | Redlands Passenger Rail Project | EIS/EIR

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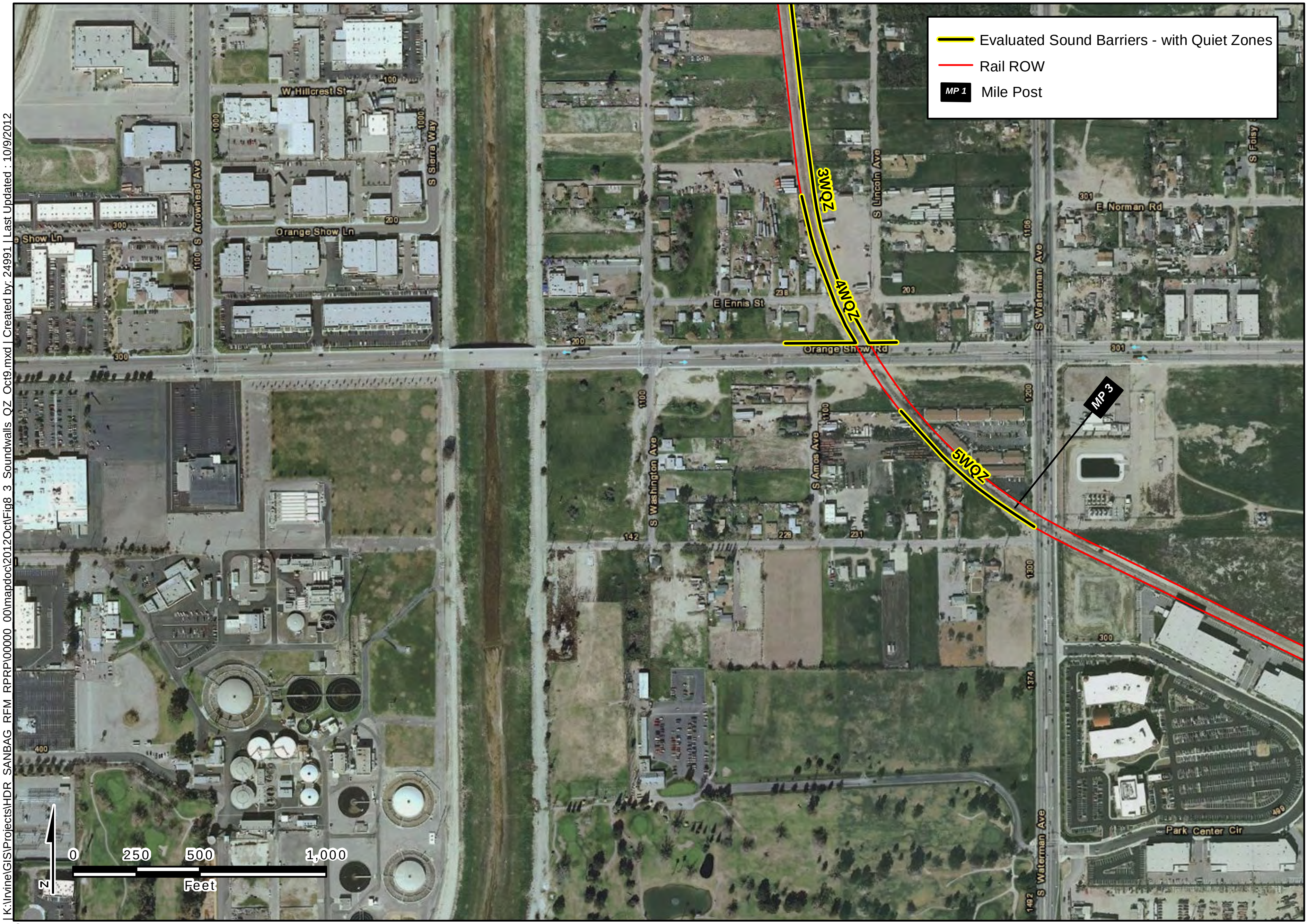
Evaluated Sound Barrier Locations - Scenario with Implementation of Quiet Zones

Figure 8-3 B

SANBAG/FTA | Redlands Passenger Rail Project | EIS/EIR



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Evaluated Sound Barrier Locations - Scenario with Implementation of Quiet Zones

Figure 8-3 C

SANBAG/FTA | Redlands Passenger Rail Project | EIS/EIR

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Evaluated Sound Barrier Locations - Scenario with Implementation of Quiet Zones

Figure 8-3 D

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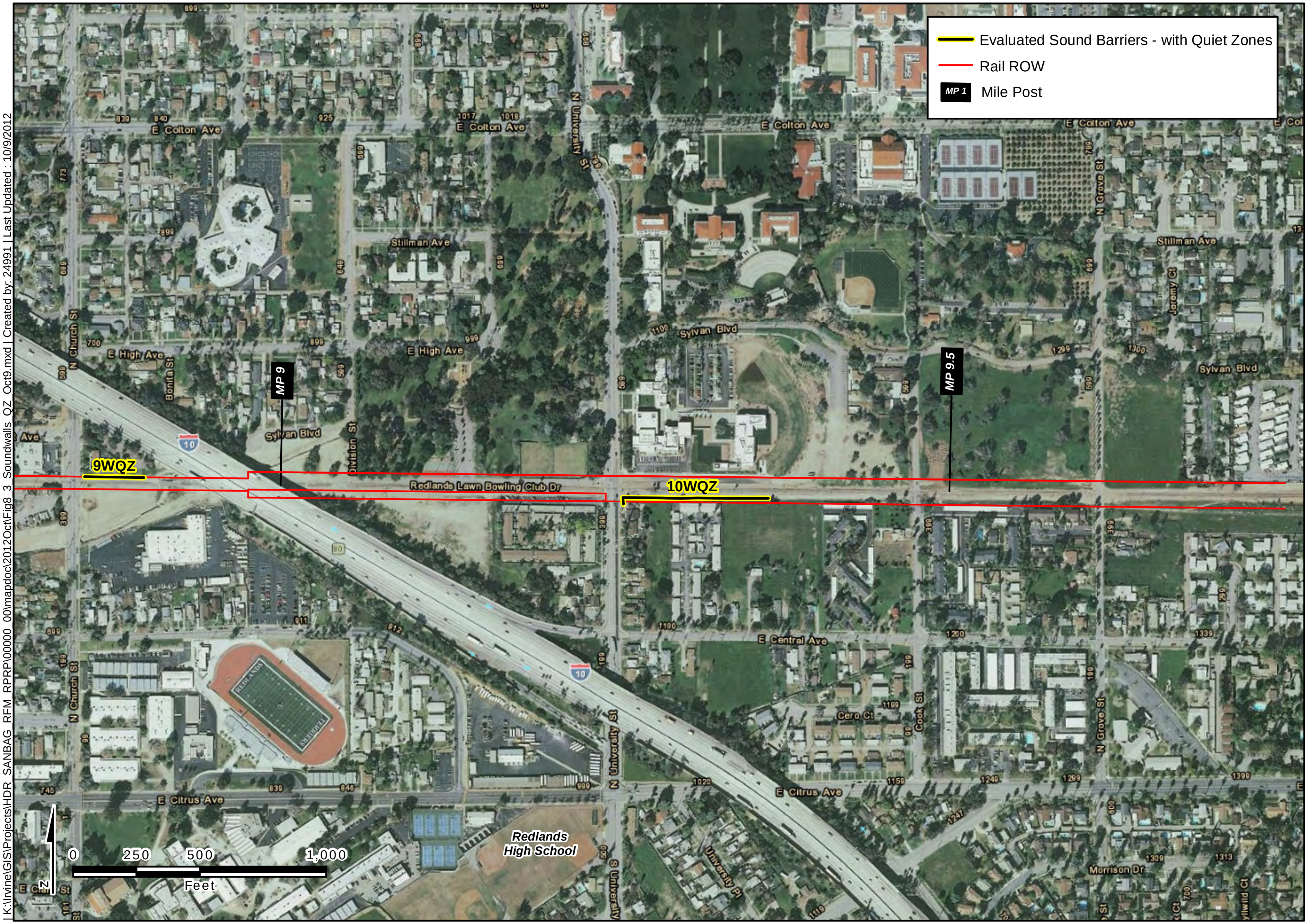
Evaluated Sound Barrier Locations - Scenario with Implementation of Quiet Zones

Figure 8-3 E

SANBAG/FTA | Redlands Passenger Rail Project | EIS/EIR



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Evaluated Sound Barrier Locations - Scenario with Implementation of Quiet Zones

Figure 8-3 F

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- Using noise-producing signals, including horns, whistles, alarms, and bells, for safety-warning purposes only.
- Locating stationary noise-generating equipment, construction parking, and maintenance areas as far as reasonable from sensitive receivers when sensitive receivers adjoin or are near the construction project study area.
- Prohibiting unnecessary idling of internal combustion engines (i.e., in excess of 5 minutes).
- Placing temporary sound barriers or enclosures around stationary noise-generating equipment when located near noise-sensitive areas (5- to 15-decibel reduction possible).
- Ensuring that project-related public address or music systems are not audible at any adjacent receiver.
- Notifying adjacent residents in advance of construction work.

Mitigation Measure NV-6: Prepare a Community Awareness Program for Project Construction

In consultation with the representatives of the neighboring cities, the construction contractor will prepare and maintain a program to enhance community awareness of project construction issues, including noise, vibration, nighttime noise, nighttime lighting, and roadway closures. Initial information packets will be prepared and mailed to all residences within a 500-foot radius of project construction, with updates prepared as necessary to indicate new scheduling or processes. A project liaison will be identified who will be available to respond to community concerns regarding noise, vibration, and light.

Mitigation Measure NV-7: Structural Evaluation of Historic Properties

To determine the structural stability of the Redlands Depot, Cope Commercial Company Warehouse, Haight Packing House, and the brick warehouse at 440 Oriental Ave., structural evaluations will be prepared by a qualified engineer for these four buildings prior to the commencement of construction. Qualified recommendations within the structural evaluation will be adhered to, as appropriate.

8.2 Discussion of Mitigation Measures for Rail Noise Impacts

The mitigation of rail noise impacts was considered using the recommendations contained in Section 6.8 of the FTA manual. Source treatments, such as specifications for quieter vehicles, undercar absorption, wheel skirts, etc., were considered and discussed with the project sponsor but were rejected and considered not feasible because of the need to have interchangeability for the rolling stock.

The primary noise mitigation approaches applicable to the proposed Project are:

1. **Quiet Zones**:[6] Implementation of the FRA guidelines for the establishment of Quiet Zones would eliminate or reduce many of the predicted noise impacts, because horn noise near and approaching at-grade crossings is a major component of the overall noise from train operations. The effects of Quiet Zone implementation was analyzed for at-grade crossings near noise-sensitive land uses found to be affected by horn noise. The analysis assumed that the following at-grade crossings would be modified to meet Quiet Zone standards:

[6] The establishment of a "quiet zone" requires implementation of a number of Supplemental Safety Measures (SSMs) such as four-quadrant gate systems, temporary closure of crossings, etc. which would then allow the rail operator to not sound the locomotive horn as otherwise proscribed by the safety rules of the FRA. The current Metrolink guidelines for local agencies that wish to establish quiet zones include early coordination with Metrolink followed by diagnostic meetings with the principal stakeholders.

- South Arrowhead Ave.,
- South Sierra Way,
- West Central Ave.,
- East Orange Show Road,
- South Waterman Ave.,
- South Tippecanoe Ave.,
- South Richardson St.,
- Mountain View Ave.,
- West Colton Ave.,
- Tennessee St.,
- Church St., and
- North University St.

The locations of the quiet zones and residual noise effects are shown in Figure 8-1. Table 8-1 summarizes the results of the analysis with the elimination of locomotive horn noise at the crossings with Quiet Zones.

In summary, the impact would be considered moderate at a total of 14 receivers, representing 49 Category 2 land uses. The impact would be considered severe at a total of four receivers, representing 11 Category 2 land uses. The resultant rail noise levels with implementation of the Quiet Zones are described below by MP segment.

Table 8-1. Rail Noise Impacts following Quiet Zone Implementation

Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Existing Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers) without Quiet Zone	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers) with Quiet Zone	FTA Level of Noise Impact Remaining[1]
MP 1 to MP 2: E St. to southeast of Sierra Way							
1	Commercial/ Transient Residential use east of N. E St. and north of alignment (includes horn noise)	Transient Residential / Commercial (Motel) / 2	1	69	57	51	No Impact
2	200' to 400' south of alignment, west of Pershing Ave.	Residential / 2	2	55	62	55	No Impact
3	50' to 100' east of alignment, east of Dorothy St.	Residential / 2	3	55	68	62	Severe Impact
4	100 to 200' east of alignment, east of Dorothy St.	Residential / 2	3	55	64	56	Moderate Impact

Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Existing Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers) without Quiet Zone	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers) with Quiet Zone	FTA Level of Noise Impact Remaining[1]
5	200 to 400' east of alignment, east of Dorothy St.	Residential / 2	32	55	61	54	No Impact
6	400 to 800' east of alignment, east of Dorothy St.	Residential / 2	8	55	51	44	No Impact
7	200 to 400' east of alignment, east of Dorothy St.	Residential / 2	3	55	55	48	No Impact
8	50' to 100' east of alignment, east of Dorothy St.	Residential / 2	5	55	68	60	Moderate Impact
9	100 to 200' east of alignment, east of Dorothy St.	Residential / 2	1	55	56	56	Moderate Impact
10	200 to 400' east of alignment, east of Dorothy St.	Residential / 2	1	55	54	47	No Impact
MP 2 to MP 3.5: Southeast of Sierra Way to southeast of South Waterman Ave.							
11	200 to 400' east of alignment, east of Lincoln Ave.	Residential / 2	3	52	55	50	No Impact
12	200' to 400' west of alignment, east of S. Washington Ave.	Residential / 2	1	52	58	51	No Impact
13	100 to 200' east of alignment, east of Lincoln Ave.	Residential / 2	6	52	66	59	Moderate Impact
14	50' to 100' west of alignment, east of S. Washington Ave.	Residential / 2	1	52	68	61	Severe Impact
15	100' to 200' west of alignment, east of S. Washington Ave.	Residential / 2	2	52	65	57	Moderate Impact
16	200' to 400' west of alignment, east of S. Washington Ave.	Residential / 2	3	52	55	48	No Impact
17	200' to 400' west of alignment, east of S. Washington Ave.	Residential / 2	2	52	62	55	Moderate Impact
18	100' to 200' east of alignment, south of Ennis St.	Residential / 2	1	52	64	58	Moderate Impact

Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Existing Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers) without Quiet Zone	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers) with Quiet Zone	FTA Level of Noise Impact Remaining[1]
19	200' to 400' east of alignment, east of Lincoln Ave.	Residential / 2	2	52	62	55	Moderate Impact
20	200' to 400' east of alignment, east of Lincoln Ave.	Residential / 2	2	52	58	52	No Impact
21	400' to 800' west of alignment, south of Orange Show Rd.	Residential / 2	1	52	59	52	No Impact
22	50' to 100' southwest of alignment, north of Dumas St.	Residential / 2	1	52	71	63	Severe Impact
23	100' to 200' southwest of alignment, north of Dumas St.	Residential / 2	2	52	64	57	Moderate Impact
24	200' to 400' southwest of alignment, north of Dumas St.	Residential / 2	4	52	61	55	Moderate Impact
MP 3.5 to MP 6: Southeast of South Waterman Ave. to Bryn Mawr Ave.							
25	100' to 200' south of alignment, east of Tippecanoe Ave.	Residential / 2	3	64	64	58	No Impact
26	200' to 400' south of alignment, east of Tippecanoe Ave.	Residential / 2	8	64	58	51	No Impact
27	100' to 200' south of alignment, east of Tippecanoe Ave.	Residential / 2	8	64	63	55	No Impact
28	100' to 200' south of alignment, west of S. Richardson St.	Residential / 2	18	64	63	55	No Impact
29	200' to 400' south of alignment, west of S. Richardson St.	Residential / 2	4	64	53	46	No Impact
30	100' to 200' south of alignment, east of S. Richardson St.	Recreation (School Athletic Fields) and School / 3	1	55	60	57	No Impact (Category 3)
31	100' to 200' north of alignment, east of S. Richardson St.	Residential / 2	6	58	66	59	Moderate Impact
32	200' to 400' north of alignment, east of S. Richardson St.	Residential / 2	5	58	54	47	No Impact

Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Existing Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers) without Quiet Zone	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers) with Quiet Zone	FTA Level of Noise Impact Remaining[1]
33	100' to 200' north of alignment, south of Victoria Ave.	Residential / 2	8	58	64	56	No Impact
34	100' to 200' north of alignment, south of Victoria Ave.	Residential / 2	4	58	56	56	No Impact
35	100' to 200' south of alignment, north of east Gould St.	Residential / 2	8	58	55	55	No Impact
36	100' to 200' south of alignment, north of E. Gould St.	Residential / 2	10	58	64	56	No Impact
37	200' to 400' south of alignment, west of Mountain View Ave.	Residential / 2	7	58	53	46	No Impact
38	200' to 400' south of alignment, west of Mountain View Ave.	Day Care Facility / 3	1	55	56	56	No Impact
39	100' to 200' north of alignment, south of Victoria Ave.	Residential / 2	3	58	65	58	Moderate Impact
40	200' to 400' north of alignment, south of Victoria Ave.	Residential / 2	3	58	58	51	No Impact
41	50' to 100' north of alignment, east of Mountain View Ave.	Residential / 2	6	58	71	63	Severe Impact
MP 6 to MP 8.5: Bryn Mawr Ave. to east of Texas St.							
42	100' to 200' south of alignment, east of Bryn Mawr Ave.	Residential / 2	8	71	56	56	No Impact
43	50' to 100' north of alignment, east of Nevada St.	Transient Residential / Commercial (Motel)	1	67	60	60	No Impact
44	100' to 200' south of alignment, south of Redlands Blvd.	Residential / 2	6	67	64	56	No Impact
45	200' to 400' south of alignment, south of Redlands Blvd.	Residential / 2	22	67	55	47	No Impact
46	0' to 100' north of alignment, west of Tennessee St.	Transient Residential / Commercial (Motel) / 2	1	67	68	61	No Impact

Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Existing Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers) without Quiet Zone	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers) with Quiet Zone	FTA Level of Noise Impact Remaining[1]
47	100' to 200' north of alignment, west of New York St.	Residential / 2	1	62	63	57	No Impact
48	200' to 400' south of alignment, south of Redlands Blvd.	Recreation (Park) / 3	1	60	60	61	No Impact (Category 3)
49	200' to 400' north of alignment, west of Texas St.	Recreation (School Athletic Fields) and School / 2	1	57	58	58	No Impact (Category 3)
50	200' to 400' north of alignment, east of Texas St.	Residential / 2	6	62	56	51	No Impact
51	200' to 400' north of alignment, east of Texas St.	Residential / 2	1	62	51	45	No Impact
MP 8.5 to MP 10: East of Texas St. to east of North University St. (Project End)							
52	200' to 400' north of alignment, east of Eureka St.	Residential / 2	3	62	58	53	No Impact
53	200' to 400' north of alignment, east of Texas St.	Residential / 2	1	62	55	49	No Impact
54	50' to 100' north of alignment, west of 9th St.	Residential / 2	3	67	68	62	No Impact
55	50' to 100' north of alignment, west of 9th St.	Church / 3	1	61	66	64	No Impact
56	200' to 400' south of alignment, west of Church St.	Residential / 2	4	67	52	47	No Impact
57	200' to 400' south of alignment, west of Church St.	Residential / 2	4	67	56	49	No Impact
58	200' to 400' north of alignment, east of 9th St.	Residential / 2	10	67	56	50	No Impact
59	200' to 400' north of alignment, east of 9th St.	Residential / 2	10	67	56	50	No Impact
60	200' to 400' south of alignment, east of Church St.	Residential / 2	3	67	52	45	No Impact
61	50' to 100' north of alignment, east of Church St.	Residential / 2	6	67	71	65	Moderate Impact

Receiver #	Receiver Location Description	Land Use Category	Number of Noise-Sensitive Sites Represented	Existing Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers)	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers) without Quiet Zone	Project Noise Exposure (dBA L_{dn} or L_{eq} for Cat 3 Receivers) with Quiet Zone	FTA Level of Noise Impact Remaining[1]
62	200' to 400' north of alignment, north of Sylvan Blvd.	Residential / 2	7	64	61	53	No Impact
63	50' to 100' north of alignment, north of Park Ave.	Recreation (Park) / 3	1	61	68	63	No Impact (Category 3)
64	100' to 200' south of alignment, west of University St.	Residential / 2	1	64	62	55	No Impact
65	100' to 200' south of alignment, west of University St.	Residential / 2	8	64	62	55	No Impact
66	100' to 200' south of alignment, west of University St.	Residential / 2	10	64	56	50	No Impact
67	200' to 400' south of alignment, west of University St.	Residential / 2	4	64	52	45	No Impact
68	50' to 100' south of alignment, east of University St.	Residential / 2	6	61	69	62	Moderate Impact
69	100' to 200' south of alignment, east of University St.	Residential / 2	7	61	59	53	No Impact
70	200' to 400' south of alignment, east of University St.	Residential / 2	4	61	54	48	No Impact
71	100' to 200' north of alignment, east of University St.	School (University of Redlands) / 3	1	54	63	57	No Impact
72	100' to 200' south of alignment, east of Cook St.	Residential / 2	6	61	60	53	No Impact

[1]Represents FTA Impact criteria

MP 1 to MP 2 (E St. to southeast of Sierra Way). Moderate impacts from project-related rail noise are predicted to occur at three receivers (Receivers[7] 4, 8, and 9), representative of a total of nine residential (Category 2) land uses in the area. Severe impacts from project-related rail noise are predicted to occur at one receiver (Receiver 3), representative of a total of three residential (Category 2) land uses in the area. No Category 3 land uses would be affected in the area.

[7] Modeled receiver locations are shown in Figures 5-1 and 6-1.

MP 2 to MP 3.5 (southeast of Sierra Way to southeast of South Waterman Ave.). Moderate impacts from project-related rail noise are predicted to occur at seven receivers (Receivers 13, 15, 17, 18, 19, 23, and 24), representative of a total of 19 residential (Category 2) land uses in the area. Severe impacts from project-related rail noise are predicted to occur at two receivers (Receivers 14 and 22), representative of a total of two residential (Category 2) land uses in the area. No Category 3 land uses would be affected in the area.

MP 3.5 to MP 6 (Southeast of South Waterman Ave. to Bryn Mawr Ave.). Moderate impacts from project-related rail noise are predicted to occur at two receivers (Receivers 31 and 39), representative of a total of 9 residential (Category 2) land uses in the area. Severe impacts from project-related rail noise are predicted to occur at one receiver (Receiver 41), representative of a total of six residential (Category 2) land uses in the area.

MP 6 to MP 8.5 (Bryn Mawr Ave. to east of Texas St.). No Category 2 or Category 3 land uses would be affected in the area.

MP 8.5 to MP 10 (East of Texas St. to east of North University St.). Moderate impacts from project-related rail noise are predicted to occur at two receivers (Receivers 61 and 68), representative of a total of 12 residential (Category 2) land uses in the area. No severe impacts are predicted to occur in the area.

2. **Sound Barriers:** Sound barriers in the form of solid walls were considered for two scenarios. The sound barriers shown in Figure 8-2 and summarized in Table 8-2 show the results of the analysis for areas in which moderate or severe impacts were predicted to occur from the project and Quiet Zones were not implemented. The sound barriers shown in Figure 8-3 and summarized in Table 8-3 show the results for areas in which moderate or severe impacts would remain following implementation of Quiet Zones.

Table 8-2. Sound Barrier Locations – without Implementation of Quiet Zones

Sound Barrier #	Receiver #s	Sound Barrier Location/ Description	Mile Post Location (Approx.)	Max. Threshold Exceeded, dB	Barrier Length (feet)	Barrier Height (feet)	Estimated Barrier Performance[1] (dB)
1NQZ	2	South side of rail alignment east of South Arrowhead Ave.	1.3	7	440	12	8
2NQZ	3	Northeast side of rail alignment north of East Julia St., east of South Sierra Way	1.5	13	105	16	13
3NQZ	4, 5, 8, 9	East side of rail alignment adjacent to South Dorothy St.	1.6	13	1,460	18	13
4NQZ	12, 14, 15, 16, 17	West side of rail alignment, north of East Orange Show Rd.	2.6	14	2,570	10 to 22	14
5NQZ	11, 13, 18, 19, 20	East side of rail alignment, north of East Orange Show Rd., south of East Central Ave.	2.6	12	2,200	18	12
6NQZ	21, 22, 23	Southwest side of rail alignment, south of East Orange Show Rd., west of Waterman Ave.	2.9	17	1,120	18	17

Sound Barrier #	Receiver #s	Sound Barrier Location/ Description	Mile Post Location (Approx.)	Max. Threshold Exceeded, dB	Barrier Length (feet)	Barrier Height (feet)	Estimated Barrier Performance[1] (dB)
7NQZ	24	Southwest side of rail alignment, south of West Dumas St., west of Waterman Ave.	3.0	7	410	10	8
8NQZ	25, 27, 28	South side of rail alignment, east of South Tippecanoe Ave.	4.4	4	2,190	12	4
9NQZ	31, 33	North side of rail alignment, east of South Richardson St.	4.8	10	1,320	14	10
10NQZ	30	South side of rail alignment, east of South Richardson St.	4.7	7	1,120	12	8
11NQZ	36	South side of rail alignment, west of Mountain View Ave.	5.2	8	990	12	9
12NQZ	39, 40	Northeast side of rail alignment, west of Mountain View Ave.	5.2	9	650	16	10
13NQZ	41	Northeast side of rail alignment, east of Mountain View Ave., south of West Lugonia Ave.	5.3	15	610	26	15
14NQZ	44	South side of rail alignment, at Kansas St.	7.6	2	1,370	10	6
15NQZ	46	North side of rail alignment, west of Tennessee St.	7.7	6	860	8	6
16NQZ	47	North side of rail alignment, west of New York St.	8.1	5	1,040	10	8
17NQZ	54, 55	North side of rail alignment, west of 9th St.	9.1	6	340	10	7
18NQZ	61, 62	North side of rail alignment, east of Church St.	9.4	9	1,065	10 to 14	10
19NQZ	63	North side of rail alignment, east of Division St.	9.6	8	560	12	9
20NQZ	64	North side of rail alignment, west of North University St.	9.7	2	690	10	4
21NQZ	65	South side of rail alignment, west of North University St.	9.7	2	780	10	7
22NQZ	68,69, 72	South side of rail alignment, east of North University St.	9.8	11	1,260	10 to 16	11
23NQZ	71	North side of rail alignment, east of North University St.	9.8	6	760	10	8
[1]Assuming a solid barrier with absorptive surface facing the rail alignment.							

Table 8-3. Sound Barrier Locations – with Implementation of Quiet Zones

Sound Barrier #	Receiver #s	Sound Barrier Location/ Description	Mile Post Location (Approx.)	Max. Threshold Exceeded, dB	Barrier Length (feet)	Barrier Height (feet)	Estimated Barrier Performance[1] (dB)
1WQZ	3	Northeast side of rail alignment north of East Julia St., east of South Sierra Way	1.5	7	105	10	9
2WQZ	4, 8, 9	East side of rail alignment adjacent to South Dorothy St.	1.6	5	1,460	10	6 to 7
3WQZ	13,18, 19	East side of rail alignment, north of East Orange Show Rd., south of East Central Ave.	2.6	5	900	10	5 to 7
4WQZ	14, 15, 17	West side of rail alignment, north of East Orange Show Rd.	2.8	7	2,200	10	5 to 7
5WQZ	22, 23, 24	Southwest side of rail alignment, south of East Orange Show Rd., west of Waterman Ave.	3.0	9	700	12	7 to 10
6WQZ	31	North side of rail alignment, east of South Richardson St.	4.7	3	760	10	4 to 7
7WQZ	39	Northeast side of rail alignment, west of Mountain View Ave.	5.1	2	650	10	6
8WQZ	41	Northeast side of rail alignment, east of Mountain View Ave., south of West Lugonia Ave.	5.3	7	610	10	9
9WQZ	61	North side of rail alignment, east of Church St.	9.3	3	235	14	8
10WQZ	68	South side of rail alignment, east of North University St.	9.8	4	600	10	7

3. **Rail Lubrication**: Wheel squeal on tight radius curves (less than 1,000 feet radius) can be a particularly annoying community noise. It is usually possible to substantially reduce wheel squeal with wayside applicators that apply a friction control material to the top of the rail and/or a lubricant to the gage face of the rail.

   Installation of wayside applicators is recommended for all major curves on the project alignment. If the wayside applicators are not able to reduce squeal to an acceptable level, additional reduction may be possible through customized profiling of the rail to reduce the forces required for trains to negotiate the curves.

9.0 REFERENCES

9.1.1 Printed References

Federal Highway Administration. 2004. *Federal Highway Administration Traffic Noise Model*, version 2.5. Office of Environment and Planning. Washington, D.C. February.

HDR. 2013. *Redlands Passenger Rail Project, Draft Traffic Analysis.* Irvine, CA. May 2013.

U.S. Department of Transportation, Federal Transit Administration, Office of Planning and Environment. 2006. *Transit Noise and Vibration Impact Assessment.* FTA-VA-90-1003-06 (Prepared under contract by Harris, Miller, Miller and Hanson). Burlington, MA. May.

9.1.2 Personal Communications

Medina, Richard. BNSF engineer in charge. Personal communication—information provided to Gerard Reminiskey at HDR on July 23, 2010.

Appendix A

Introduction to Rail and Construction Noise/Vibration

APPENDIX A

This appendix provides general information regarding the fundamentals of rail noise and construction noise and vibration.

A-1 Fundamentals of Rail Noise

Noise is the common term used to describe unwanted sound. The terms "noise" and "sound" are used interchangeably in this discussion.

A-1.1 A-Weighted Sound Level

The unit of sound pressure level measurement is the decibel (dB). It is a unit describing the amplitude of sound pressure compared to a reference pressure. Commonly encountered sound levels range from slightly above the threshold of hearing and very quiet (around 20 dB) to very loud sounds at 130 dB. The sound pressure level is mathematically equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals.

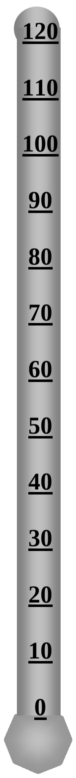
The most common descriptor of sound and noise associated with community noise measurements is the A-weighted sound pressure level, which is abbreviated as dBA. It is defined as the sound pressure level in decibels as measured on a sound meter using the A-weighting filter network. The A-weighting frequency filter de-emphasizes the very low- and very high-frequency components of sound in a manner similar to the frequency response of human hearing and correlates well with people's group reactions to sound and environmental noise. All sound levels in this report are A-weighted. A-weighted sound pressure levels of typical sources of noise are shown in Figure A-1.

A-1.2 Equivalent Sound Level and Day-Night Average Sound Level

The A-weighted sound level of rail noise and other long-term noise-producing activities within and around a community vary with time. Certain noise descriptors are preferred for use in describing community noise environments. These descriptors are based on noise energy and called the equivalent sound level (L_{eq}), and the day-night average sound level (L_{dn} or DNL). L_{eq} is defined as the continuous steady-state noise level that would have the same total acoustical energy as the real fluctuating noise measured during the same period. Although L_{eq} can be measured or computed for any period, it is typically specified for 1 hour (L_{eq}[h]) or 24 hours (L_{eq}[24h]). L_{dn} is the same as a 24-hour L_{eq} except that noise occurring during the nighttime hours (10:00 p.m. to 6:59 a.m.) is weighted or penalized by 10 dBA. The nighttime penalty accounts for the increased annoyance of noise during typical sleeping hours. L_{dn} accounts for the tempo (operational frequency), acoustic magnitude, duration, and time of day of transit-related noise events.

Both L_{eq} and L_{dn} descriptors are approved by various regulatory agencies for noise-related land use planning. The unit for each of these descriptors is dBA. The most recent methodology recommended for assessing rail noise effects (Federal Transit Administration [FTA] 2006) uses L_{dn} as the noise descriptor of choice. This is consistent with the guidelines previously adopted in 1995 by FTA. Figures A-2 and A-3 show typical L_{eq} and L_{dn}, respectively, for transit (rail) and nontransit (nonrail) sources. Comparing the automobile traffic noise levels, 1,000 autos per hour at 40 mph generate approximately 65 dBA L_{eq} at a reference distance of 50 feet (Figure A-1). Assuming this constant rate for the daytime period but only 100 autos per hour during the nighttime, the L_{dn} would be 65 dBA.

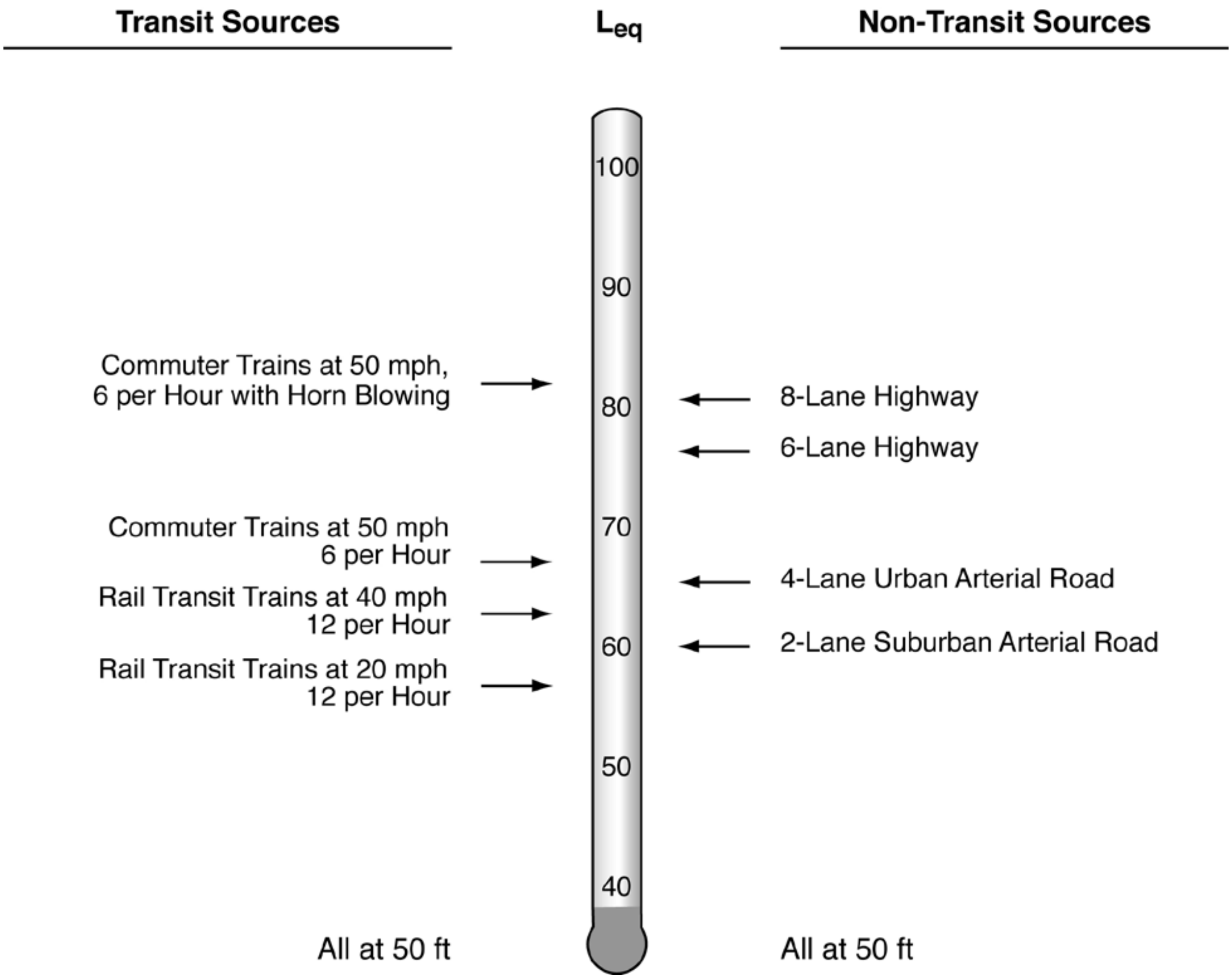
Figure A-1. Sound Levels of Typical Noise Sources and Noise Environments



Noise Level dBA	Extremes	Home Appliances	Speech at 3 Feet	Motor Vehicles at 50 Feet	General Type of Community Environment
	Jet aircraft at 500 ft				
		Chain saw			
		Power lawn mower		Diesel truck (not muffled)	
		Shop tools	Shout	Diesel truck (muffled)	
		Blender	Loud voice	Automobile at 70 mph	Major metropolis
		Dishwasher	Normal voice	Automobile at 40 mph	Urban (daytime)
		Air conditioner	Normal voice (back to listener)	Automobile at 20 mph	Suburban (daytime)
		Refrigerator			Rural (daytime)
	Threshold of hearing				

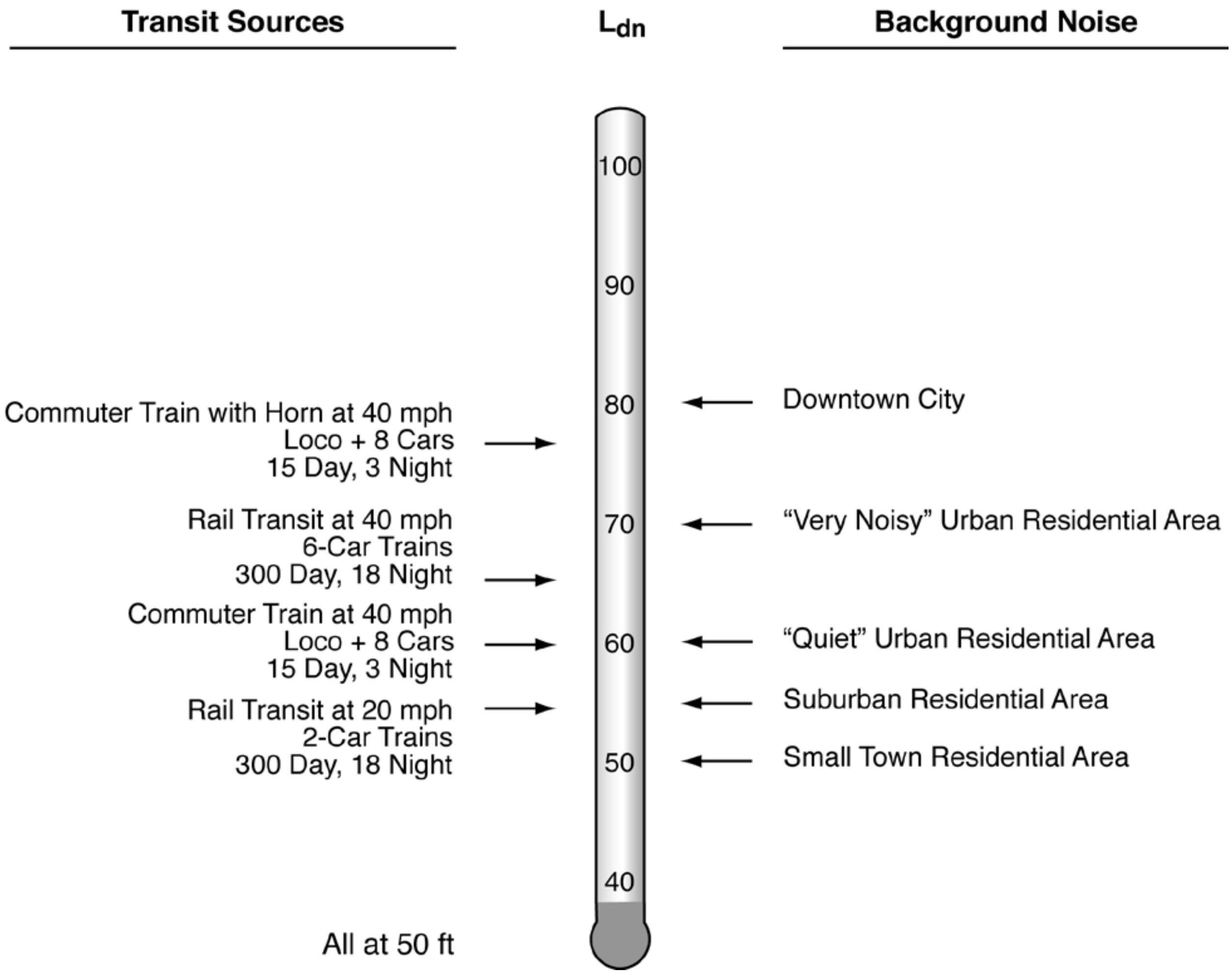
Source: Harris Miller Miller & Hanson, Inc. 2003. Noise and Vibration Impact Assessment for the San Francisco Bay Area Rapid Transit District (BART) Warm Springs Extension Project. Draft report. February. (HMMH Report No. 298760-01.) Burlington, MA. Prepared for Jones & Stokes.

Figure A-2. Typical Hourly L_{eq}



Source: FTA 2006.

Figure A-3. Typical L_{dn} Values



Source: FTA 2006.

The sound exposure level (SEL) is also an important descriptor or metric used in these noise analyses. The SEL describes a receiver's cumulative noise exposure from a single noise event. It is represented by the total A-weighted sound energy during the event, normalized to a 1-second interval. It is the primary descriptor of low- and high-speed rail vehicle noise emissions and is also a useful intermediate quantity for estimating the L_{dn} due to train passbys.

Other noise metrics used to describe the noise environment include the maximum sound level (L_{max}) and the minimum sound level (L_{min}). L_{max} is the highest noise level achieved during a noise event or measurement period. Standard sound level meters have two settings, fast and slow, which represent different time constants. L_{max} measured using the fast setting will typically be 1 to 3 dB greater than L_{max} using the slow setting. L_{max} values expressed in this report refer to the slow setting, which uses a time constant of 1 second. L_{min} denotes the lowest noise level achieved during a noise event or measurement period.

A-1.3 Insertion Loss

The insertion loss (abbreviated IL) is a measure of the effectiveness of a sound barrier. It is the noise level reduction at a specific receiver due to construction of a noise barrier between the noise source (such as traffic) and the receiver. Generally, it is the net effect of the noise barrier attenuation and the loss of ground effects.

A-1.4 Perception of Noise

A change in environmental noise and/or vibration conditions often results from providing new or expanded transportation services. Generally in the United States the main source of environmental noise affecting the population today is surface transportation noise, more specifically, noise from vehicles traveling local streets and roads and state and interstate highways. A more limited population is exposed to noise from railroad and aviation noise sources, with a very small number of persons affected by noise from marine transportation. Community noise may also be associated with transit stations, park-and-ride lots, and rail vehicle maintenance facilities.

Evaluating differences between an existing and total predicted future noise environment assesses the potential responses of persons to changes in their noise environment. The following relationships of perception and response to quantifiable increases in long-term sound levels are used as a basis for assessing potential effects of rail noise:

- Except in a carefully controlled laboratory condition, a change of 1 dBA is very difficult to perceive.
- In the outside environment, a 3 dBA change is considered perceptible.
- An increase of 5 dBA is considered readily perceptible and would generally result in a change in community response to its noise environment.
- A 10 dBA increase is perceived as a doubling in loudness and would likely result in a widespread community response.

A-1.5 Rail Noise Source Characteristics

Rail noise is dependent on many factors:

- Train length, consist, and speed.
- Track condition and gradient.
- Distance from the track to the receiver.
- Intervening ground surface characteristics, whether acoustically reflective or absorptive (i.e., pavement or vegetation).
- Meteorological factors such as wind and temperature gradients.

- Shielding due to structures, sound barriers, earthen berms, hills, and the edge of a roadway.

The noise from a train passby is a combination of contributions from locomotive engines and from cars, with the majority of the noise exposure from the engines. Engines produce higher noise levels than cars, but the duration of the car-related noise is usually longer. The noise emitted by the engine is nearly independent of speed, but is highly dependent on the grade of the track. The noise output of an engine increases when traveling uphill, and decreases rapidly when descending. Downgrade noise output tends to level off as the grade reaches approximately -2.5% because of increased noise from the cooling fans of the dynamic braking system.

Car noise is independent of grade but increases by approximately 6 dB for each doubling of speed. Track constriction and wheel condition have the greatest effect on car noise; jointed track (as opposed to welded track) and the presence of frogs and switches can produce noise levels up to 8 dBA higher than smooth track in good condition. In addition, wheel flats (caused by dragging of the car along the track when brakes are inappropriately applied) can add up to 15 dBA to the car noise emission.

Another difference between engines and cars is the location of their noise sources. The noisiest components on most locomotives are the cooling fans and radiators on the engine compartment, while the wheel-rail interaction typically generates the greatest noise from cars. The location of the noise source affects the noise reduction provided by a barrier because both the height and proximity of the source and receiver with respect to the barrier's location and height are important in determining the effectiveness of the barrier. The shape and surface of the barrier will also affect the attenuation provided. For example, an absorptive earthen berm or sound barrier may provide up to 3 dBA greater attenuation compared to a reflective thin "screen" barrier of the same height and location.

A-2 Vibration

Ground-borne vibration is a small, rapidly fluctuating motion transmitted through the ground. The strength of ground-borne vibration diminishes (or attenuates) fairly rapidly over distance. Some soil types transmit vibration quite efficiently; other types (primarily sandy soils) do not. There are several basic measurement units commonly used to describe the intensity of ground vibration. The descriptors used by FTA are peak particle velocity, abbreviated PPV, in units of inches per second, and the velocity decibel, abbreviated VdB. The velocity parameter (instead of acceleration or displacement) best correlates with human perception of vibration. Thus, the response of humans, buildings, and sensitive equipment to vibration is described in this section in terms of the root-mean square (RMS) velocity level in VdB units relative to one micro-inch per second. As a point of reference, the average person can just barely perceive vibration velocity levels below 70 VdB (typically in the vertical direction).

A comparison of common ground-borne vibration levels is shown in Figure A-4. Typical background vibration levels are between 50 and 60 VdB, whereas the levels for minor cosmetic damage to fragile buildings or blasting are generally 100 VdB.

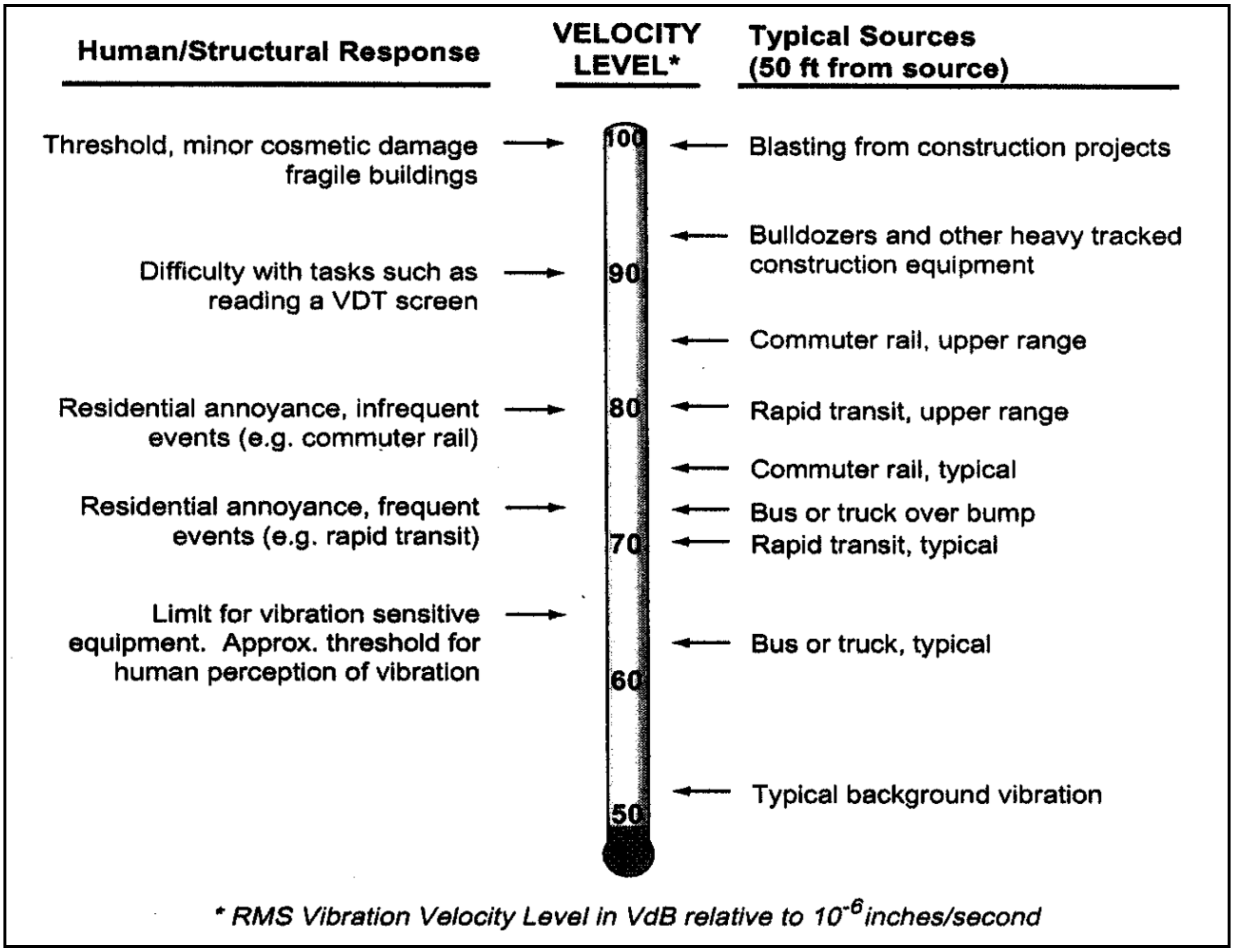
A-3 Construction Noise and Vibration

Conventional and specialized construction noise is addressed in Sections A-3.1 and A-3.2, respectively.

A-3.1 Conventional Construction Noise

The "conventional construction" activities for the Redlands Passenger Rail Project (RPRP or Project) would require the use of vehicles and heavy equipment whose noise characteristics are known. Table A-1 provides construction noise levels typical of various types of conventional construction equipment. The equipment ranges from concrete mixers producing noise levels of 80 to 86 dBA at a distance of 49.2 feet to jackhammers producing 90 to 95 dBA at a distance of 49.2 feet.

Figure A-4. Typical Levels of Ground-Borne Vibration



Source: FTA 2006.

Table A-1. Noise Level Ranges of Typical Construction Equipment

Equipment	Levels in dBA at 50 feet[a]
Front Loader	73–86
Trucks	82–95
Cranes (moveable)	75–88
Cranes (derrick)	86–89
Vibrator	68–82
Saws	72–82
Pneumatic Impact Equipment	83–88
Jackhammer	81–98
Pumps	68–72
Generators	71–83
Compressors	75–87
Concrete Mixers	75–88
Concrete Pumps	81–85
Back Hoe	73–95
Pile Driving (peaks)	95–107
Tractor	77–98
Scraper/Grader	80–93
Paver	85–88

[a] Machinery equipped with noise control devices or other noise-reducing design features may generate lower levels of emissions than those shown in this table

Source: U.S. Environmental Protection Agency 1971.

A-3.2 Construction Vibration

Construction activities can also produce varying degrees of ground vibration, depending on the equipment and methods employed. Operation of construction equipment causes ground vibrations that spread through the ground and decrease with distance. Ground vibrations from construction activities very rarely reach levels high enough to cause damage to structures, although special consideration must be made for fragile historical buildings. The construction activities that typically generate the highest levels of vibration are blasting and impact pile driving.

Ground vibration levels from construction activities vary considerably depending on soil conditions. Table A-2 presents average PPV and VdB levels at a distance of 25 feet from measured data of various types of construction equipment (FTA 2006).

Table A-2. Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft (in/sec)	L_V at 25 ft (VdB)*
Pile driver (impact)	Upper range	1.518	112
	Typical	0.644	104
Pile driver (vibratory)	Upper range	0.734	105
	Typical	0.17	93
Clam shovel drop (slurry wall)		0.202	94
Hydromill (slurry wall)	In soil	0.008	66
	In rock	0.017	75
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

* RMS velocity in decibels (VdB) re 1 micro-inch/second.

Source: FTA 2006.

Vibration from construction should be evaluated on an individual project basis where there is significant potential for impact (severe impact). Such activities include demolition, pile driving, and drilling or excavation in proximity to structures. Vibration propagates according to the following expression, based on point sources with normal propagation conditions:

$PPV_{equip} = PPV_{ref} \times (^{25}/_{D})^{1.5}$

Where:

PPV_{equip} = the PPV in inches per second of the equipment adjusted for distance.

PPV_{ref} = the reference vibration level in inches per second at 25 feet.

D = the distance from the equipment to the receiver.

FTA and the Federal Railroad Administration (FRA) have published guidelines for assessing the impacts of ground-borne vibration associated with construction of transportation projects, which have been applied by other jurisdictions to other types of projects (FTA 2006; FRA 1998). The FTA measure of the threshold of architectural damage for conventional sensitive structures is 0.2 inch per second PPV. The threshold of perception of vibration is 0.01 inch per second PPV.

Mitigation measures, in cases where potential construction vibration impacts are identified, can include the following:

- Limit ground-borne vibration due to construction activities to not exceed 0.2 inch per second velocity in the vertical direction at sensitive receivers.
- Route heavily loaded trucks away from residential streets or streets with the fewest homes.

- Operate earthmoving equipment on the construction site as far away from vibration-sensitive receivers as possible.
- Phase construction activities that create high vibration levels so as not to occur at the same time.
- Avoid nighttime activities.
- Avoid impact pile driving where possible in vibration-sensitive areas. Consider the use of alternative methods that create less vibration such as drilled piles or a vibratory pile driver.
- Where necessary and feasible, select demolition methods not involving impact.

A-4 References

U.S. Department of Labor, Occupational Safety and Health Administration, Office of Information. 1980. *Noise Control*. Washington, D.C.

U.S. Department of Transportation, Federal Railroad Administration. 1998. *High-Speed Ground Transportation Noise and Vibration Impact Assessment, Final Draft*. December.

U.S. Department of Transportation, Office of Planning and Environment, Federal Transit Administration. 2006. *Transit Noise and Vibration Impact Assessment.* FTA-VA-90-1003-06. Prepared under contract by Harris, Miller, Miller and Hanson. Burlington, MA. May.

U.S. Environmental Protection Agency. 1971. *Noise from Construction Equipment and Operations, Building Equipment and Home Appliances*. Prepared under contract by Bolt, Beranek & Newman, Boston, MA. Washington, D.C.

Appendix B

List of Noise Measurement Instruments

Appendix B
List of Field Instrumentation

- **Sound Level Meter** (for long-term noise measurements)
  - Rion NL-21Type 2 Integrating Sound Level Meter, Serial Number 00776887
  - Rion NL-21Type 2 Integrating Sound Level Meter, Serial Number 00676771
  - Rion NL-22Type 2 Integrating Sound Level Meter, Serial Number 00773232

- **Acoustical Calibrators**
  - Larson Davis Model Cal 200 (114 dB SPL @ 1000 Hz), Serial Number 6644
- **Meteorology Instrumentation**
  - Kestrel Model K3000 Digital Hygrometer/Thermometer/Anemometer, Serial Number 475332

Appendix C

Noise Measurement Data Sheets

FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **Redlands Passenger Rail** PROJ. #

SITE IDENTIFICATION: AVL 0501 LT-1	OBSERVER(S): Mike Greene/Peter Hardie
ADDRESS: BEHIND 134 JULIA ST	
START DATE / TIME: 10:15 5-2-12	END DATE / TIME:

METEROLOGICAL CONDITIONS:

TEMP: 64 °F HUMIDITY: 92 %R.H. WIND: CALM LIGHT MODERATE VARIABLE

WINDSPEED: 0 MPH DIR: N NE E SE S SW W NW STEADY GUSTY

SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

DRIZZLE

ACOUSTIC MEASUREMENTS:

INSTRUMENT: RION NL-21 TYPE: 1 2 SERIAL #:

CALIBRATOR: CAL200 SERIAL #: 6694

CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN ✓

SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	
LT-1	10:15										

COMMENTS: THERE ARE DOGS IN ALL YARDS SURROUNDING METER SO DOGS MAY BARK DURING MEASUREMENT. MOST CONSTANT NOISE SOURCE WAS BIRDS & TRAFFIC ON SIERRA.

SOURCE INFO AND TRAFFIC COUNTS:

PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: DOG BARKING EVERY YARD SURROUNDING

ROADWAY TYPE: ALONG SIERRA WAY

TRAFFIC COUNT DURATION: ___-MIN SPEED #2 COUNT SPEED

	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

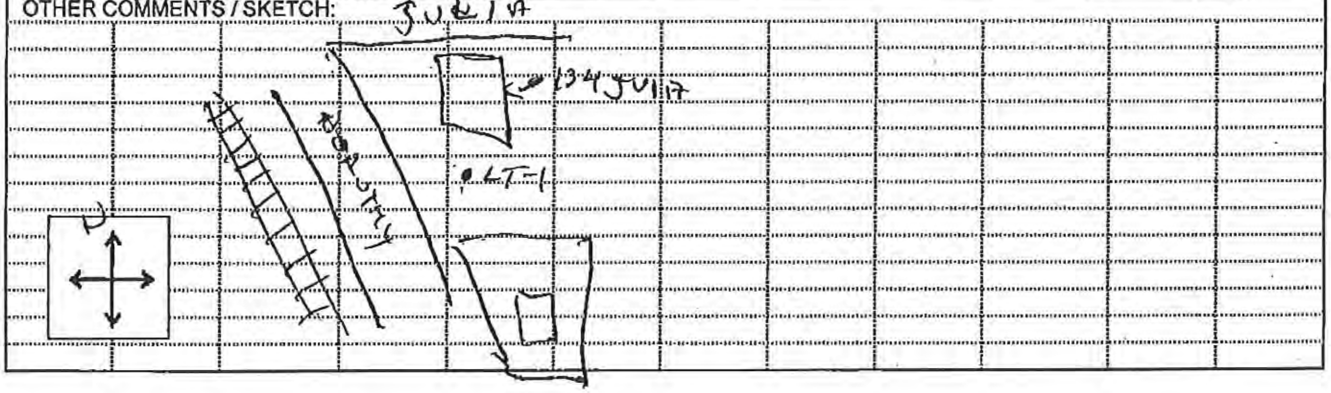
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:

TERRAIN: HARD SOFT MIXED FLAT OTHER:

PHOTOS: 1234 NESW

OTHER COMMENTS / SKETCH:



C-1

Jones & Stokes

FIELD NOISE MEASUREMENT DATA

PROJECT: **Redlands Passenger Rail** PROJ. #

SITE IDENTIFICATION: LT-2 AU 2 05 02 OBSERVER(S): Mike Greene/Peter Hardie

BETWEEN 1038 & 1018

ADDRESS: 1038/1018 LINCOLN AVE

START DATE / TIME: 5-2-12 11:00 END DATE / TIME:

METEROLOGICAL CONDITIONS:

TEMP: 63 °F HUMIDITY: 84 %R.H. WIND: CALM LIGHT MODERATE VARIABLE

WINDSPEED: 2-3 MPH DIR: N NE E SE S SW W NW STEADY GUSTY

SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

DRIZZLE

ACOUSTIC MEASUREMENTS:

INSTRUMENT: NL-22 TYPE: 1 2 SERIAL #: 77322

CALIBRATOR: CAL 200 SERIAL #: 6614

CALIBRATION CHECK: PRE-TEST 114 dBA SPL POST-TEST 113.6 dBA SPL WINDSCREEN ✓

SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)
LT2	11:00									

COMMENTS: RECEIVER IS REP OF YARDS ON EITHER SIDE

NOISES FROM INDUSTRIAL L.S IS AUDIBLE IN BACKGROUND

SOURCE INFO AND TRAFFIC COUNTS:

PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: DOGS IN YARDS AROUND

ROADWAY TYPE:

TRAFFIC COUNT DURATION: -MIN

	NB / EB	SB / WB	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	SPEED NB / EB	SPEED SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

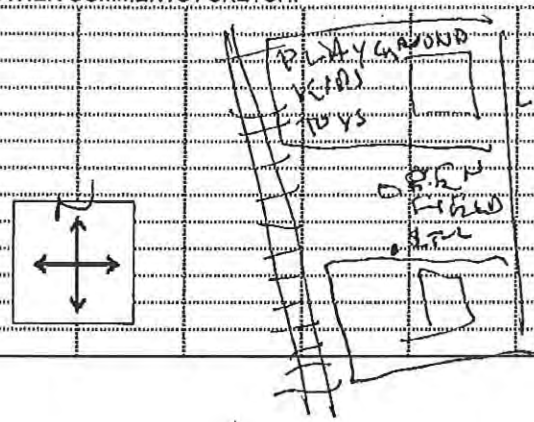
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL / DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:

TERRAIN: HARD SOFT MIXED FLAT OTHER:

PHOTOS: 5678 W S E N

OTHER COMMENTS / SKETCH:



C-2

FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **Redlands Passenger Rail** PROJ. #

SITE IDENTIFICATION: ST-2 AU20503
OBSERVER(S): Mike Greene/Peter Hardie
ADDRESS: 380 HAROT ST
START DATE / TIME: 12:15 5-2-12
END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 67 °F HUMIDITY: 87 %R.H. WIND: CALM LIGHT MODERATE VARIABLE STEADY GUSTY
WINDSPEED: 0 MPH DIR: N NE E SE S SW W NW
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: RION NL21 TYPE: 1 2 SERIAL #:
CALIBRATOR: CAL 200 SERIAL #: 6644
CALIBRATION CHECK: PRE-TEST 114 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN

SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)
LT-3	12:15									

COMMENTS: ROOSTERS ARE LOUDEST NOISE SOURCE

SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: ROOSTERS
ROADWAY TYPE:

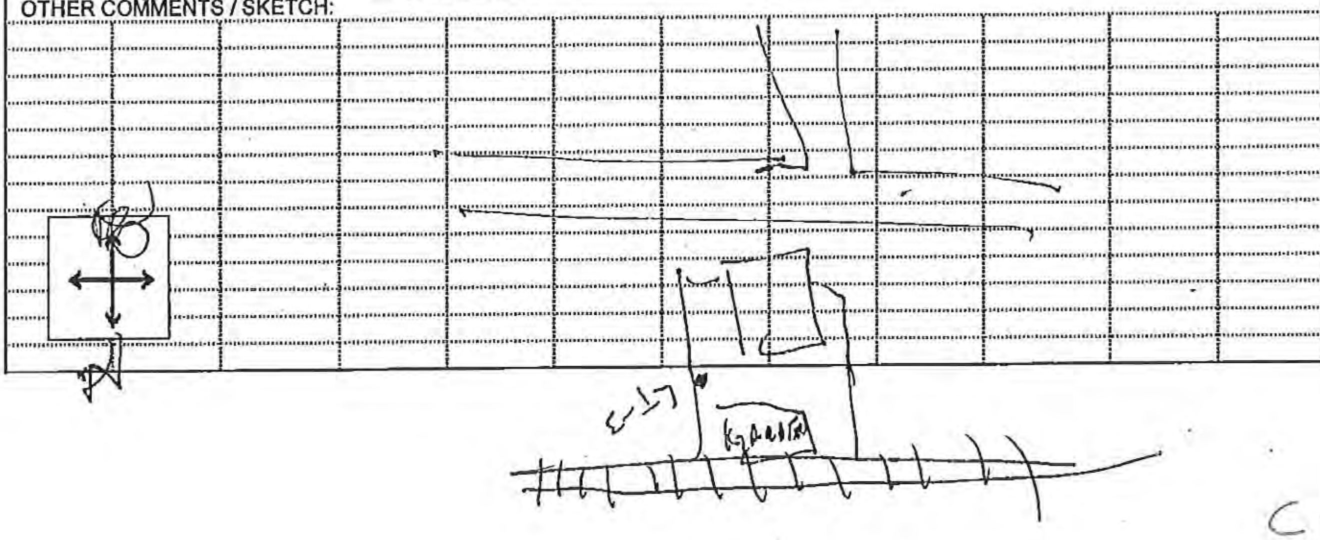
TRAFFIC COUNT DURATION: ____-MIN

	NB / EB	SB / WB	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	SPEED NB / EB	SPEED SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:
G ON TIPPECANOE

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS: [illegible] E S N
OTHER COMMENTS / SKETCH:



Jones & Stokes

FIELD NOISE MEASUREMENT DATA

PROJECT: **Redlands Passenger Rail** PROJ. #

SITE IDENTIFICATION: AU2 0504 LT-4
ADDRESS: 1424 R HARDT
START DATE / TIME: 14:45 5/31/12
OBSERVER(S): Mike Greene/Peter Hardie
END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 74 °F HUMIDITY: 65 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: <4 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: NL-22 TYPE: 1 2 SERIAL #: 773237
CALIBRATOR: CAL200 SERIAL #: 6644
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN ✓
SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	
LT-4	14:45										

COMMENTS: NOISE WILL LIKELY BE CAUSED BY DOGS IN BKYARD

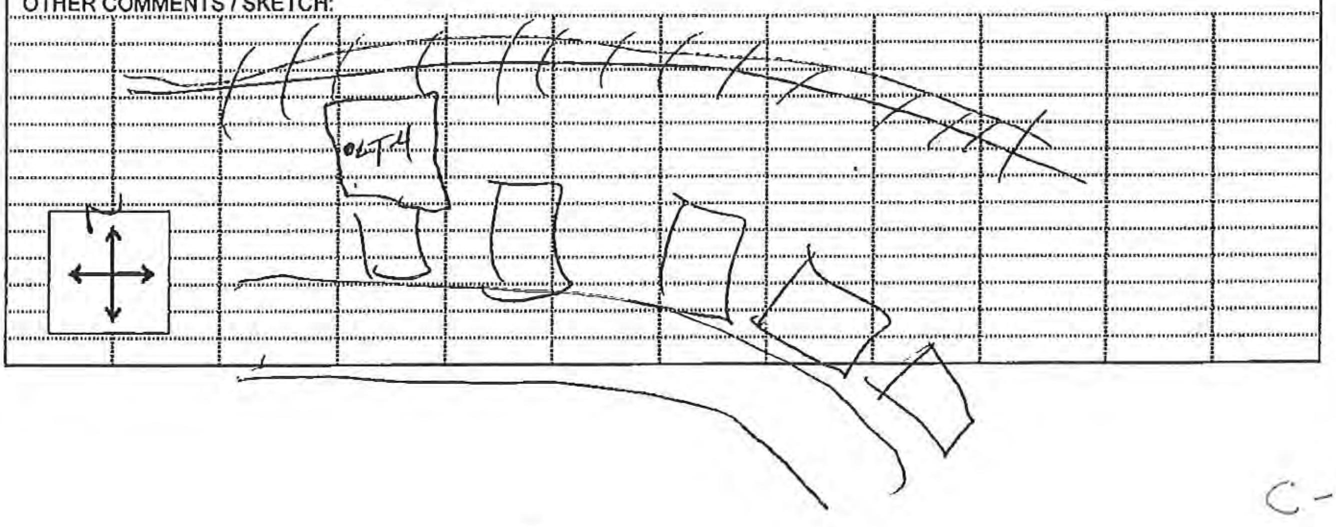
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: KIDS PLAYING
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN

	NB / EB	SB / WB	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	SPEED NB / EB	SPEED SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS: N W 12 13
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **Redlands Passenger Rail** PROJ. #

SITE IDENTIFICATION: AV2 0505
ADDRESS: BACK SIDE ON ROIBWOOD APTS
START DATE / TIME: 15:15
OBSERVER(S): Mike Greene/Peter Hardie
END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 71 °F HUMIDITY: 60 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 4-5 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: RION NL-21 TYPE: 1 2 SERIAL #: 67671
CALIBRATOR: CAL200 SERIAL #: 6644
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN ✓

SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	
LT-5	15:15										

COMMENTS:

7 1-10

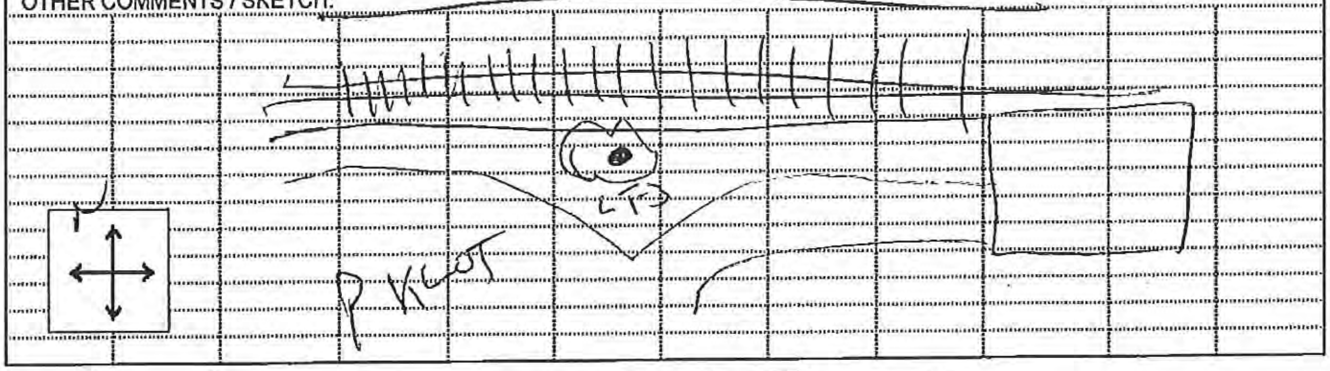
SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ___-MIN

	SPEED				#2 COUNT		SPEED	
	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL / DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER: 1-10
PHOTOS: 1415 16 NE
OTHER COMMENTS / SKETCH:



C-5

FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **Redlands Passenger Rail** PROJ. # ______

SITE IDENTIFICATION: LT-11 OBSERVER(S): Mike Greene/Peter Hardie
ADDRESS: South of sorority house on College St
START DATE / TIME: 5-8-12 END DATE / TIME: ______

METEROLOGICAL CONDITIONS:
TEMP: 92 °F HUMIDITY: 47 %R.H. WIND: CALM **LIGHT** MODERATE VARIABLE
WINDSPEED: 3-5 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: **SUNNY** **CLEAR** OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: Rion NL-21 TYPE: 1 **2** SERIAL #: ______
CALIBRATOR: CAL 200 SERIAL #: 664
CALIBRATION CHECK: PRE-TEST 114 dBA SPL POST-TEST ______ dBA SPL WINDSCREEN ✓

SETTINGS: **A-WEIGHTED** **SLOW** FAST FRONTAL **RANDOM** **ANSI** OTHER: ______

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	
LT-11	5:00										

COMMENTS:

SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: **TRAFFIC** AIRCRAFT RAIL INDUSTRIAL **AMBIENT** **OTHER:** People talking
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ____-MIN SPEED #2 COUNT SPEED

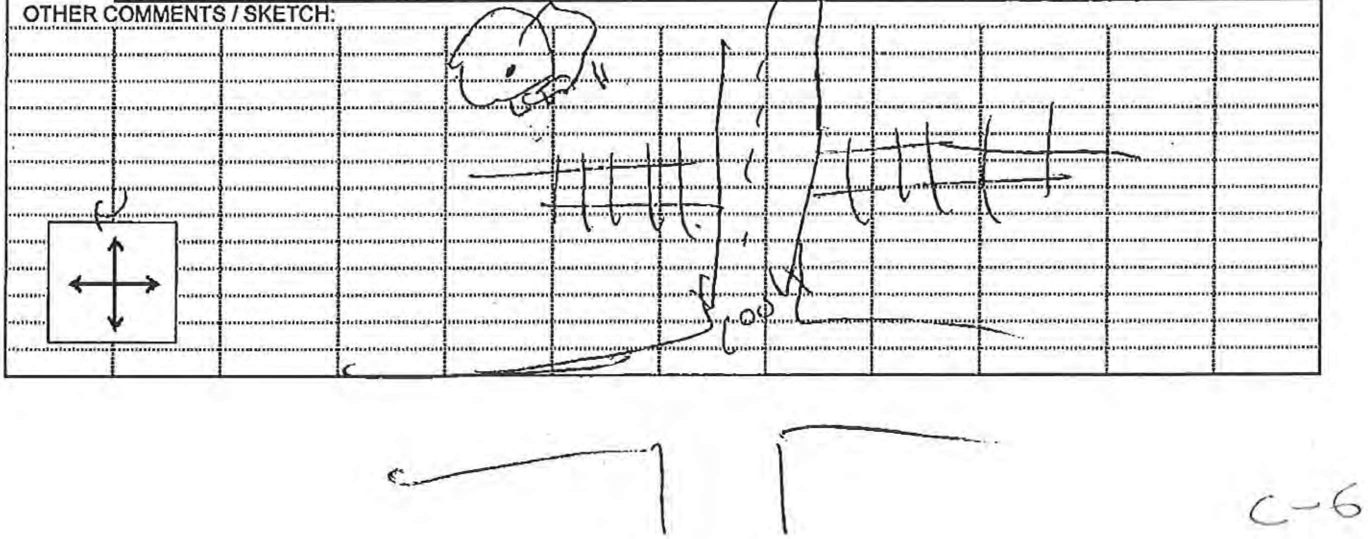
	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

sorority house

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



FIELD NOISE MEASUREMENT DATA

PROJECT: **Redlands Passenger Rail** PROJ. # ____________

SITE IDENTIFICATION: LT-6 AU0506	OBSERVER(S): Mike Greene/Peter Hardie
ADDRESS: HAWSONS MOTEL 1291 REDLANDS	
START DATE / TIME: 14:15 5/7	END DATE / TIME: ____________

METEROLOGICAL CONDITIONS:

TEMP: 94 °F HUMIDITY: 42 %R.H. WIND: CALM LIGHT MODERATE VARIABLE STEADY GUSTY

WINDSPEED: 4-8 MPH DIR: N NE E SE S SW W NW

SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:

INSTRUMENT: RION NL-21 TYPE: 1 2 SERIAL #: 676771

CALIBRATOR: CAL 200 SERIAL #: 6644

CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.0 dBA SPL WINDSCREEN ✓

SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	
LT-6	14:15										

COMMENTS:

SOURCE INFO AND TRAFFIC COUNTS:

PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: ____________

ROADWAY TYPE:

TRAFFIC COUNT DURATION: ___-MIN

	NB / EB	SB / WB	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	SPEED NB / EB	SPEED SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

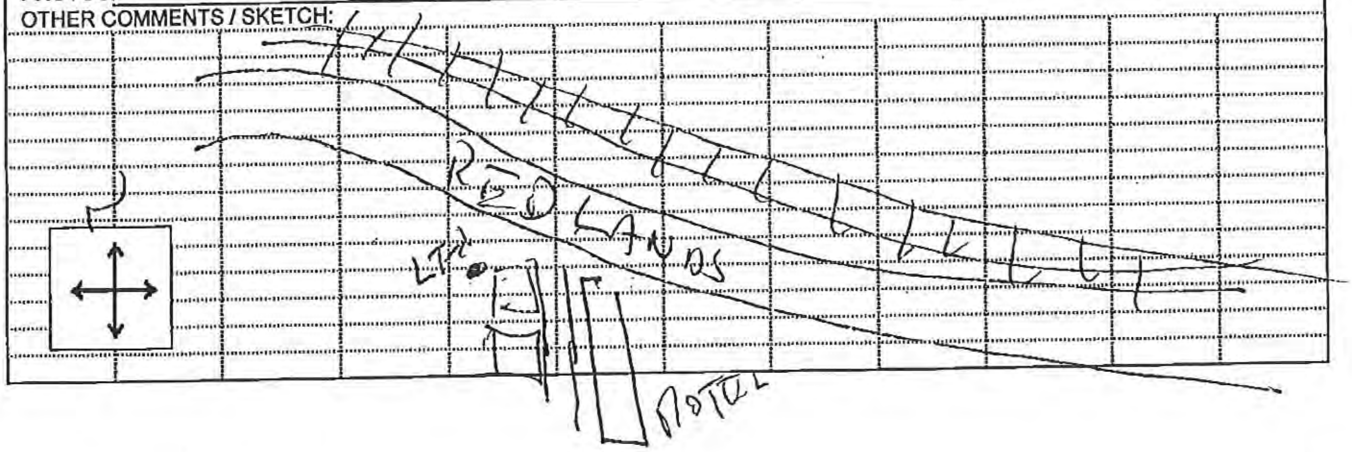
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:

TERRAIN: HARD SOFT MIXED FLAT OTHER:

PHOTOS:

OTHER COMMENTS / SKETCH:



C-7

FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **Redlands Passenger Rail** PROJ. #

SITE IDENTIFICATION: LT-7 AUZ 0507
OBSERVER(S): Mike Greene/Peter Hardie
ADDRESS: JENNIE E DAVIS MEMORIAL PARK
START DATE / TIME: 14:30 5-7-12
END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 96 °F HUMIDITY: 51 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 4-8 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: NL-21 776887 TYPE: 1 2 SERIAL #: 676711
CALIBRATOR: CAL 200 SERIAL #: 6644
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST dBA SPL WINDSCREEN ✓

SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	

COMMENTS:

SOURCE INFO AND TRAFFIC COUNTS:
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ___-MIN

	SPEED				#2 COUNT		SPEED	
	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:

FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **Redlands Passenger Rail** PROJ. #: ____

SITE IDENTIFICATION: LT-8 AJ20508
ADDRESS: 7?? W STUART
START DATE / TIME: 1530 05-07-12

OBSERVER(S): Mike Greene/Peter Hardie
END DATE / TIME: ____

METEROLOGICAL CONDITIONS:

TEMP: 77 °F HUMIDITY: 34 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 4-6 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:

INSTRUMENT: NL-22 TYPE: 1 2 SERIAL #: 773232
CALIBRATOR: CAL200 SERIAL #: 6614
CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST ____ dBA SPL WINDSCREEN ✓

SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER: ____

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	

COMMENTS:

W STUART I-10 IS IN BACKGROUND

SOURCE INFO AND TRAFFIC COUNTS:

PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER: ____
ROADWAY TYPE: ____

TRAFFIC COUNT DURATION: ____ -MIN

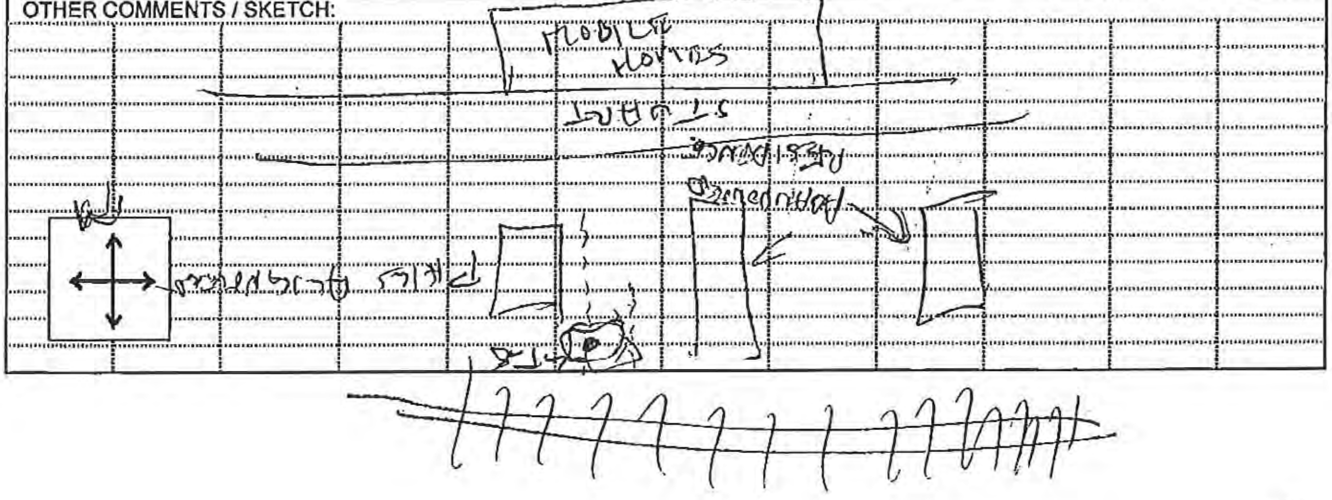
	NB / EB	SB / WB	SPEED NB / EB	SPEED SB / WB	#2 COUNT NB / EB	#2 COUNT SB / WB	SPEED NB / EB	SPEED SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL
DIST. CHILDREN PLAYING / ~~DIST. TRAFFIC / DIST.~~ LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:

TERRAIN: HARD SOFT MIXED FLAT OTHER: ____
PHOTOS:
OTHER COMMENTS / SKETCH:



C-9

Jones & Stokes

FIELD NOISE MEASUREMENT DATA

PROJECT: **Redlands Passenger Rail** PROJ. #

SITE IDENTIFICATION: LT-9 AU26509 OBSERVER(S): Mike Greene/Peter Hardie
ADDRESS: EMPTY LOT NEXT TO 610 STUART
START DATE / TIME: 1600 5-8-12 END DATE / TIME:

METEROLOGICAL CONDITIONS:
TEMP: 94 °F HUMIDITY: 34 %R.H. WIND: CALM LIGHT MODERATE VARIABLE
WINDSPEED: 5-10 MPH DIR: N NE E SE S SW W NW STEADY GUSTY
SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:
INSTRUMENT: RION NL-21 TYPE: 1 2 SERIAL #:
CALIBRATOR: CAL200 SERIAL #: 6644
CALIBRATION CHECK: PRE-TEST 114 dBA SPL POST-TEST dBA SPL WINDSCREEN ✓

SETTINGS: A-WEIGHTED SLOW FAST FRONTAL RANDOM ANSI OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	
LT-9	~~1600~~ 1715										

COMMENTS:

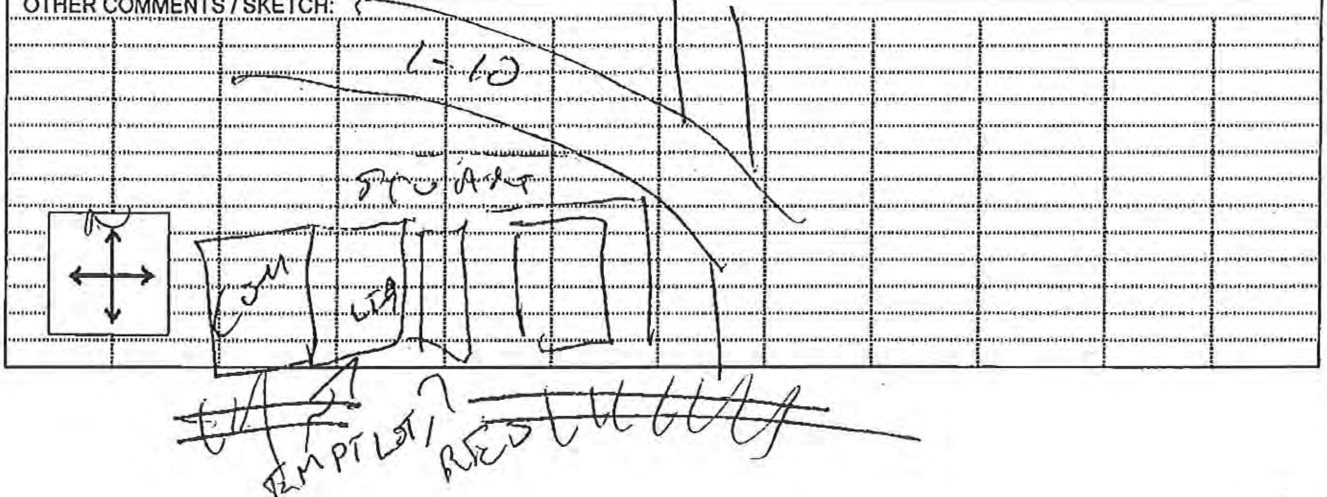
SOURCE INFO AND TRAFFIC COUNTS: I-10
PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:
ROADWAY TYPE:
TRAFFIC COUNT DURATION: ___-MIN SPEED #2 COUNT SPEED

	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:
TERRAIN: HARD SOFT MIXED FLAT OTHER:
PHOTOS:
OTHER COMMENTS / SKETCH:



C-102

FIELD NOISE MEASUREMENT DATA

Jones & Stokes

PROJECT: **Redlands Passenger Rail** PROJ. #

SITE IDENTIFICATION: LT-10 AVE - 05-10		OBSERVER(S):	Mike Greene/Peter Hardie
ADDRESS: SYLVAN PARK			
START DATE / TIME: 5-8-12		END DATE / TIME:	

METEROLOGICAL CONDITIONS:

TEMP: 94 °F HUMIDITY: 78 %R.H. WIND: CALM LIGHT MODERATE VARIABLE

WINDSPEED: 4-6 MPH DIR: N NE E SE S SW W NW STEADY GUSTY

SKY: SUNNY CLEAR OVRCST PRTLY CLOUDY FOG RAIN OTHER:

ACOUSTIC MEASUREMENTS:

INSTRUMENT: RION NL-21 TYPE: 1 2 SERIAL #: 622771

CALIBRATOR: CAL 200 SERIAL #: 6514

CALIBRATION CHECK: PRE-TEST 114.0 dBA SPL POST-TEST 114.1 dBA SPL WINDSCREEN ✓

SETTINGS: A-WEIGHTED SLOW FAST FRONTAL ~~RANDOM~~ ANSI OTHER:

REC #	START	END	L_{eq}	L_{max}	L_{min}	L_{90}	L_{50}	L_{10}	OTHER:	(TYPE?)	
LT-10	5:30										

COMMENTS:

? ON I-10 KIDS @ PLAYGROUND

SOURCE INFO AND TRAFFIC COUNTS:

PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL AMBIENT OTHER:

ROADWAY TYPE:

TRAFFIC COUNT DURATION: ____-MIN SPEED #2 COUNT SPEED

	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB	NB / EB	SB / WB
AUTOS:								
MED. TRUCKS:								
HVY TRUCKS:								
BUSES:								
MOTORCYCLES:								

SPEED ESTIMATED BY: RADAR / DRIVING / OBSERVER

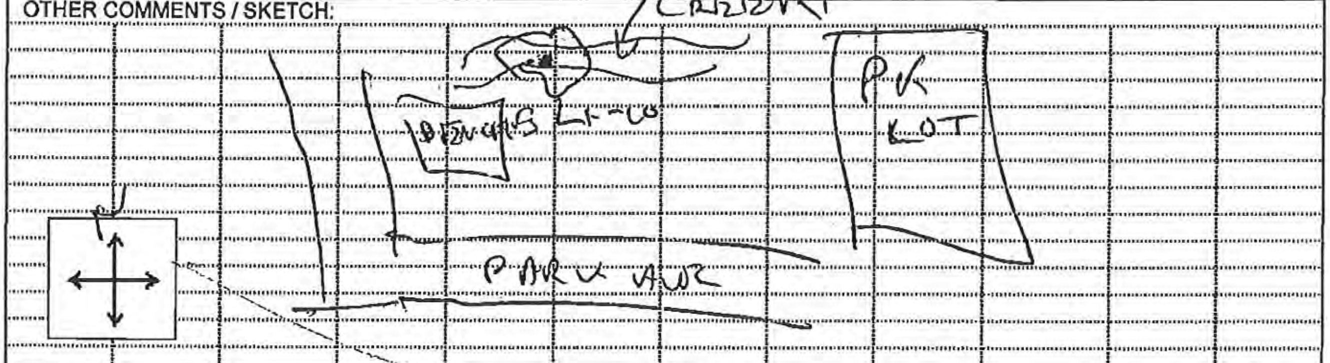
OTHER SOURCES: DIST. AIRCRAFT / RUSTLING LEAVES / DIST. BARKING DOGS / BIRDS / DIST. INDUSTRIAL DIST. CHILDREN PLAYING / DIST. TRAFFIC / DIST. LANDSCAPING ACTIVITIES / OTHER:

DESCRIPTION / SKETCH:

TERRAIN: HARD SOFT MIXED FLAT OTHER:

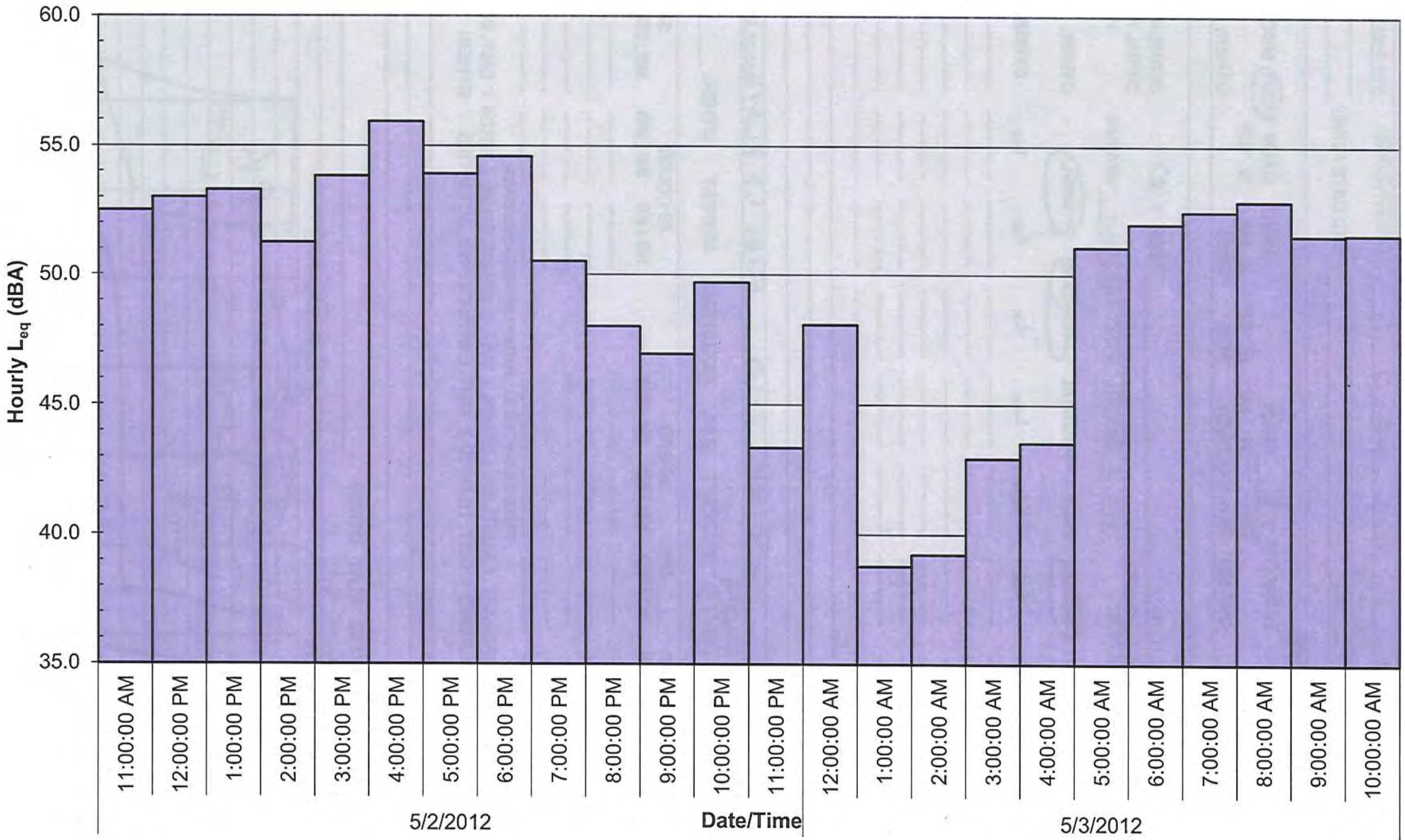
PHOTOS: 123 RNW

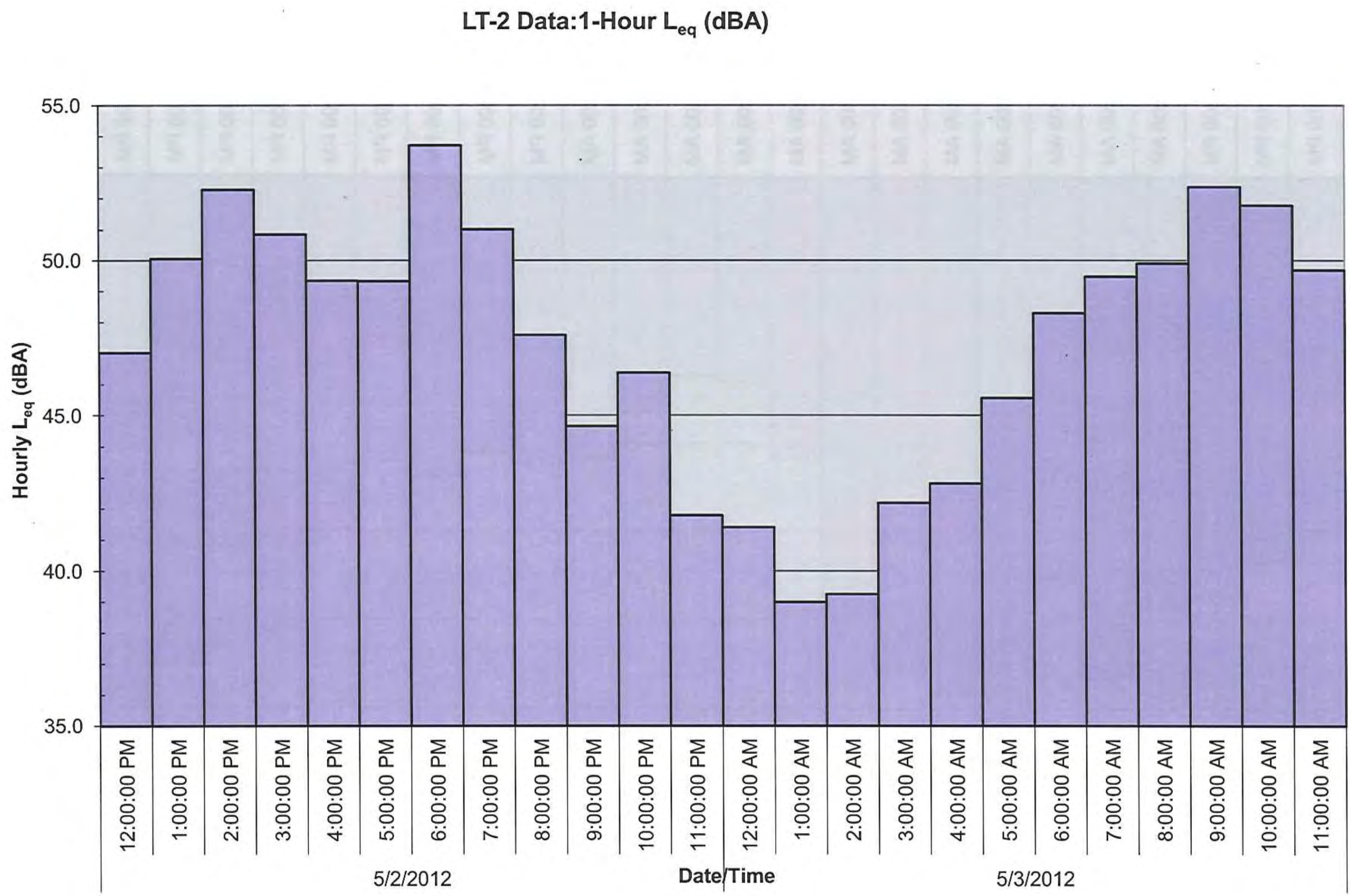
OTHER COMMENTS / SKETCH:



I-10

LT-1 Data:1-Hour L_{eq} (dBA)




LT-2 Data:1-Hour L_{eq} (dBA)
55.0
50.0
45.0
40.0
35.0
Hourly L_{eq} (dBA)
12:00:00 PM
1:00:00 PM
2:00:00 PM
3:00:00 PM
4:00:00 PM
5:00:00 PM
6:00:00 PM
7:00:00 PM
8:00:00 PM
9:00:00 PM
10:00:00 PM
11:00:00 PM
12:00:00 AM
1:00:00 AM
2:00:00 AM
3:00:00 AM
4:00:00 AM
5:00:00 AM
6:00:00 AM
7:00:00 AM
8:00:00 AM
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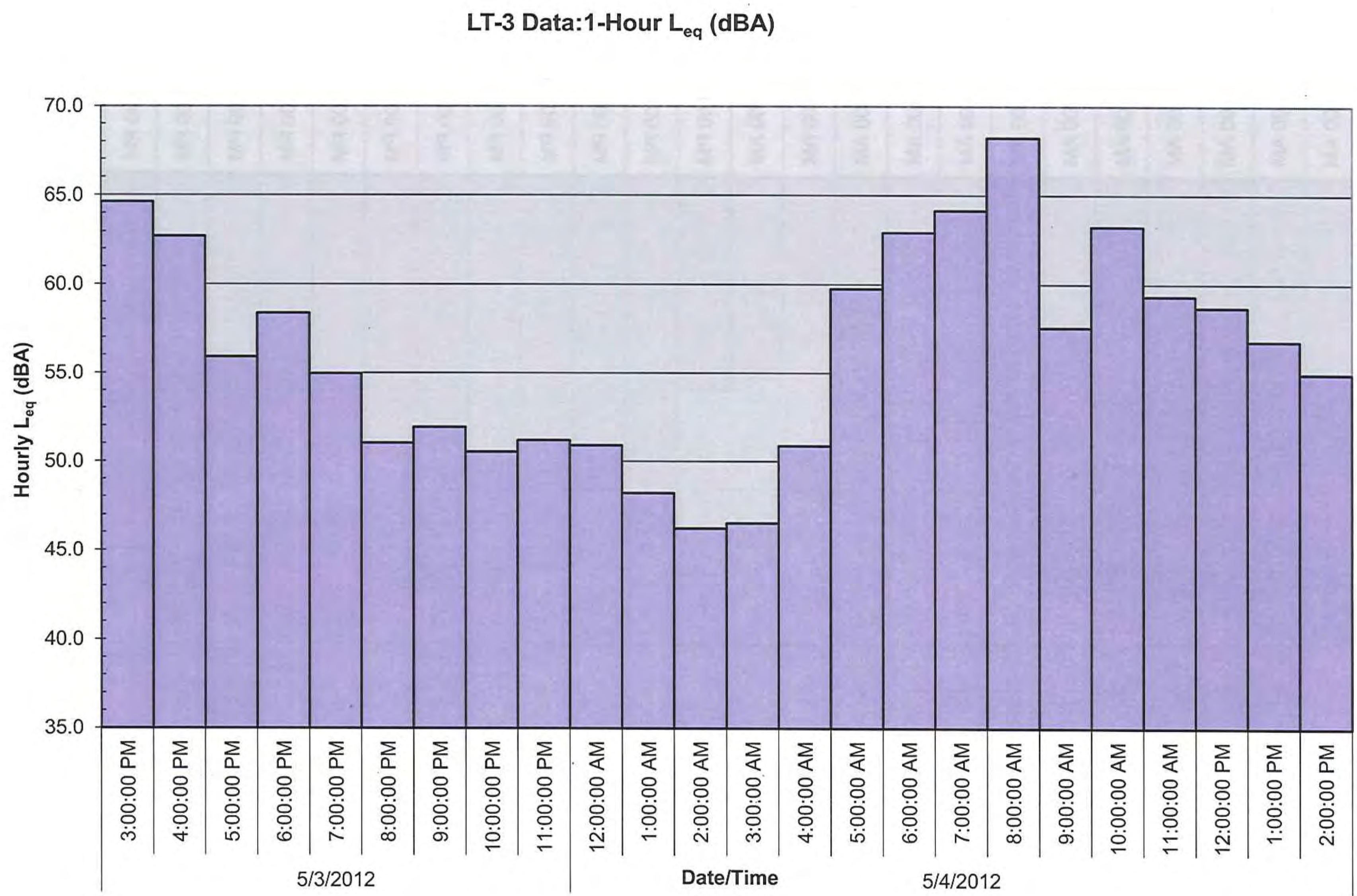
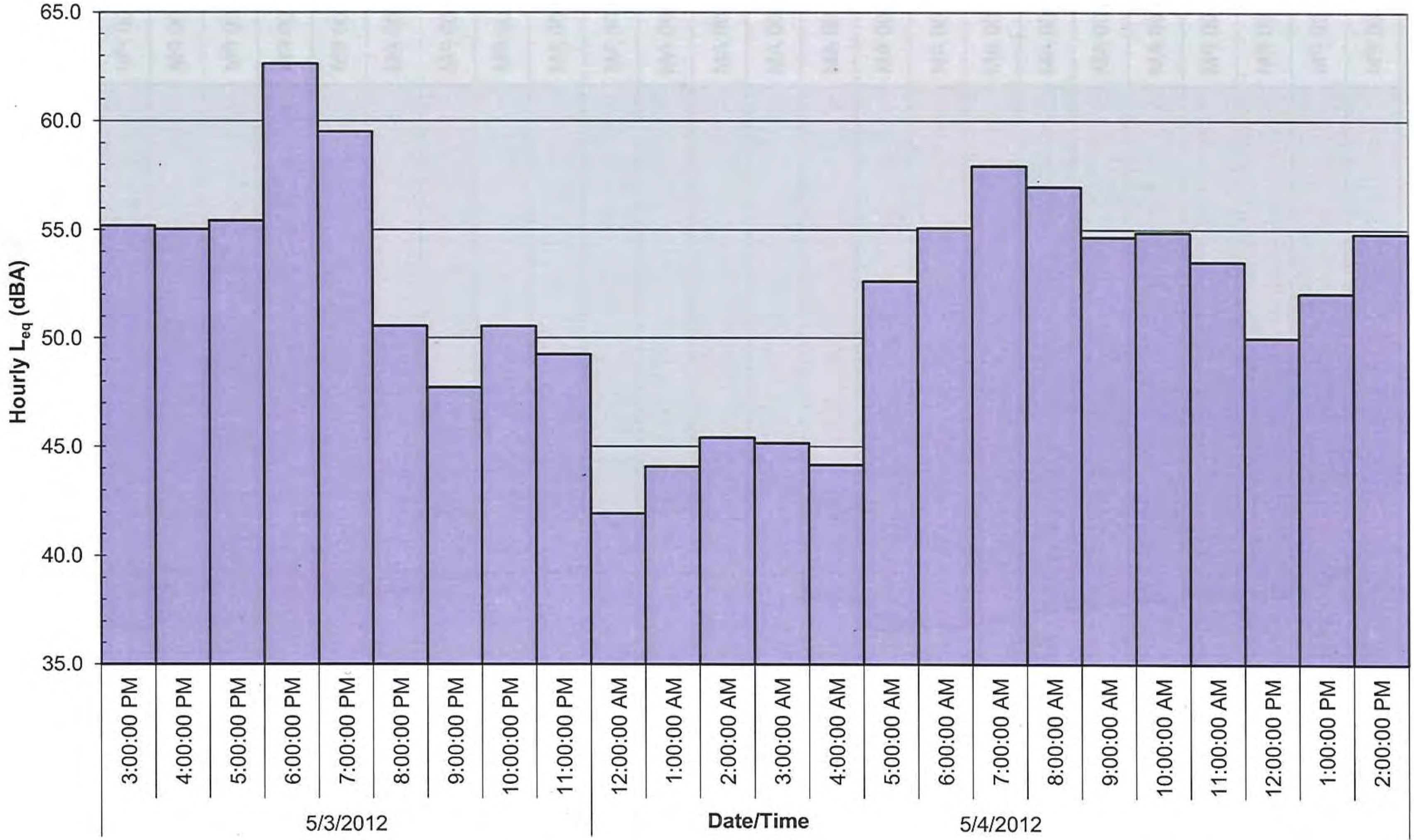
10:00:00 AM
11:00:00 AM
5/2/2012
Date/Time
5/3/2012

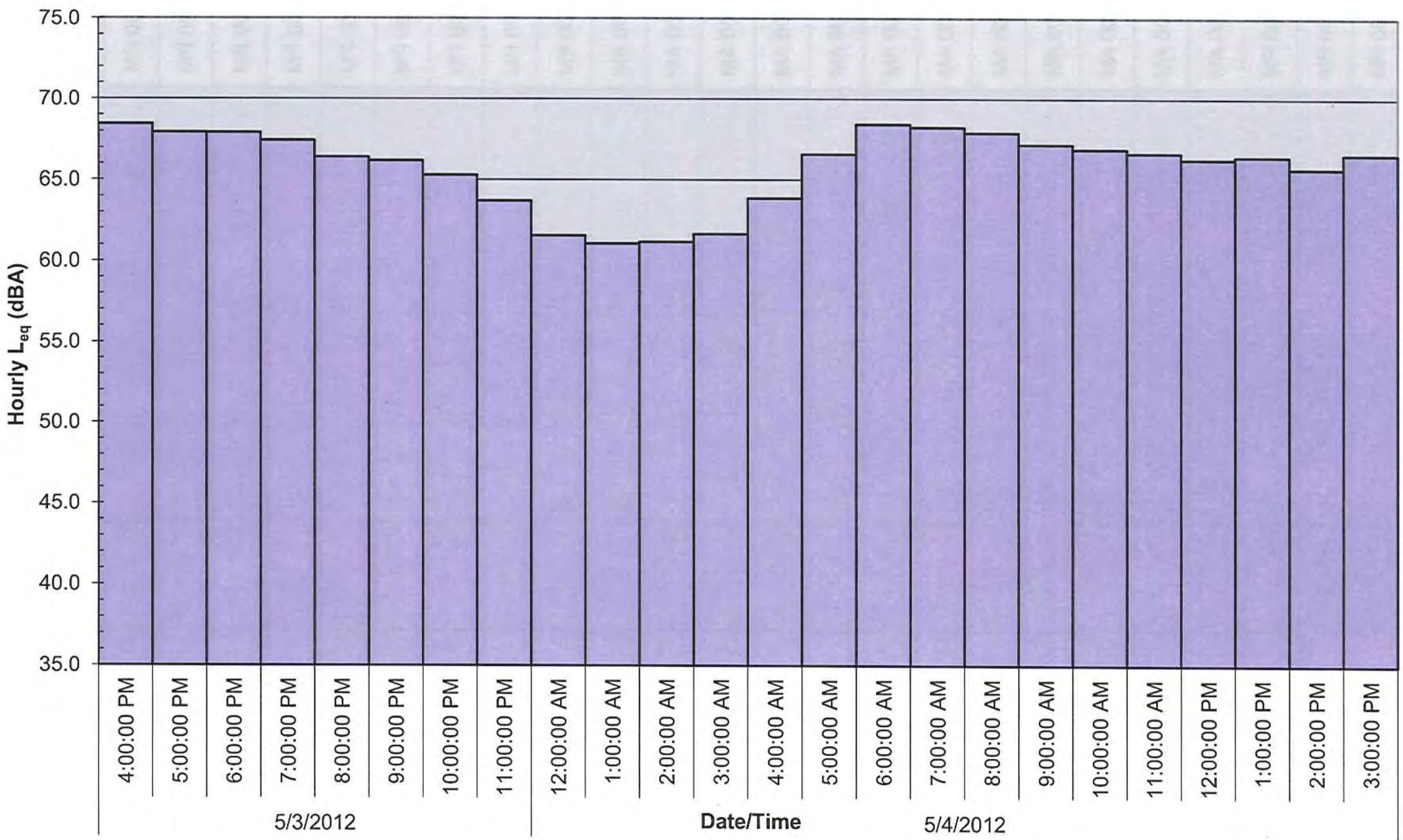

LT-3 Data:1-Hour L_{eq} (dBA)
Hourly L_{eq} (dBA)
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
3:00:00 PM
4:00:00 PM
5:00:00 PM
6:00:00 PM
7:00:00 PM
8:00:00 PM
9:00:00 PM
10:00:00 PM
11:00:00 PM
12:00:00 AM
1:00:00 AM
2:00:00 AM
3:00:00 AM
4:00:00 AM
5:00:00 AM
6:00:00 AM
7:00:00 AM
8:00:00 AM
9:00:00 AM
10:00:00 AM
11:00:00 AM
12:00:00 PM
1:00:00 PM
2:00:00 PM
5/3/2012
Date/Time
5/4/2012

C-14

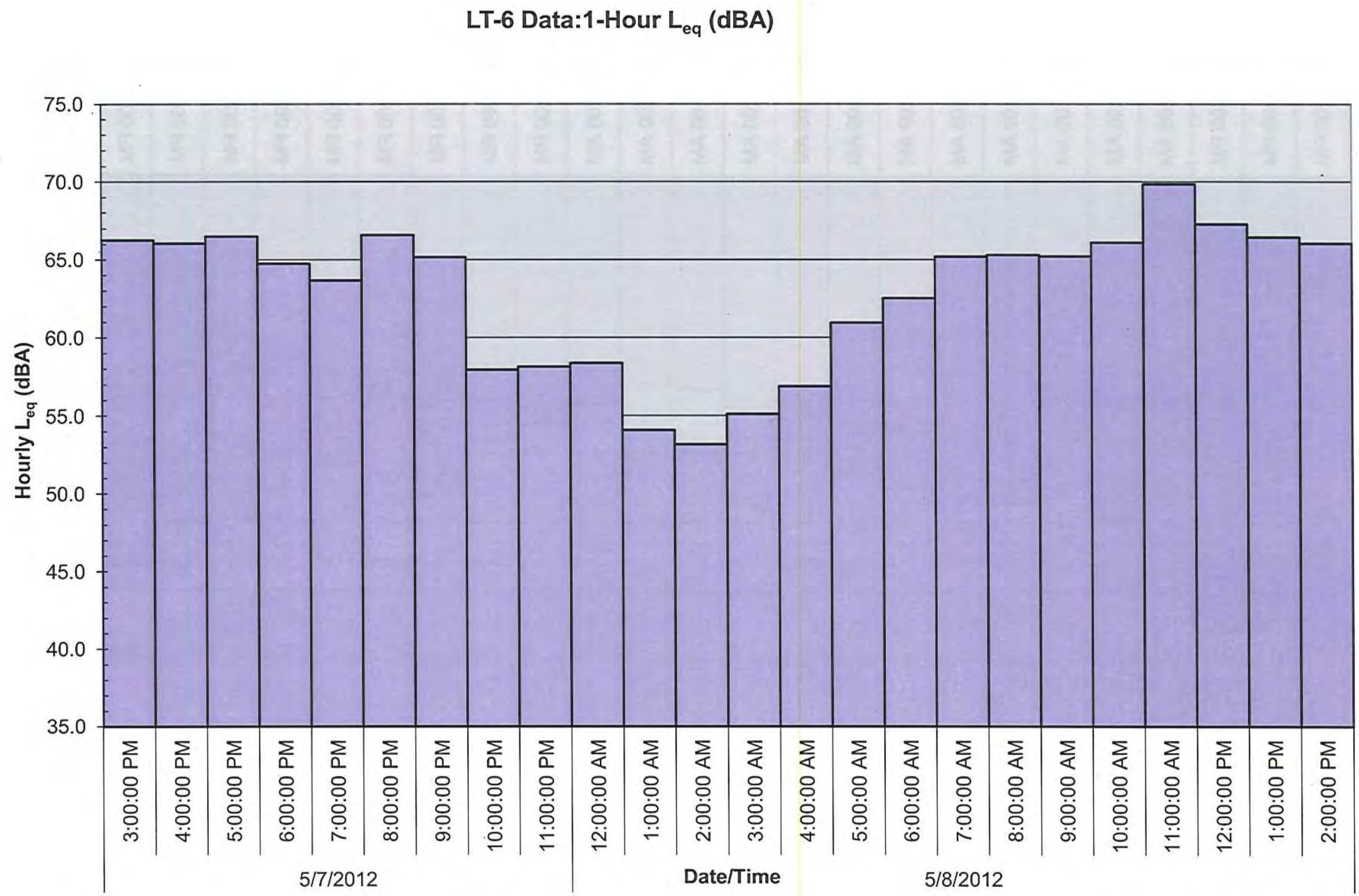
LT-4 Data:1-Hour L_{eq} (dBA)



LT-5 Data: 1-Hour L_{eq} (dBA)



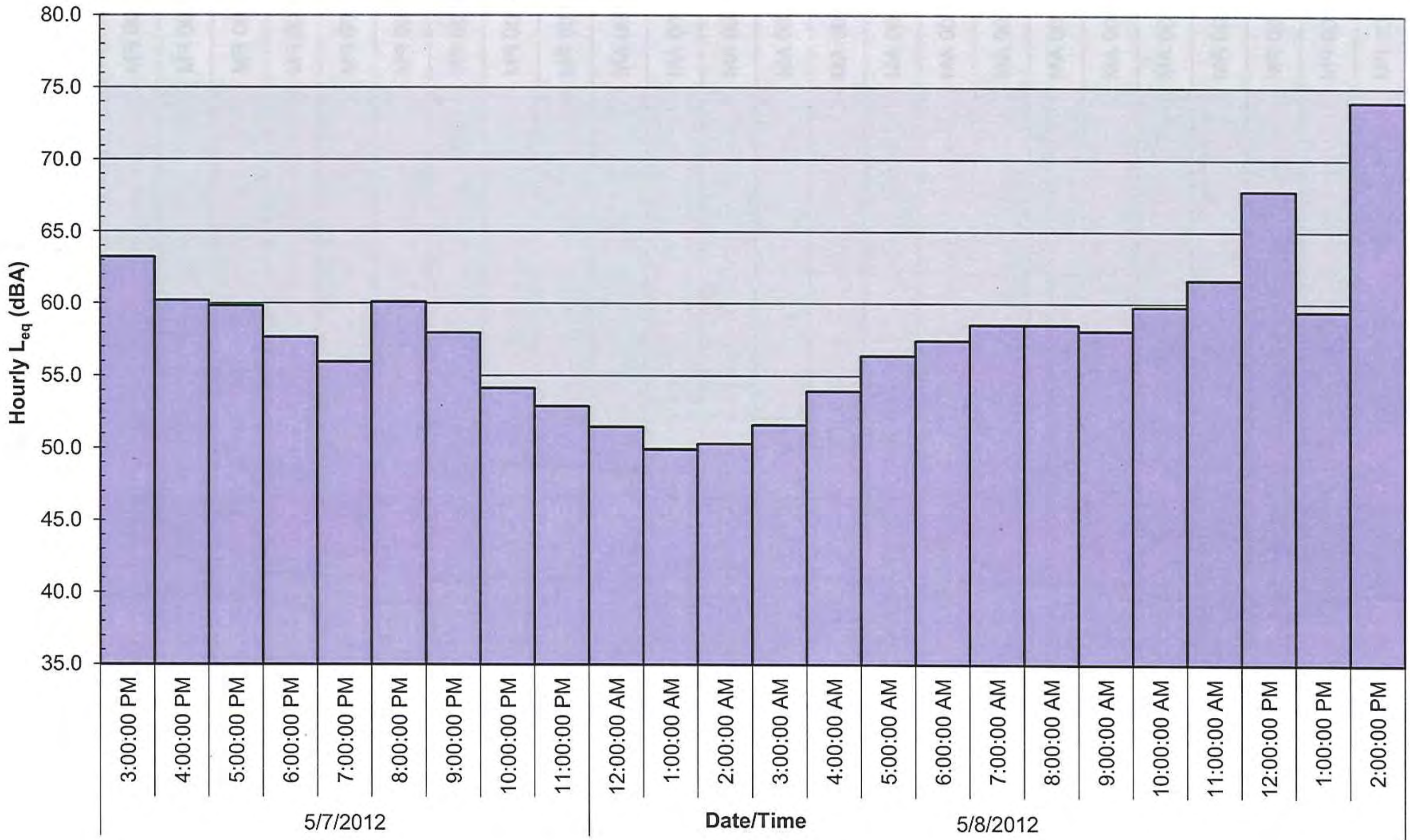
C-16



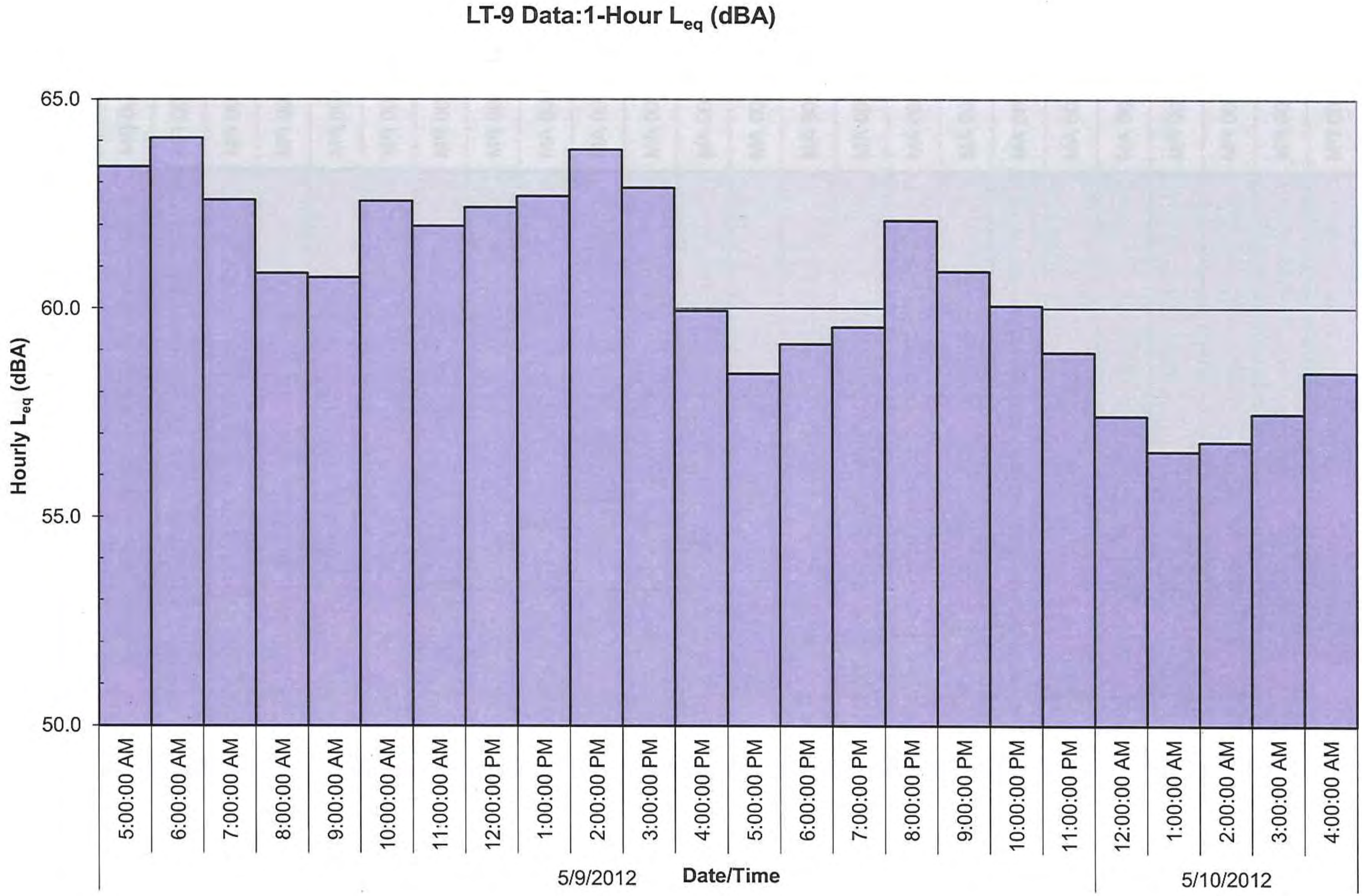
LT-6 Data:1-Hour L_{eq} (dBA)
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
Hourly L_{eq} (dBA)
3:00:00 PM
4:00:00 PM
5:00:00 PM
6:00:00 PM
7:00:00 PM
8:00:00 PM
9:00:00 PM
10:00:00 PM
11:00:00 PM
12:00:00 AM
1:00:00 AM
2:00:00 AM
3:00:00 AM
4:00:00 AM
5:00:00 AM
6:00:00 AM
7:00:00 AM
8:00:00 AM
9:00:00 AM
10:00:00 AM
11:00:00 AM
12:00:00 PM
1:00:00 PM
2:00:00 PM
5/7/2012
Date/Time
5/8/2012

C-17

LT-7 Data:1-Hour L_{eq} (dBA)

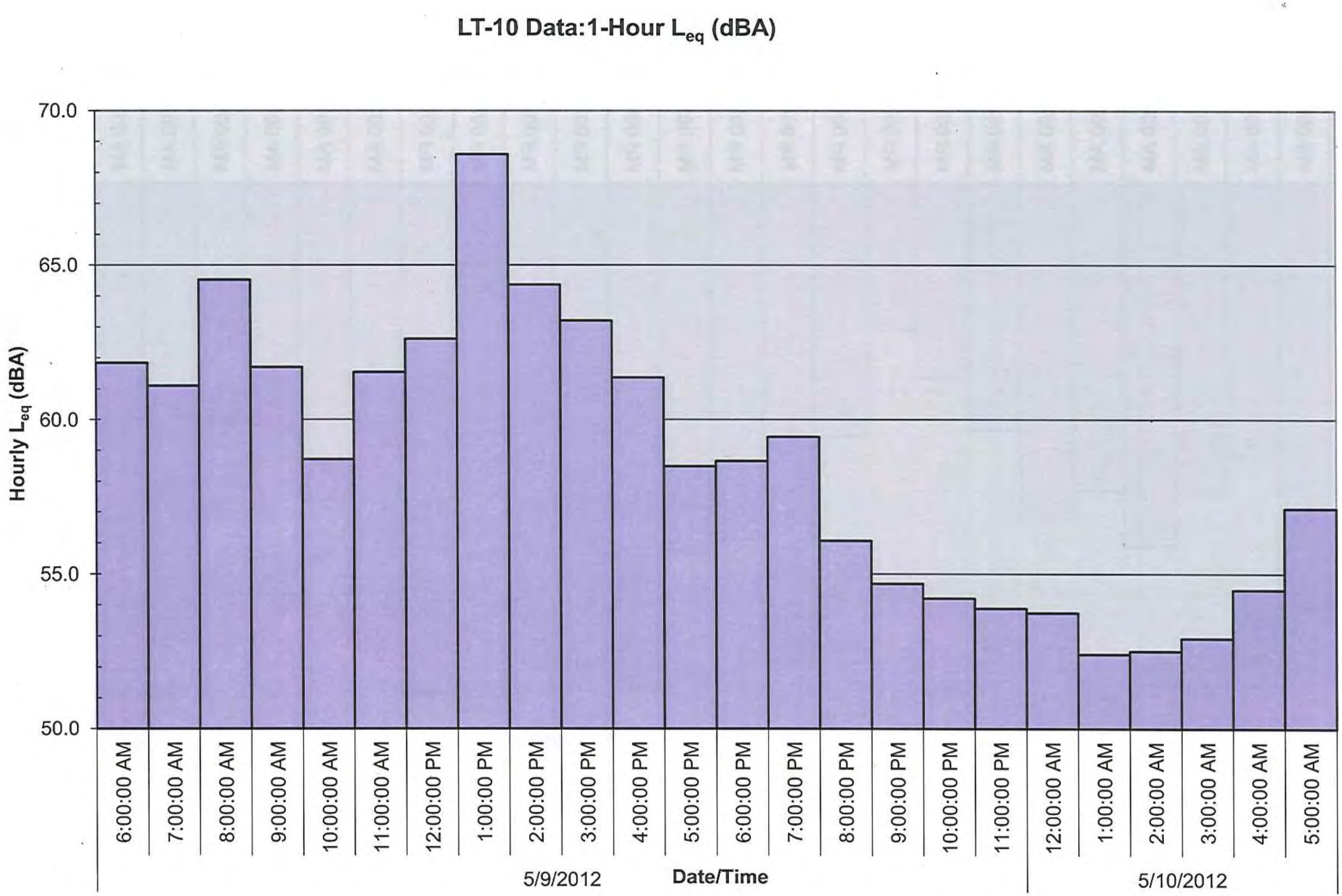



LT-8 Data:1-Hour L_{eq} (dBA)
65.0
60.0
55.0
50.0
45.0
40.0
35.0
Hourly L_{eq} (dBA)
4:00:00 PM
5:00:00 PM
6:00:00 PM
7:00:00 PM
8:00:00 PM
9:00:00 PM
10:00:00 PM
11:00:00 PM
12:00:00 AM
1:00:00 AM
2:00:00 AM
3:00:00 AM
4:00:00 AM
5:00:00 AM
6:00:00 AM
7:00:00 AM
8:00:00 AM
9:00:00 AM
10:00:00 AM
11:00:00 AM
12:00:00 PM
1:00:00 PM
2:00:00 PM
3:00:00 PM
5/7/2012
Date/Time
5/8/2012



LT-9 Data:1-Hour L_{eq} (dBA)
65.0
60.0
55.0
50.0
Hourly L_{eq} (dBA)
5:00:00 AM
6:00:00 AM
7:00:00 AM
8:00:00 AM
9:00:00 AM
10:00:00 AM
11:00:00 AM
12:00:00 PM
1:00:00 PM
2:00:00 PM
3:00:00 PM
4:00:00 PM
5:00:00 PM
6:00:00 PM
7:00:00 PM
8:00:00 PM
9:00:00 PM
10:00:00 PM
11:00:00 PM
12:00:00 AM
1:00:00 AM
2:00:00 AM
3:00:00 AM
4:00:00 AM
5/9/2012
Date/Time
5/10/2012

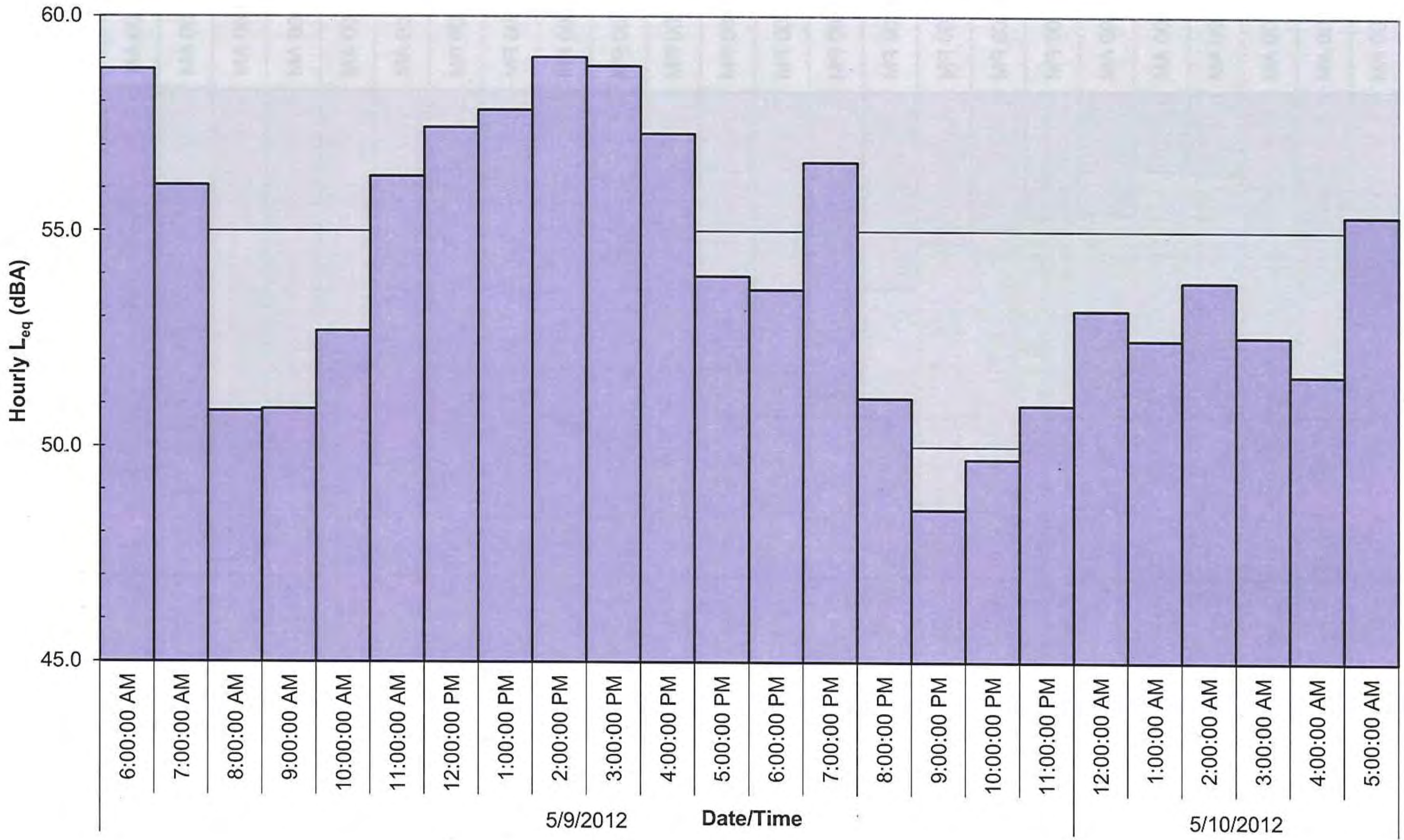
C-20



LT-10 Data:1-Hour L_{eq} (dBA)
Hourly L_{eq} (dBA)
70.0
65.0
60.0
55.0
50.0
6:00:00 AM
7:00:00 AM
8:00:00 AM
9:00:00 AM
10:00:00 AM
11:00:00 AM
12:00:00 PM
1:00:00 PM
2:00:00 PM
3:00:00 PM
4:00:00 PM
5:00:00 PM
6:00:00 PM
7:00:00 PM
8:00:00 PM
9:00:00 PM
10:00:00 PM
11:00:00 PM
12:00:00 AM
1:00:00 AM
2:00:00 AM
3:00:00 AM
4:00:00 AM
5:00:00 AM
5/9/2012
Date/Time
5/10/2012

C-21

LT-11 Data:1-Hour L_{eq} (dBA)



Appendix D

Rail Noise

Input and Output

Detailed Noise Assessment - Chapters 5 and 6 of the FTA Transit Noise and Vibration Assessment manual

Source Reference Levels:

Using 92 dBA SEL (diesel-electric locomotive) at 50 feet and 50 mph, and 82 dBA SEL for rail cars, based on Table 5-1

Speed: 20 mph (assumed)

Hourly Leq at 50':		
Train without horns (ref : Table 5-2 FTA Manual)		
Leqh=SELref +10*Log(N)+K*Log(S/50)+10*Log(V)-35.6		
Nlocos=1 (for RPRP consist), 2 for Metrolink Express	1	2
Ncars = 2 (for RPRP consist), 6 for Metrolink Express	2	6
K=-10 (passenger diesel)		
RPRP Trains		
V=21/15 = 1.4 daytime, 3/9 = 0.33 nighttime	1.40	0.33
Metrolink Express Trains		
V=1/15 = 0.07 daytime, 1/9 = 0.11 nighttime	0.07	0.11

Locomotives:			Rail cars:	
RPRP Trains				
Daytime Hourly Leq:			Daytime Hourly Leq:	
Leqh=	61.8		Leqh=	42.9
Nighttime Hourly Leq			Nighttime Hourly Leq	
Leqh=	55.6		Leqh=	36.7
Ldn @50':	**63.7 dBA**		**Ldn @50':**	**44.7**
Combined Ldn		**63.7**		
Metrolink Express Trains				
Daytime Hourly Leq:			Daytime Hourly Leq:	
Leqh=	51.6		Leqh=	34.5
Nighttime Hourly Leq			Nighttime Hourly Leq	
Leqh=	53.8		Leqh=	36.7
Ldn @50':	**60.0 dBA**		**Ldn @50':**	**42.8**
Combined Ldn		**60.1**		
Total Combined Ldn		**65.3**		

Detailed Noise Assessment - Chapters 5 and 6 of the FTA Transit Noise and Vibration Assessment manual (Cont'd)

Speed: 28 mph (assumed)

Hourly Leq at 50':
Train without horns (ref : Table 5-2 FTA Manual)
Leqh=SELref +10*Log(N)+K*Log(S/50)+10*Log(V)-35.6

Nlocos=1 (for RPRP consist), 2 for Metrolink Express	1	2
Ncars = 2 (for RPRP consist), 6 for Metrolink Express	2	6
K=-10 (passenger diesel)		
RPRP Trains		
V=21/15 = 1.4 daytime, 3/9 = 0.33 nighttime	1.40	0.33
Metrolink Express Trains		
V=1/15 = 0.07 daytime, 1/9 = 0.11 nighttime	0.07	0.11

Locomotives:		Rail cars:	
RPRP Trains			
Daytime Hourly Leq:		Daytime Hourly Leq:	
Leqh=	60.4	Leqh=	45.8
Nighttime Hourly Leq		Nighttime Hourly Leq	
Leqh=	54.1	Leqh=	39.6
Ldn @50':	**62.2 dBA**	**Ldn @50':**	**47.6**

Combined Ldn **62.3**

Metrolink Express Trains			
Daytime Hourly Leq:		Daytime Hourly Leq:	
Leqh=	50.2	Leqh=	37.4
Nighttime Hourly Leq		Nighttime Hourly Leq	
Leqh=	52.4	Leqh=	39.6
Ldn @50':	**58.5 dBA**	**Ldn @50':**	**45.8**

Combined Ldn **58.8**

Total Combined Ldn **63.9**

Detailed Noise Assessment - Chapters 5 and 6 of the FTA Transit Noise and Vibration Assessment manual (Cont'd)

Speed: 35 mph (assumed)

Hourly Leq at 50':
Train without horns (ref : Table 5-2 FTA Manual)
Leqh=SELref +10*Log(N)+K*Log(S/50)+10*Log(V)-35.6

Nlocos=1 (for RPRP consist), 2 for Metrolink Express	1	2
Ncars = 2 (for RPRP consist), 6 for Metrolink Express	2	6
K=-10 (passenger diesel)		

RPRP Trains

V=21/15 = 1.4 daytime, 3/9 = 0.33 nighttime	1.40	0.33

Metrolink Express Trains

V=1/15 = 0.07 daytime, 1/9 = 0.11 nighttime	0.07	0.11

Locomotives:		Rail cars:	
RPRP Trains			
Daytime Hourly Leq:		Daytime Hourly Leq:	
Leqh=	59.4	Leqh=	47.8
Nighttime Hourly Leq		Nighttime Hourly Leq	
Leqh=	53.2	Leqh=	41.5
Ldn @50':	**61.2 dBA**	**Ldn @50':**	**49.6**

Combined Ldn **61.5**

Metrolink Express Trains			
Daytime Hourly Leq:		Daytime Hourly Leq:	
Leqh=	49.2	Leqh=	39.3
Nighttime Hourly Leq		Nighttime Hourly Leq	
Leqh=	51.4	Leqh=	41.5
Ldn @50':	**57.6 dBA**	**Ldn @50':**	**47.7**

Combined Ldn **58.0**

Total Combined Ldn **63.1**

Detailed Noise Assessment - Chapters 5 and 6 of the FTA Transit Noise and Vibration Assessment manual (Cont'd)

Train Horns (ref: Table 5-2 and Table 6-3, FTA Manual)

Leqh=SELref+10*Log(V)-35.6

V_d=	1.47	Daytime
V_n=	0.44	Nighttime

Based on information provided by ATS Consulting (e-mail of 6/14/2011), using 97 dBA SEL at 100 feet (adjusted to 50 feet level)

SELref= 101.5 dBA SEL

Daytime Hourly Leq:

Leqh=	67.6	at 50	feet

Nighttime Hourly Leq:

Leqh=	62.4	at 50	feet

Ldn @50': 70.0 dBA

Crossing Signal Noise (applicable to all at-grade crossings)

Per Table 5-6, Chapter 5 of the FTA Manual

Reference SEL 109 dBA

E, average duration: assume 20 seconds

Nd =	1.47
Nn=	0.44

Daytime Hourly Leq:

Leqh= 54.2

Nighttime Hourly Leq

Leqh= 43.8

Ldn @50': 54.0 dBA

TABLE D-1

Detailed Noise Assessment - Chapters 5 and 6 of the FTA Transit Noise and Vibration Assessment manual (Cont'd)

Summary Table	
Speed	Combined Rail Ldn
20	65.3
28	63.9
35	63.1

TABLE D-2

Redlands Passenger Rail Project FTA Noise Detailed Analysis Modeling Results Input and Output

Receiver #	Receiver Location Description	Land Use Description	Number of Noise Sensitive Sites Represented	Existing (dBA Ldn)	Distance to BNSF Track Centerline (Feet)	Modeled Future with Project Rail Noise Level (dBA Ldn) (Includes horn noise where applicable)	Existing Barrier or Building Row ?	Estimated Reduction from Existing Barriers / Building Rows	Resultant Rail Noise Level (dBA Ldn)	Distance to Crossing Signal (Feet)	Modeled Future Crossing Signal (Bell) Noise Level (dBA Ldn)	Existing Barrier or Building Row ?	Estimated Reduction from Existing Barriers / Building Rows	Resultant Crossing Bell Noise Level (dBA Ldn)	Combined Modeled Future with Project Rail Plus Crossing Signal Noise (dBA Ldn)	FTA Impact Level
1	Commercial/ Transient Residential use e of N. E St. and n of alignment (includes horn noise)	Transient Residential / Commercial (Motel)	1	69	200	62	1 Row	5	57	210	50	1 Row	5	45	57	No Impact
2	200' to 400' s of alignment, w of Pershing Ave	Residential	2	55	200	62	0 Rows	0	62	300	47	0 Rows	0	47	62	Severe Impact
3	50' to 100' e of alignment, e of Dorothy St	Residential	3	55	75	68	0 Rows	0	68	100	57	0 Rows	0	57	68	Severe Impact
4	100 to 200' e of alignment, e of Dorothy St	Residential	3	55	150	64	0 Rows	0	64	320	47	0 Rows	0	47	64	Severe Impact
5	200 to 400' e of alignment, e of Dorothy St	Residential	32	55	220	61	0 Rows	0	61	440	44	0 Rows	0	44	61	Moderate Impact
6	400 to 800' e of alignment, e of Dorothy St	Residential	8	55	400	57	2 Rows	6.5	51	540	42	2 Rows	6.5	36	51	No Impact
7	200 to 400' e of alignment, e of Dorothy St	Residential	3	55	250	60	1 Row	5	55	700	40	1 Row	5	35	55	No Impact
8	50' to 100' e of alignment, e of Dorothy St	Residential	5	55	75	68	0 Rows	0	68	900	38	0 Rows	0	38	68	Severe Impact
9	100 to 200' e of alignment, e of Dorothy St	Residential	1	55	150	56	0 Rows	0	56	1200	35	1 Row	5	30	56	Moderate Impact
10	200 to 400' e of alignment, e of Dorothy St	Residential	1	55	300	59	1 Row	5	54	600	41	1 Row	5	36	54	No Impact
11	200 to 400' e of alignment, e of Lincoln Ave	Residential	3	52	275	60	1 Row	5	55	320	47	0 Rows	0	47	55	Moderate Impact
12	200' to 400' w of alignment, e of S Washington Ave	Residential	1	52	350	58	0 Rows	0	58	520	42	0 Rows	0	42	58	Moderate Impact
13	100 to 200' e of alignment, e of Lincoln Ave	Residential	6	52	100	66	0 Rows	0	66	740	39	1 Row	5	34	66	Severe Impact
14	50' to 100' w of alignment, e of S Washington Ave	Residential	1	52	75	68	0 Rows	0	68	430	44	1 Row	5	39	68	Severe Impact

TABLE D-2, CONT'D

15	100' to 200' w of alignment, e of S Washington Ave	Residential	2	52	125	65	0 Rows	0	65	490	43	1 Row	5	38	65	Severe Impact
16	200' to 400' w of alignment, e of S Washington Ave	Residential	3	52	250	60	1 Row	5	55	530	42	2 Rows	6.5	36	55	Moderate Impact
17	200' to 400' w of alignment, e of S Washington Ave	Residential	2	52	200	62	0 Rows	0	62	320	47	0 Rows	0	47	62	Severe Impact
18	100' to 200' e of alignment, s of Ennis St	Residential	1	52	150	64	0 Rows	0	64	140	54	0 Rows	0	54	64	Severe Impact
19	200' to 400' e of alignment, e of Lincoln Ave	Residential	2	52	200	62	0 Rows	0	62	300	47	0 Rows	0	47	62	Severe Impact
20	200' to 400' e of alignment, e of Lincoln Ave	Residential	2	52	350	58	0 Rows	0	58	330	46	0 Rows	0	46	58	Moderate Impact
21	400' to 800' w of alignment, s of Orange Show Rd	Residential	1	52	325	59	0 Rows	0	59	300	47	0 Rows	0	47	59	Moderate Impact
22	50' to 100' sw of alignment, n of Dumas St	Residential	1	52	50	71	0 Rows	0	71	390	45	0 Rows	0	45	71	Severe Impact
23	100' to 200' sw of alignment, n of Dumas St	Residential	2	52	140	64	0 Rows	0	64	350	46	0 Rows	0	46	64	Severe Impact
24	200' to 400' sw of alignment, n of Dumas St	Residential	4	52	220	61	0 Rows	0	61	240	49	0 Rows	0	49	61	Severe Impact
25	100' to 200' s of alignment, e of Tippecanoe Ave	Residential	3	64	140	64	0 Rows	0	64	180	52	0 Rows	0	52	64	Moderate Impact
26	200' to 400' s of alignment, e of Tippecanoe Ave	Residential	8	64	380	58	0 Rows	0	58	380	45	0 Rows	0	45	58	No Impact
27	100' to 200' s of alignment, e of Tippecanoe Ave	Residential	8	64	175	63	0 Rows	0	63	490	43	0 Rows	0	43	63	Moderate Impact
28	100' to 200' s of alignment, w of S Richardson St	Residential	18	64	175	63	0 Rows	0	63	420	44	0 Rows	0	44	63	Moderate Impact
29	200' to 400' s of alignment, w of S Richardson St	Residential	4	64	390	57	1 Row	5	52	450	44	1 Row	5	39	53	No Impact
30	100' to 200' s of alignment, e of S Richardson St	Recreation (School Athletic Fields) and School	1	58	175	63	0 Rows	0	63	240	49	0 Rows	0	49	63	Moderate Impact (Category 3)

TABLE D-2, CONT'D

31	100' to 200' n of alignment, e of S Richardson St	Residential	6	58	100	66	0 Rows	0	66	430	44	0 Rows	0	44	66	Severe Impact
32	200' to 400' n of alignment, e of S Richardson St	Residential	5	58	320	59	1 Row	5	54	530	42	1 Row	5	37	54	No Impact
33	100' to 200' n of alignment, s of Victoria Ave	Residential	8	58	150	64	0 Rows	0	64	980	37	1 Row	5	32	64	Severe Impact
34	100' to 200' n of alignment, s of Victoria Ave	Residential	4	58	150	56	0 Rows	0	56	1350	34	0 Rows	0	34	56	No Impact
35	100' to 200' s of alignment, n of E Gould St	Residential	8	58	175	55	0 Rows	0	55	1100	36	0 Rows	0	36	55	No Impact
36	100' to 200' s of alignment, n of E Gould St	Residential	10	58	150	64	0 Rows	0	64	470	43	0 Rows	0	43	64	Severe Impact
37	200' to 400' s of alignment, w of Mouintain View Ave	Residential	7	58	350	58	1 Row	5	53	530	42	1 Row	5	37	53	Moderate Impact
38	200' to 400' s of alignment, w of Mouintain View Ave	Day Care Facility	1	58	340	58	0 Rows	0	58	340	46	0 Rows	0	46	59	No Impact
39	100' to 200' n of alignment, s of Victoria Ave	Residential	3	58	125	65	0 Rows	0	65	315	47	0 Rows	0	47	65	Severe Impact
40	200' to 400' n of alignment, s of Victoria Ave	Residential	3	58	350	58	0 Rows	0	58	625	41	0 Rows	0	41	58	Moderate Impact
41	50' to 100' n of alignment, e of Mountain View Ave	Residential	6	58	50	71	0 Rows	0	71	650	40	0 Rows	0	40	71	Severe Impact
42	100' to 200' s of alignment, e of Bryn Mawr Ave	Residential	8	71	150	56	0 Rows	0	56	1000	37	0 Rows	0	37	56	No Impact
43	50' to 100' n of alignment, e of Nevada St	Transient Residential / Commercial (Motel)	1	67	75	60	0 Rows	0	60	1450	33	1 Row	5	28	60	No Impact
44	100' to 200' s of alignment, s of Redlands Blvd	Residential	6	67	150	64	0 Rows	0	64	600	41	0 Rows	0	41	64	Moderate Impact
45	200' to 400' s of alignment, s of Redlands Blvd	Residential	22	67	225	61	2 Rows	6.5	55	640	41	1 Row	5	36	55	No Impact
46	0' to 100' n of alignment, w of Tennessee St	Transient Residential / Commercial (Motel)	1	67	75	68	0 Rows	0	68	430	44	1 Row	5	39	68	Severe Impact
47	100' to 200' n of alignment, w of New York St	Residential	1	62	175	63	0 Rows	0	63	500	43	0 Rows	0	43	63	Moderate Impact

TABLE D-2, CONT'D

48	200' to 400' s of alignment, s of Redlands Blvd	Recreation (Park)	1	64	200	62	0 Rows	0	62	200	51	0 Rows	0	51	63	No Impact (Category 3)
49	200' to 400' n of alignment, w of Texas St	Recreation (School Athletic Fields) and School	1	62	250	61	0 Rows	0	61	525	42	0 Rows	0	42	61	No Impact (Category 3)
50	200' to 400' n of alignment, e of Texas St	Residential	6	62	240	61	1 Row	5	56	250	49	1 Row	5	44	56	No Impact
51	200' to 400' n of alignment, e of Texas St	Residential	1	62	350	59	3 Rows	8	51	420	44	2 Rows	6.5	38	51	No Impact
52	200' to 400' n of alignment, e of Eureka St	Residential	3	62	375	58	0 Rows	0	58	420	44	0 Rows	0	44	58	No Impact
53	200' to 400' n of alignment, e of Texas St	Residential	1	62	300	60	1 Row	5	55	590	41	1 Row	5	36	55	No Impact
54	50' to 100' n of alignment, w of 9th St	Residential	3	67	75	68	0 Rows	0	68	140	54	0 Rows	0	54	68	Severe Impact
55	50' to 100' n of alignment, w of 9th St	Church	1	67	80	68	0 Rows	0	68	100	57	0 Rows	0	57	68	Moderate Impact (Category 3)
56	200' to 400' s of alignment, w of Church St	Residential	4	67	475	56	1 Row	5	51	275	48	1 Row	5	43	52	No Impact
57	200' to 400' s of alignment, w of Church St	Residential	4	67	250	61	1 Row	5	56	400	45	1 Row	5	40	56	No Impact
58	200' to 400' n of alignment, e of 9th St	Residential	10	67	225	61	1 Row	5	56	410	44	1 Row	5	39	56	No Impact
59	200' to 400' n of alignment, e of 9th St	Residential	10	67	225	61	1 Row	5	56	410	44	1 Row	5	39	56	No Impact
60	200' to 400' s of alignment, e of Church St	Residential	3	67	475	56	1 Row	5	51	480	43	1 Row	5	38	52	No Impact
61	50' to 100' n of alignment, e of Church St	Residential	6	67	50	71	0 Rows	0	71	80	59	0 Rows	0	59	71	Severe Impact
62	200' to 400' n of alignment, n of Sylvan Blvd	Residential	7	64	250	61	0 Rows	0	61	820	38	1 Row	5	33	61	Moderate Impact
63	50' to 100' n of alignment, n of Park Ave	Recreation (Park)	1	64	75	68	0 Rows	0	68	700	40	0 Rows	0	40	68	Moderate Impact (Category 3)
64	100' to 200' s of alignment, w of University St	Residential	1	64	100	66	1 Row	5	61	390	45	1 Row	5	40	62	Moderate Impact
65	100' to 200' s of alignment, w of University St	Residential	8	64	100	66	1 Row	5	61	190	51	1 Row	5	46	62	Moderate Impact
66	100' to 200' s of alignment, w of University St	Residential	10	64	175	63	2 Rows	6.5	56	270	48	2 Rows	6.5	42	56	No Impact
67	200' to 400' s of alignment, w of University St	Residential	4	64	300	59	3 Rows	8	51	320	47	3 Rows	8	39	52	No Impact
68	50' to 100' s of alignment, e of University St	Residential	6	61	75	68	0 Rows	0	68	120	55	0 Rows	0	55	69	Severe Impact

TABLE D-2, CONT'D

69	100' to 200' s of alignment, e of University St	Residential	7	61	150	64	1 Row	5	59	185	51	1 Row	5	46	59	Moderate Impact
70	200' to 400' s of alignment, e of University St	Residential	4	61	250	61	2 Rows	6.5	54	275	48	2 Rows	6.5	41	54	No Impact
71	100' to 200' n of alignment, e of University St	School (University of Redlands)	1	61	150	64	0 Rows	0	64	380	45	0 Rows	0	45	64	Moderate Impact (Category 3)
72	100' to 200' s of alignment, e of Cook St	Residential	6	61	125	65	1 Row	5	60	870	38	1 Row	5	33	60	Moderate Impact

TABLE D-3

Redlands Passenger Rail Project FTA Noise Detailed Analysis Modeling Results Input and Output - with Quiet Zones[1]

Receiver #	Receiver Location Description	Land Use Description	Number of Noise-Sensitive Sites Represented	Existing (dBA Ldn)	Distance to BNSF Track Centerline (Feet)	Modeled Future with Project Rail Noise Level (dBA Ldn)	Existing Barrier or Building Row ?	Estimated Reduction from Existing Barriers / Building Rows	Resultant Rail Noise Level (dBA Ldn)	Distance to Crossing Signal (Feet)	Modeled Future Crossing Signal (Bell) Noise Level (dBA Ldn)	Existing Barrier or Building Row ?	Estimated Reduction from Existing Barriers / Building Rows	Resultant Crossing Bell Noise Level (dBA Ldn)	Combined Modeled Future with Project Rail Plus Crossing Signal Noise (dBA Ldn)	Combined Existing plus Future Rail Noise (dBA Ldn) (for Cumulative Analysis)	Rail Noise minus Existing Noise Level (dB)	FTA Impact Level
1	Commercial/ Transient Residential use e of N. E St. and n of alignment (includes horn noise)	Transient Residential / Commercial (Motel)	1	69	200	54	1 Row	5	49	210	50	1 Row	5	45	51	69	-18	No Impact
2	200' to 400' s of alignment, w of Pershing Ave	Residential	2	55	200	54	0 Rows	0	54	300	47	0 Rows	0	47	55	58	0	No Impact
3	50' to 100' e of alignment, e of Dorothy St	Residential	3	55	75	60	0 Rows	0	60	100	57	0 Rows	0	57	62	63	7	Severe Impact
4	100 to 200' e of alignment, e of Dorothy St	Residential	3	55	150	56	0 Rows	0	56	320	47	0 Rows	0	47	56	59	1	Moderate Impact
5	200 to 400' e of alignment, e of Dorothy St	Residential	32	55	220	53	0 Rows	0	53	440	44	0 Rows	0	44	54	57	-1	No Impact
6	400 to 800' e of alignment, e of Dorothy St	Residential	8	55	400	50	2 Rows	6.5	43	540	42	2 Rows	6.5	36	44	55	-11	No Impact
7	200 to 400' e of alignment, e of Dorothy St	Residential	3	55	250	53	1 Row	5	48	700	40	1 Row	5	35	48	56	-7	No Impact
8	50' to 100' e of alignment, e of Dorothy St	Residential	5	55	75	60	0 Rows	0	60	900	38	0 Rows	0	38	60	62	5	Moderate Impact
9	100 to 200' e of alignment, e of Dorothy St	Residential	1	55	150	56	0 Rows	0	56	1200	35	1 Row	5	30	56	59	1	Moderate Impact
10	200 to 400' e of alignment, e of Dorothy St	Residential	1	55	300	51	1 Row	5	46	600	41	1 Row	5	36	47	56	-8	No Impact
11	200 to 400' e of alignment, e of Lincoln Ave	Residential	3	52	275	52	1 Row	5	47	320	47	0 Rows	0	47	50	54	-2	No Impact
12	200' to 400' w of alignment, e of S Washington Ave	Residential	1	52	350	50	0 Rows	0	50	520	42	0 Rows	0	42	51	55	-1	No Impact
13	100 to 200' e of alignment, e of Lincoln Ave	Residential	6	52	100	59	0 Rows	0	59	740	39	1 Row	5	34	59	59	7	Moderate Impact
14	50' to 100' w of alignment, e of S Washington Ave	Residential	1	52	75	60	0 Rows	0	60	430	44	1 Row	5	39	61	61	9	Severe Impact
15	100' to 200' w of alignment, e of S Washington Ave	Residential	2	52	125	57	0 Rows	0	57	490	43	1 Row	5	38	57	58	5	Moderate Impact

TABLE D-3, CONT'D

16	200' to 400' w of alignment, e of S Washington Ave	Residential	3	52	250	53	1 Row	5	48	530	42	2 Rows	6.5	36	48	53	-4	No Impact
17	200' to 400' w of alignment, e of S Washington Ave	Residential	2	52	200	54	0 Rows	0	54	320	47	0 Rows	0	47	55	57	3	Moderate Impact
18	100' to 200' e of alignment, s of Ennis St	Residential	1	52	150	56	0 Rows	0	56	140	54	0 Rows	0	54	58	59	6	Moderate Impact
19	200' to 400' e of alignment, e of Lincoln Ave	Residential	2	52	200	54	0 Rows	0	54	300	47	0 Rows	0	47	55	57	3	Moderate Impact
20	200' to 400' e of alignment, e of Lincoln Ave	Residential	2	52	350	50	0 Rows	0	50	330	46	0 Rows	0	46	52	55	0	No Impact
21	400' to 800' w of alignment, s of Orange Show Rd	Residential	1	52	325	51	0 Rows	0	51	300	47	0 Rows	0	47	52	55	0	No Impact
22	50' to 100' sw of alignment, n of Dumas St	Residential	1	52	50	63	0 Rows	0	63	390	45	0 Rows	0	45	63	63	11	Severe Impact
23	100' to 200' sw of alignment, n of Dumas St	Residential	2	52	140	56	0 Rows	0	56	350	46	0 Rows	0	46	57	58	5	Moderate Impact
24	200' to 400' sw of alignment, n of Dumas St	Residential	4	52	220	53	0 Rows	0	53	240	49	0 Rows	0	49	55	57	3	Moderate Impact
25	100' to 200' s of alignment, e of Tippecanoe Ave	Residential	3	64	140	56	0 Rows	0	56	180	52	0 Rows	0	52	58	65	-6	No Impact
26	200' to 400' s of alignment, e of Tippecanoe Ave	Residential	8	64	380	50	0 Rows	0	50	380	45	0 Rows	0	45	51	64	-13	No Impact
27	100' to 200' s of alignment, e of Tippecanoe Ave	Residential	8	64	175	55	0 Rows	0	55	490	43	0 Rows	0	43	55	65	-9	No Impact
28	100' to 200' s of alignment, w of S Richardson St	Residential	18	64	175	55	0 Rows	0	55	420	44	0 Rows	0	44	55	65	-9	No Impact
29	200' to 400' s of alignment, w of S Richardson St	Residential	4	64	390	50	1 Row	5	45	450	44	1 Row	5	39	46	64	-18	No Impact
30	100' to 200' s of alignment, e of S Richardson St	Recreation (School Athletic Fields) and School	1	58	175	55	0 Rows	0	55	240	49	0 Rows	0	49	56	60	-2	No Impact (Category 3)
31	100' to 200' n of alignment, e of S Richardson St	Residential	6	58	100	59	0 Rows	0	59	430	44	0 Rows	0	44	59	61	1	Moderate Impact
32	200' to 400' n of alignment, e of S Richardson St	Residential	5	58	320	51	1 Row	5	46	530	42	1 Row	5	37	47	58	-11	No Impact
33	100' to 200' n of alignment, s of Victoria Ave	Residential	8	58	150	56	0 Rows	0	56	980	37	1 Row	5	32	56	60	-2	No Impact
34	100' to 200' n of alignment, s of Victoria Ave	Residential	4	58	150	56	0 Rows	0	56	1350	34	0 Rows	0	34	56	60	-2	No Impact

TABLE D-3, CONT'D

35	100' to 200' s of alignment, n of E Gould St	Residential	8	58	175	55	0 Rows	0	55	1100	36	0 Rows	0	36	55	60	-3	No Impact
36	100' to 200' s of alignment, n of E Gould St	Residential	10	58	150	56	0 Rows	0	56	470	43	0 Rows	0	43	56	60	-2	No Impact
37	200' to 400' s of alignment, w of Mountain View Ave	Residential	7	58	350	50	1 Row	5	45	530	42	1 Row	5	37	46	58	-12	No Impact
38	200' to 400' s of alignment, w of Mountain View Ave	Day Care Facility	1	58	340	51	0 Rows	0	51	340	46	0 Rows	0	46	52	59	-6	No Impact
39	100' to 200' n of alignment, s of Victoria Ave	Residential	3	58	125	57	0 Rows	0	57	315	47	0 Rows	0	47	58	61	0	Moderate Impact
40	200' to 400' n of alignment, s of Victoria Ave	Residential	3	58	350	50	0 Rows	0	50	625	41	0 Rows	0	41	51	59	-7	No Impact
41	50' to 100' n of alignment, e of Mountain View Ave	Residential	6	58	50	63	0 Rows	0	63	650	40	0 Rows	0	40	63	64	5	Severe Impact
42	100' to 200' s of alignment, e of Bryn Mawr Ave	Residential	8	71	150	56	0 Rows	0	56	1000	37	0 Rows	0	37	56	71	-15	No Impact
43	50' to 100' n of alignment, e of Nevada St	Transient Residential / Commercial (Motel)	1	67	75	60	0 Rows	0	60	1450	33	1 Row	5	28	60	68	-7	No Impact
44	100' to 200' s of alignment, s of Redlands Blvd	Residential	6	67	150	56	0 Rows	0	56	600	41	0 Rows	0	41	56	67	-11	No Impact
45	200' to 400' s of alignment, s of Redlands Blvd	Residential	22	67	225	53	2 Rows	6.5	47	640	41	1 Row	5	36	47	67	-20	No Impact
46	0' to 100' n of alignment, w of Tennessee St	Transient Residential / Commercial (Motel)	1	67	75	60	0 Rows	0	60	430	44	1 Row	5	39	61	68	-6	No Impact
47	100' to 200' n of alignment, w of New York St	Residential	1	62	175	57	0 Rows	0	57	500	43	0 Rows	0	43	57	63	-5	No Impact
48	200' to 400' s of alignment, s of Redlands Blvd	Recreation (Park)	1	64	200	56	0 Rows	0	56	200	51	0 Rows	0	51	57	65	-7	No Impact (Category 3)
49	200' to 400' n of alignment, w of Texas St	Recreation (School Athletic Fields) and School	1	62	250	55	0 Rows	0	55	525	42	0 Rows	0	42	55	63	-7	No Impact (Category 3)
50	200' to 400' n of alignment, e of Texas St	Residential	6	62	240	55	1 Row	5	50	250	49	1 Row	5	44	51	62	-11	No Impact
51	200' to 400' n of alignment, e of Texas St	Residential	1	62	350	53	3 Rows	8	45	420	44	2 Rows	6.5	38	45	62	-17	No Impact
52	200' to 400' n of alignment, e of Eureka St	Residential	3	62	375	52	0 Rows	0	52	420	44	0 Rows	0	44	53	62	-9	No Impact
53	200' to 400' n of alignment, e of Texas St	Residential	1	62	300	54	1 Row	5	49	590	41	1 Row	5	36	49	62	-13	No Impact

TABLE D-3, CONT'D

54	50' to 100' n of alignment, w of 9th St	Residential	3	67	75	61	0 Rows	0	61	140	54	0 Rows	0	54	62	68	-5	No Impact
55	50' to 100' n of alignment, w of 9th St	Church	1	67	80	61	0 Rows	0	61	100	57	0 Rows	0	57	62	68	-5	No Impact
56	200' to 400' s of alignment, w of Church St	Residential	4	67	475	49	1 Row	5	44	275	48	1 Row	5	43	47	67	-20	No Impact
57	200' to 400' s of alignment, w of Church St	Residential	4	67	250	53	1 Row	5	48	400	45	1 Row	5	40	49	67	-18	No Impact
58	200' to 400' n of alignment, e of 9th St	Residential	10	67	225	54	1 Row	5	49	410	44	1 Row	5	39	50	67	-17	No Impact
59	200' to 400' n of alignment, e of 9th St	Residential	10	67	225	54	1 Row	5	49	410	44	1 Row	5	39	50	67	-17	No Impact
60	200' to 400' s of alignment, e of Church St	Residential	3	67	475	49	1 Row	5	44	480	43	1 Row	5	38	45	67	-22	No Impact
61	50' to 100' n of alignment, e of Church St	Residential	6	67	50	64	0 Rows	0	64	80	59	0 Rows	0	59	65	69	-2	Moderate Impact
62	200' to 400' n of alignment, n of Sylvan Blvd	Residential	7	64	250	53	0 Rows	0	53	820	38	1 Row	5	33	53	64	-11	No Impact
63	50' to 100' n of alignment, n of Park Ave	Recreation (Park)	1	64	75	61	0 Rows	0	61	700	40	0 Rows	0	40	61	66	-3	No Impact
64	100' to 200' s of alignment, w of University St	Residential	1	64	100	59	1 Row	5	54	390	45	1 Row	5	40	55	64	-9	No Impact
65	100' to 200' s of alignment, w of University St	Residential	8	64	100	59	1 Row	5	54	190	51	1 Row	5	46	55	65	-9	No Impact
66	100' to 200' s of alignment, w of University St	Residential	10	64	175	56	2 Rows	6.5	49	270	48	2 Rows	6.5	42	50	64	-14	No Impact
67	200' to 400' s of alignment, w of University St	Residential	4	64	300	52	3 Rows	8	44	320	47	3 Rows	8	39	45	64	-19	No Impact
68	50' to 100' s of alignment, e of University St	Residential	6	61	75	61	0 Rows	0	61	120	55	0 Rows	0	55	62	65	1	Moderate Impact
69	100' to 200' s of alignment, e of University St	Residential	7	61	150	57	1 Row	5	52	185	51	1 Row	5	46	53	62	-8	No Impact
70	200' to 400' s of alignment, e of University St	Residential	4	61	250	53	2 Rows	6.5	47	275	48	2 Rows	6.5	41	48	61	-13	No Impact
71	100' to 200' n of alignment, e of University St	School (University of Redlands)	1	61	150	57	0 Rows	0	57	380	45	0 Rows	0	45	57	62	-4	No Impact
72	100' to 200' s of alignment, e of Cook St	Residential	6	61	125	58	1 Row	5	53	870	38	1 Row	5	33	53	62	-8	No Impact

1 - Assumes that Quiet Zones would be implemented at the following at-grade crossings: S. Arrowhead Avenue, S/ Sierra Way, W. Central Avenue, E. Orange Show Road, S. Waterman Avenue, S. Tippecanoe Avenue, S. Richardson Street, Mountain View Avenue, W. Colton Avenue, Tennessee Street, Church Street, N. University Street.

Calculation of Barrier / Bldg Row Insertion Loss (Ref. FTA Noise and Vibration Maual)

Barrier Shielding from Building Rows - Ref Table 6-10, page 6-26

Gaps in rows of bldgs typically pretty tight so use 35percent or less

A buildings = min(10 or 1.5(R-1) + 5)

Number of Rows	Barrier Shielding (dB)
0 Rows	0
1 Row	5
2 Rows	6.5
3 Rows	8
4 Rows	9.5
5 Rows	10
6 Rows	10
7 Rows	10
8 Rows	10
9 Rows	10
10 Rows	10

Barrier Insertion Loss

Ref Table 6-9, Page 6-25 (FTA Manual)

Condition	Equation
For non-absorptive transit barriers within 5 feet of the track	Abarrier=min{12 or[5.3*log(P)+6.7]}
For absorptive transit barriers within 5 feet of the track	Abarrier=min{15 or[5.3*log(P)+9.7]}
For all other barriers, and for protrusion of terrain above the line of sight:	Abarrier=min{15 or[20*log((2.51*sqrt(P)/tanh*[4.46*sqrt(P)])+5]}
Barrier Insertion Loss	Ilbarrier=max{0 or[Abarrier-10*(Gnb-Gb)*log(D/50)]}
D= closest distance btwn rcvr and source, in feet	
P = path length difference, in feet (see figure 6-7) : P=A+B-C	
GNB = Ground factor G computed without barrier (see Figure 6-5)	
GB = Ground factor G computed with barrier (see Figure 6-5)	

Hs = 8 feet for trains with diesel-electric locomotives
Hr =5 feet

TABLE D-4

Barrier Insertion Loss, Cont'd

												Abarrier = IL because assume hard-ground (Red = negative i.e., no IL)			
Source-Receiver Distance (ft. or m)	Source Base Elev. (ft. or m)	Source Height above Ground (ft. or m)	Receiver Base Elev. (ft. or m)	Receiver Height above Ground (ft. or m)	Horizontal Barrier Dist. (in ref. to source) (ft. or m)	Barrier Base Elev. (ft. or m)	Barrier Height (ft. or m)	Source-Rcvr Straight-Line Dist. (ft. or m) - C	Source-Top-of-Barrier Dist. (ft. or m) - A	Receiver-Top-of-Barrier Dist. (ft. or m) - B	P=A+B-C	If Non-absorptive	If Absorptive:	If "Other":	Noise Reduction Required for No Impact
Case: Rcvr 3															
75.0	1018.0	8.0	1018.0	5.0	60.0	1018.0	**6.0**	75.1	60.0	15.0	0.0	-4.8	-1.8	-34.6	7
75.0	1018.0	8.0	1018.0	5.0	60.0	1018.0	**8.0**	75.1	60.0	15.3	0.2	3.4	6.4	6.8	
75.0	1018.0	8.0	1018.0	5.0	60.0	1018.0	**10.0**	75.1	60.0	15.8	0.8	6.1	**9.1**	11.9	
75.0	1018.0	8.0	1018.0	5.0	60.0	1018.0	**12.0**	75.1	60.1	16.6	1.6	7.8	10.8	12.0	
75.0	1018.0	8.0	1018.0	5.0	60.0	1018.0	**14.0**	75.1	60.3	17.5	2.7	9.0	12.0	12.0	
75.0	1018.0	8.0	1018.0	5.0	60.0	1018.0	**16.0**	75.1	60.5	18.6	4.1	9.9	12.9	12.0	
75.0	1018.0	8.0	1018.0	5.0	60.0	1058.0	**18.0**	75.1	78.1	55.1	58.1	12.0	15.0	12.0	
Case: Rcvr 4															
150.0	1017.0	8.0	1017.0	5.0	14.0	1017.0	**6.0**	150.0	14.1	136.0	0.1	1.7	4.7	3.5	1
150.0	1017.0	8.0	1017.0	5.0	14.0	1017.0	**8.0**	150.0	14.0	136.0	0.0	-6.6	-3.6	-65.5	
150.0	1017.0	8.0	1017.0	5.0	14.0	1017.0	**10.0**	150.0	14.1	136.1	0.2	3.0	**6.0**	6.1	
150.0	1017.0	8.0	1017.0	5.0	14.0	1017.0	**12.0**	150.0	14.6	136.2	0.7	5.9	8.9	11.5	
150.0	1017.0	8.0	1017.0	5.0	14.0	1017.0	**14.0**	150.0	15.2	136.3	1.5	7.6	10.6	12.0	
150.0	1017.0	8.0	1017.0	5.0	14.0	1017.0	**16.0**	150.0	16.1	136.4	2.5	8.8	11.8	12.0	
150.0	1017.0	8.0	1017.0	5.0	14.0	1017.0	**18.0**	150.0	17.2	136.6	3.8	9.8	12.8	12.0	
Case: Rcvr 8															
75.0	1016.0	8.0	1016.0	5.0	20.0	1016.0	**6.0**	75.1	20.1	55.0	0.0	-0.2	2.8	-1.8	5
75.0	1016.0	8.0	1016.0	5.0	20.0	1016.0	**8.0**	75.1	20.0	55.1	0.0	-2.1	0.9	-9.9	
75.0	1016.0	8.0	1016.0	5.0	20.0	1016.0	**10.0**	75.1	20.1	55.2	0.3	3.7	**6.7**	7.3	
75.0	1016.0	8.0	1016.0	5.0	20.0	1016.0	**12.0**	75.1	20.4	55.4	0.8	6.1	9.1	11.9	
75.0	1016.0	8.0	1016.0	5.0	20.0	1016.0	**14.0**	75.1	20.9	55.7	1.6	7.7	10.7	12.0	
75.0	1016.0	8.0	1016.0	5.0	20.0	1016.0	**16.0**	75.1	21.5	56.1	2.6	8.9	11.9	12.0	
75.0	1016.0	8.0	1016.0	5.0	20.0	1016.0	**18.0**	75.1	22.4	56.5	3.8	9.8	12.8	12.0	
Case: Rcvr 9															
150.0	1015.0	8.0	1016.0	5.0	20.0	1016.0	**6.0**	150.0	20.0	130.0	0.0	-2.9	0.1	-15.0	1
150.0	1015.0	8.0	1016.0	5.0	20.0	1016.0	**8.0**	150.0	20.0	130.0	0.0	-0.4	2.6	-2.2	
150.0	1015.0	8.0	1016.0	5.0	20.0	1016.0	**10.0**	150.0	20.2	130.1	0.3	4.0	**7.0**	7.9	
150.0	1015.0	8.0	1016.0	5.0	20.0	1016.0	**12.0**	150.0	20.6	130.2	0.8	6.2	9.2	12.0	
150.0	1015.0	8.0	1016.0	5.0	20.0	1016.0	**14.0**	150.0	21.2	130.3	1.5	7.6	10.6	12.0	
150.0	1015.0	8.0	1016.0	5.0	20.0	1016.0	**16.0**	150.0	21.9	130.5	2.4	8.7	11.7	12.0	
150.0	1015.0	8.0	1016.0	5.0	20.0	1016.0	**18.0**	150.0	22.8	130.6	3.5	9.6	12.6	12.0	
Case: Rcvr 13															

TABLE D-4, CONT'D

100.0	1005.0	8.0	1006.0	5.0	25.0	1005.0	**6.0**	100.0	25.1	75.0	0.1	0.2	3.2	-0.3	5
100.0	1005.0	8.0	1006.0	5.0	25.0	1005.0	**8.0**	100.0	25.0	75.0	0.0	-4.8	-1.8	-34.5	
100.0	1005.0	8.0	1006.0	5.0	25.0	1005.0	**10.0**	100.0	25.1	75.1	0.2	2.6	**5.6**	5.2	
100.0	1005.0	8.0	1006.0	5.0	25.0	1005.0	**12.0**	100.0	25.3	75.2	0.5	5.3	8.3	10.3	
100.0	1005.0	8.0	1006.0	5.0	25.0	1005.0	**14.0**	100.0	25.7	75.4	1.1	7.0	10.0	12.0	
100.0	1005.0	8.0	1006.0	5.0	25.0	1005.0	**16.0**	100.0	26.2	75.7	1.9	8.2	11.2	12.0	
100.0	1005.0	8.0	1006.0	5.0	25.0	1005.0	**18.0**	100.0	26.9	76.0	2.9	9.1	12.1	12.0	
Case: Rcvr 14															
75.0	1009.0	8.0	1008.0	5.0	25.0	1009.0	**6.0**	75.1	25.1	50.0	0.0	-3.2	-0.2	-17.8	7
75.0	1009.0	8.0	1008.0	5.0	25.0	1009.0	**8.0**	75.1	25.0	50.2	0.1	-0.1	2.9	-1.1	
75.0	1009.0	8.0	1008.0	5.0	25.0	1009.0	**10.0**	75.1	25.1	50.4	0.3	4.2	**7.2**	8.2	
75.0	1009.0	8.0	1008.0	5.0	25.0	1009.0	**12.0**	75.1	25.3	50.6	0.8	6.3	9.3	12.0	
75.0	1009.0	8.0	1008.0	5.0	25.0	1009.0	**14.0**	75.1	25.7	51.0	1.6	7.8	10.8	12.0	
75.0	1009.0	8.0	1008.0	5.0	25.0	1009.0	**16.0**	75.1	26.2	51.4	2.6	8.9	11.9	12.0	
75.0	1009.0	8.0	1008.0	5.0	25.0	1009.0	**18.0**	75.1	26.9	51.9	3.7	9.7	12.7	12.0	
Case: Rcvr 15															
125.0	1009.0	8.0	1007.0	5.0	25.0	1009.0	**6.0**	125.1	25.1	100.0	0.0	-1.8	1.2	-8.3	3
125.0	1009.0	8.0	1007.0	5.0	25.0	1009.0	**8.0**	125.1	25.0	100.1	0.0	-1.8	1.2	-8.2	
125.0	1009.0	8.0	1007.0	5.0	25.0	1009.0	**10.0**	125.1	25.1	100.2	0.2	3.3	**6.3**	6.6	
125.0	1009.0	8.0	1007.0	5.0	25.0	1009.0	**12.0**	125.1	25.3	100.4	0.6	5.6	8.6	10.9	
125.0	1009.0	8.0	1007.0	5.0	25.0	1009.0	**14.0**	125.1	25.7	100.6	1.2	7.1	10.1	12.0	
125.0	1009.0	8.0	1007.0	5.0	25.0	1009.0	**16.0**	125.1	26.2	100.8	2.0	8.3	11.3	12.0	
125.0	1009.0	8.0	1007.0	5.0	25.0	1009.0	**18.0**	125.1	26.9	101.1	2.9	9.2	12.2	12.0	
Case: Rcvr 17															
200.0	1009.0	8.0	1009.0	5.0	25.0	1009.0	**6.0**	200.0	25.1	175.0	0.1	0.2	3.2	-0.3	1
200.0	1009.0	8.0	1009.0	5.0	25.0	1009.0	**8.0**	200.0	25.0	175.0	0.0	-6.5	-3.5	-63.4	
200.0	1009.0	8.0	1009.0	5.0	25.0	1009.0	**10.0**	200.0	25.1	175.1	0.1	2.0	**5.0**	4.0	
200.0	1009.0	8.0	1009.0	5.0	25.0	1009.0	**12.0**	200.0	25.3	175.1	0.4	4.8	7.8	9.4	
200.0	1009.0	8.0	1009.0	5.0	25.0	1009.0	**14.0**	200.0	25.7	175.2	0.9	6.5	9.5	12.0	
200.0	1009.0	8.0	1009.0	5.0	25.0	1009.0	**16.0**	200.0	26.2	175.3	1.6	7.7	10.7	12.0	
200.0	1009.0	8.0	1009.0	5.0	25.0	1009.0	**18.0**	200.0	26.9	175.5	2.4	8.7	11.7	12.0	
Case: Rcvr 18															
150.0	1009.0	8.0	1010.0	5.0	25.0	1010.0	**6.0**	150.0	25.0	125.0	0.0	-3.8	-0.8	-22.2	4
150.0	1009.0	8.0	1010.0	5.0	25.0	1010.0	**8.0**	150.0	25.0	125.0	0.0	-0.6	2.4	-2.9	
150.0	1009.0	8.0	1010.0	5.0	25.0	1010.0	**10.0**	150.0	25.2	125.1	0.3	3.7	**6.7**	7.3	
150.0	1009.0	8.0	1010.0	5.0	25.0	1010.0	**12.0**	150.0	25.5	125.2	0.7	5.8	8.8	11.3	
150.0	1009.0	8.0	1010.0	5.0	25.0	1010.0	**14.0**	150.0	26.0	125.3	1.3	7.3	10.3	12.0	
150.0	1009.0	8.0	1010.0	5.0	25.0	1010.0	**16.0**	150.0	26.6	125.5	2.0	8.3	11.3	12.0	
150.0	1009.0	8.0	1010.0	5.0	25.0	1010.0	**18.0**	150.0	27.3	125.7	3.0	9.2	12.2	12.0	
Case: Rcvr 19															
200.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**6.0**	200.0	25.1	175.0	0.1	0.2	3.2	-0.3	1
200.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**8.0**	200.0	25.0	175.0	0.0	-6.5	-3.5	-63.4	
200.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**10.0**	200.0	25.1	175.1	0.1	2.0	**5.0**	4.0	
200.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**12.0**	200.0	25.3	175.1	0.4	4.8	7.8	9.4	
200.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**14.0**	200.0	25.7	175.2	0.9	6.5	9.5	12.0	
200.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**16.0**	200.0	26.2	175.3	1.6	7.7	10.7	12.0	
200.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**18.0**	200.0	26.9	175.5	2.4	8.7	11.7	12.0	

TABLE D-4, CONT'D

Case: Rcvr 22															
50.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**6.0**	50.1	25.1	25.0	0.0	-3.9	-0.9	-23.8	9
50.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**8.0**	50.1	25.0	25.2	0.1	1.1	4.1	2.1	
50.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**10.0**	50.1	25.1	25.5	0.5	5.0	8.0	9.9	
50.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**12.0**	50.1	25.3	26.0	1.2	7.1	**10.1**	12.0	
50.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**14.0**	50.1	25.7	26.6	2.2	8.5	11.5	12.0	
50.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**16.0**	50.1	26.2	27.3	3.5	9.6	12.6	12.0	
50.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**18.0**	50.1	26.9	28.2	5.0	10.4	13.4	12.0	
Case: Rcvr 23															
140.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**6.0**	140.0	25.1	115.0	0.1	-0.1	2.9	-1.3	3
140.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**8.0**	140.0	25.0	115.0	0.0	-4.7	-1.7	-33.1	
140.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**10.0**	140.0	25.1	115.1	0.2	2.4	5.4	4.9	
140.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**12.0**	140.0	25.3	115.2	0.5	5.1	**8.1**	10.0	
140.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**14.0**	140.0	25.7	115.4	1.0	6.8	9.8	12.0	
140.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**16.0**	140.0	26.2	115.5	1.7	8.0	11.0	12.0	
140.0	1010.0	8.0	1010.0	5.0	25.0	1010.0	**18.0**	140.0	26.9	115.7	2.6	8.9	11.9	12.0	
Case: Rcvr 24															
220.0	1012.0	8.0	1010.0	5.0	25.0	1011.0	**6.0**	220.1	25.2	195.0	0.1	2.1	5.1	4.2	1
220.0	1012.0	8.0	1010.0	5.0	25.0	1011.0	**8.0**	220.1	25.0	195.0	0.0	-5.9	-2.9	-51.1	
220.0	1012.0	8.0	1010.0	5.0	25.0	1011.0	**10.0**	220.1	25.0	195.1	0.1	0.0	3.0	-0.8	
220.0	1012.0	8.0	1010.0	5.0	25.0	1011.0	**12.0**	220.1	25.2	195.2	0.3	3.8	**6.8**	7.6	
220.0	1012.0	8.0	1010.0	5.0	25.0	1011.0	**14.0**	220.1	25.5	195.3	0.7	5.9	8.9	11.4	
220.0	1012.0	8.0	1010.0	5.0	25.0	1011.0	**16.0**	220.1	26.0	195.4	1.3	7.3	10.3	12.0	
220.0	1012.0	8.0	1010.0	5.0	25.0	1011.0	**18.0**	220.1	26.6	195.5	2.0	8.3	11.3	12.0	
Case: Rcvr 31															
100.0	1079.0	8.0	1081.0	5.0	50.0	1080.0	**6.0**	100.0	50.0	50.0	0.0	-5.5	-2.5	-44.2	3
100.0	1079.0	8.0	1081.0	5.0	50.0	1080.0	**8.0**	100.0	50.0	50.0	0.0	-0.4	2.6	-2.4	
100.0	1079.0	8.0	1081.0	5.0	50.0	1080.0	**10.0**	100.0	50.1	50.2	0.2	3.5	**6.5**	6.9	
100.0	1079.0	8.0	1081.0	5.0	50.0	1080.0	**12.0**	100.0	50.2	50.4	0.6	5.5	8.5	10.8	
100.0	1079.0	8.0	1081.0	5.0	50.0	1080.0	**14.0**	100.0	50.5	50.6	1.1	7.0	10.0	12.0	
100.0	1079.0	8.0	1081.0	5.0	50.0	1080.0	**16.0**	100.0	50.8	51.0	1.8	8.0	11.0	12.0	
100.0	1079.0	8.0	1081.0	5.0	50.0	1080.0	**18.0**	100.0	51.2	51.4	2.6	8.9	11.9	12.0	
Case: Rcvr 33															
150.0	1086.0	8.0	1088.0	5.0	50.0	1086.0	**6.0**	150.0	50.0	100.0	0.0	-0.6	2.4	-3.1	0
150.0	1086.0	8.0	1088.0	5.0	50.0	1086.0	**8.0**	150.0	50.0	100.0	0.0	-8.0	-5.0	-104.9	
150.0	1086.0	8.0	1088.0	5.0	50.0	1086.0	**10.0**	150.0	50.0	100.0	0.1	0.9	**3.9**	1.6	
150.0	1086.0	8.0	1088.0	5.0	50.0	1086.0	**12.0**	150.0	50.2	100.1	0.3	3.8	6.8	7.5	
150.0	1086.0	8.0	1088.0	5.0	50.0	1086.0	**14.0**	150.0	50.4	100.2	0.6	5.5	8.5	10.8	
150.0	1086.0	8.0	1088.0	5.0	50.0	1086.0	**16.0**	150.0	50.6	100.4	1.0	6.8	9.8	12.0	
150.0	1086.0	8.0	1088.0	5.0	50.0	1086.0	**18.0**	150.0	51.0	100.6	1.6	7.8	10.8	12.0	
Case: Rcvr 39															
125.0	1096.0	8.0	1100.0	5.0	50.0	1098.0	**6.0**	125.0	50.0	75.0	0.0	-6.9	-3.9	-73.4	2
125.0	1096.0	8.0	1100.0	5.0	50.0	1098.0	**8.0**	125.0	50.0	75.0	0.0	-0.6	2.4	-2.9	
125.0	1096.0	8.0	1100.0	5.0	50.0	1098.0	**10.0**	125.0	50.2	75.1	0.2	3.2	**6.2**	6.4	
125.0	1096.0	8.0	1100.0	5.0	50.0	1098.0	**12.0**	125.0	50.4	75.2	0.5	5.2	8.2	10.2	
125.0	1096.0	8.0	1100.0	5.0	50.0	1098.0	**14.0**	125.0	50.6	75.3	1.0	6.6	9.6	12.0	
125.0	1096.0	8.0	1100.0	5.0	50.0	1098.0	**16.0**	125.0	51.0	75.5	1.5	7.7	10.7	12.0	
125.0	1096.0	8.0	1100.0	5.0	50.0	1098.0	**18.0**	125.0	51.4	75.8	2.2	8.5	11.5	12.0	

TABLE D-4, CONT'D

Case: Rcvr 41															
50.0	1109.0	8.0	1110.0	5.0	20.0	1110.0	**6.0**	50.0	20.0	30.0	0.0	-8.0	-5.0	-105.1	7
50.0	1109.0	8.0	1110.0	5.0	20.0	1110.0	**8.0**	50.0	20.0	30.1	0.1	2.1	5.1	4.2	
50.0	1109.0	8.0	1110.0	5.0	20.0	1110.0	**10.0**	50.0	20.2	30.4	0.6	5.5	**8.5**	10.8	
50.0	1109.0	8.0	1110.0	5.0	20.0	1110.0	**12.0**	50.0	20.6	30.8	1.4	7.4	10.4	12.0	
50.0	1109.0	8.0	1110.0	5.0	20.0	1110.0	**14.0**	50.0	21.2	31.3	2.5	8.8	11.8	12.0	
50.0	1109.0	8.0	1110.0	5.0	20.0	1110.0	**16.0**	50.0	21.9	32.0	3.8	9.8	12.8	12.0	
50.0	1109.0	8.0	1110.0	5.0	20.0	1110.0	**18.0**	50.0	22.8	32.7	5.5	10.6	13.6	12.0	
Case: Rcvr 61															
50.0	1409.0	8.0	1410.0	5.0	24.0	1410.0	**6.0**	50.0	24.0	26.0	0.0	-15.5	-12.5	-947.2	3
50.0	1409.0	8.0	1410.0	5.0	24.0	1410.0	**8.0**	50.0	24.0	26.2	0.2	2.4	5.4	4.8	
50.0	1409.0	8.0	1410.0	5.0	24.0	1410.0	**10.0**	50.0	24.2	26.5	0.6	5.6	**8.6**	11.0	
50.0	1409.0	8.0	1410.0	5.0	24.0	1410.0	**12.0**	50.0	24.5	26.9	1.4	7.5	10.5	12.0	
50.0	1409.0	8.0	1410.0	5.0	24.0	1410.0	**14.0**	50.0	25.0	27.5	2.5	8.8	11.8	12.0	
50.0	1409.0	8.0	1410.0	5.0	24.0	1410.0	**16.0**	50.0	25.6	28.2	3.8	9.8	12.8	12.0	
50.0	1409.0	8.0	1410.0	5.0	24.0	1410.0	**18.0**	50.0	26.4	29.1	5.4	10.6	13.6	12.0	
Case: Rcvr 68															
75.0	1446.0	8.0	1446.0	5.0	35.0	1446.0	**6.0**	75.1	35.1	40.0	0.0	-4.0	-1.0	-24.6	4
75.0	1446.0	8.0	1446.0	5.0	35.0	1446.0	**8.0**	75.1	35.0	40.1	0.1	-0.1	2.9	-1.3	
75.0	1446.0	8.0	1446.0	5.0	35.0	1446.0	**10.0**	75.1	35.1	40.3	0.3	4.0	**7.0**	7.9	
75.0	1446.0	8.0	1446.0	5.0	35.0	1446.0	**12.0**	75.1	35.2	40.6	0.8	6.1	9.1	11.9	
75.0	1446.0	8.0	1446.0	5.0	35.0	1446.0	**14.0**	75.1	35.5	41.0	1.5	7.6	10.6	12.0	
75.0	1446.0	8.0	1446.0	5.0	35.0	1446.0	**16.0**	75.1	35.9	41.5	2.3	8.6	11.6	12.0	
75.0	1446.0	8.0	1446.0	5.0	35.0	1446.0	**18.0**	75.1	36.4	42.1	3.4	9.5	12.5	12.0	

Appendix E

Traffic Noise Model (TNM)

Input and Output

ICF International
M Greene

16 August 2012
TNM 2.5

INPUT: ROADWAYS
PROJECT/CONTRACT: <Project Name?>
RUN: Rdlnds Pssngr Rail Project Existing

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Roadway		Points					Flow Control			Segment	
Name	Width	Name	No.	Coordinates (pavement) X	Y	Z	Control Device	Speed Constraint	Percent Vehicles Affected	Pvmt Type	On Struct?
	ft			ft	ft	ft		mph	%		
Sierra Way N of Mill Street	75.0	point1	1	100.0	1,000.0	100.00				Average	
		point5	5	100.0	2,000.0	100.00					
Sierra Way S of Mill Street	75.0	point3	3	100.0	100.0	100.00				Average	
		point6	6	100.0	1,000.0	100.00					
Mill Street W of Sierra Way	75.0	point7	7	-900.0	1,000.0	100.00				Average	
		point4	4	100.0	1,000.0	100.00					
Mill Street W of Sierra Way	75.0	point8	8	100.0	1,000.0	100.00				Average	
		point2	2	1,000.0	1,000.0	100.00					
Waterman Avenue N of 9th Street	75.0	point9	9	2,000.0	1,000.0	100.00				Average	
		point10	10	2,000.0	2,000.0	100.00					
Waterman Avenue S of 9th Street	75.0	point11	11	2,000.0	100.0	100.00				Average	
		point12	12	2,000.0	1,000.0	100.00					
9th Street W of Waterman Avenue	75.0	point13	13	1,000.0	1,000.0	100.00				Average	
		point14	14	2,000.0	1,000.0	100.00					
9th Street E of Waterman Avenue	75.0	point15	15	2,000.0	1,000.0	100.00				Average	
		point16	16	3,000.0	1,000.0	100.00					
Waterman Ave N of Orange Show Rd	75.0	point17	17	2,000.0	3,000.0	100.00				Average	
		point18	18	2,000.0	4,000.0	100.00					
Waterman Ave S of Orange Show Rd	75.0	point19	19	2,000.0	2,000.0	100.00				Average	
		point20	20	2,000.0	3,000.0	100.00					
Orange Show Rd W of Waterman Ave	75.0	point21	21	1,000.0	3,000.0	100.00				Average	
		point22	22	2,000.0	3,000.0	100.00					
Orange Show Rd E of Waterman Ave	75.0	point23	23	2,000.0	3,000.0	100.00				Average	
		point24	24	3,000.0	3,000.0	100.00					
Waterman Ave N of Dumas Street	75.0	point25	25	2,000.0	5,000.0	100.00				Average	

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		point26	26	2,000.0	6,000.0	100.00					
Waterman Ave S of Dumas Street	75.0	point27	27	2,000.0	4,000.0	100.00				Average	
		point28	28	2,000.0	5,000.0	100.00					
Dumas Street W of Waterman Avenue	30.0	point29	29	1,000.0	5,000.0	100.00				Average	
		point30	30	2,000.0	5,000.0	100.00					
Dumas Street E of Waterman Avenue	30.0	point31	31	2,000.0	5,000.0	100.00				Average	
		point32	32	3,000.0	5,000.0	100.00					
Waterman Ave N of Washington Street	80.0	point33	33	2,000.0	7,000.0	100.00				Average	
		point34	34	2,000.0	8,000.0	100.00					
Waterman Ave S of Washington Street	80.0	point35	35	2,000.0	6,000.0	100.00				Average	
		point36	36	2,000.0	7,000.0	100.00					
Washington Street W of Waterman Ave	100.0	point37	37	1,000.0	7,000.0	100.00				Average	
		point38	38	2,000.0	7,000.0	100.00					
Washington Street E of Waterman Ave	100.0	point39	39	2,000.0	7,000.0	100.00				Average	
		point40	40	3,000.0	7,000.0	100.00					
Tippecanoe Ave N of Hospitality Lane	100.0	point41	41	4,000.0	1,000.0	100.00				Average	
		point42	42	4,000.0	2,000.0	100.00					
Tippecanoe Ave S of Hospitality Lane	100.0	point43	43	4,000.0	100.0	100.00				Average	
		point44	44	4,000.0	1,000.0	100.00					
Hospitality Lane W of Tippecanoe Ave	80.0	point45	45	3,000.0	1,000.0	100.00				Average	
		point46	46	4,000.0	1,000.0	100.00					
Hospitality Lane E of Tippecanoe Ave	80.0	point47	47	4,000.0	1,000.0	100.00				Average	
		point48	48	5,000.0	1,000.0	100.00					
Anderson Avenue N of Academy Drive	80.0	point49	49	6,000.0	1,000.0	100.00				Average	
		point50	50	6,000.0	2,000.0	100.00					
Anderson Avenue S of Academy Drive	80.0	point51	51	6,000.0	100.0	100.00				Average	
		point52	52	6,000.0	1,000.0	100.00					
Academy Drive W of Anderson Avenue	80.0	point53	53	5,000.0	1,000.0	100.00				Average	
		point54	54	6,000.0	1,000.0	100.00					
Academy Drive E of Anderson Avenue	80.0	point55	55	6,000.0	1,000.0	100.00				Average	
		point56	56	7,000.0	1,000.0	100.00					
California Street N of Redlands Blvd	100.0	point57	57	8,000.0	1,000.0	100.00				Average	
		point58	58	8,000.0	2,000.0	100.00					
California Street S of Redlands Blvd	100.0	point59	59	8,000.0	100.0	100.00				Average	
		point60	60	8,000.0	1,000.0	100.00					
Redlands Blvd W of California Street	100.0	point61	61	7,000.0	1,000.0	100.00				Average	
		point62	62	8,000.0	1,000.0	100.00					
Redlands Blvd E of California Street	100.0	point63	63	8,000.0	1,000.0	100.00				Average	
		point64	64	9,000.0	1,000.0	100.00					

Alabama Street N of I-10 West Ramps	100.0	point65	65	10,000.0	1,000.0	100.00				Average	
		point66	66	10,000.0	2,000.0	100.00					
Alabama Street S of I-10 West Ramps	100.0	point67	67	10,000.0	100.0	100.00				Average	
		point68	68	10,000.0	1,000.0	100.00					
I-10 West Ramps W of Alabama Street	30.0	point69	69	9,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point70	70	10,000.0	1,000.0	100.00					
I-10 West Ramps E of Alabama Street	30.0	point71	71	10,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point72	72	11,000.0	1,000.0	100.00					
Alabama Street N of I-10 East Ramps	100.0	point73	73	10,000.0	3,000.0	100.00				Average	
		point74	74	10,000.0	4,000.0	100.00					
Alabama Street S of I-10 East Ramps	100.0	point75	75	10,000.0	2,000.0	100.00				Average	
		point76	76	10,000.0	3,000.0	100.00					
I-10 East Ramps W of Alabama Street	30.0	point77	77	9,000.0	3,000.0	100.00	Onramp	10.00	100	Average	
		point78	78	10,000.0	3,000.0	100.00					
I-10 East Ramps E of Alabama Street	30.0	point79	79	10,000.0	3,000.0	100.00	Onramp	10.00	100	Average	
		point80	80	11,000.0	3,000.0	100.00					
Texas Street N of Stuart Avenue	75.0	point81	81	12,000.0	1,000.0	100.00				Average	
		point82	82	12,000.0	2,000.0	100.00					
Texas Street S of Stuart Avenue	75.0	point83	83	12,000.0	100.0	100.00				Average	
		point84	84	12,000.0	1,000.0	100.00					
Stuart Avenue W of Texas Street	35.0	point85	85	11,000.0	1,000.0	100.00				Average	
		point86	86	12,000.0	1,000.0	100.00					
Stuart Avenue E of Texas Street	35.0	point87	87	12,000.0	1,000.0	100.00				Average	
		point88	88	13,000.0	1,000.0	100.00					
Eureka Street N of Pearl Avenue	75.0	point89	89	14,000.0	1,000.0	100.00				Average	
		point90	90	14,000.0	2,000.0	100.00					
Eureka Street S of Pearl Avenue	75.0	point91	91	14,000.0	100.0	100.00				Average	
		point92	92	14,000.0	1,000.0	100.00					
Pearl Avenue W of Eureka Street	50.0	point93	93	13,000.0	1,000.0	100.00				Average	
		point94	94	14,000.0	1,000.0	100.00					
Pearl Avenue E of Eureka Street	50.0	point95	95	14,000.0	1,000.0	100.00				Average	
		point96	96	15,000.0	1,000.0	100.00					
Eureka Street N of Stuart Avenue	75.0	point97	97	14,000.0	3,000.0	100.00				Average	
		point98	98	14,000.0	4,000.0	100.00					
Eureka Street S of Stuart Avenue	75.0	point99	99	14,000.0	2,000.0	100.00				Average	
		point100	100	14,000.0	3,000.0	100.00					
Stuart Avenue W of Eureka Street	35.0	point101	101	13,000.0	3,000.0	100.00				Average	
		point102	102	14,000.0	3,000.0	100.00					
Stuart Avenue E of Eureka Street	35.0	point103	103	14,000.0	3,000.0	100.00				Average	

		point104	104	15,000.0	3,000.0	100.00					
Orange Street N of Colton Avenue	75.0	point105	105	16,000.0	1,000.0	100.00				Average	
		point106	106	16,000.0	2,000.0	100.00					
Orange Street S of Colton Avenue	75.0	point107	107	16,000.0	100.0	100.00				Average	
		point108	108	16,000.0	1,000.0	100.00					
Colton Avenue W of Orange Street	50.0	point109	109	15,000.0	1,000.0	100.00				Average	
		point110	110	16,000.0	1,000.0	100.00					
Colton Avenue E of Orange Street	50.0	point111	111	16,000.0	1,000.0	100.00				Average	
		point112	112	17,000.0	1,000.0	100.00					
6th Street N of I-10 West Ramps	50.0	point113	113	18,000.0	1,000.0	100.00				Average	
		point114	114	18,000.0	2,000.0	100.00					
6th Street S of I-10 West Ramps	50.0	point115	115	18,000.0	100.0	100.00				Average	
		point116	116	18,000.0	1,000.0	100.00					
I-10 West Ramps W of 6th Street	35.0	point117	117	17,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point118	118	18,000.0	1,000.0	100.00					
I-10 West Ramps E of 6th Street	35.0	point119	119	18,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point120	120	19,000.0	1,000.0	100.00					
6th Street N of Pearl Avenue	50.0	point121	121	18,000.0	3,000.0	100.00				Average	
		point122	122	18,000.0	4,000.0	100.00					
6th Street S of Pearl Avenue	50.0	point123	123	18,000.0	2,000.0	100.00				Average	
		point124	124	18,000.0	3,000.0	100.00					
Pearl Avenue W of 6th Street	50.0	point125	125	17,000.0	3,000.0	100.00				Average	
		point126	126	18,000.0	3,000.0	100.00					
Pearl Avenue E of 6th Street	50.0	point127	127	18,000.0	3,000.0	100.00				Average	
		point128	128	19,000.0	3,000.0	100.00					
Redlands Boulevard N of Citrus Avenue	85.0	point129	129	20,000.0	1,000.0	100.00				Average	
		point130	130	20,000.0	2,000.0	100.00					
Redlands Boulevard S of Citrus Avenue	85.0	point131	131	20,000.0	100.0	100.00				Average	
		point132	132	20,000.0	1,000.0	100.00					
Citrus Avenue W of Redlands Boulevard	50.0	point133	133	19,000.0	1,000.0	100.00				Average	
		point134	134	20,000.0	1,000.0	100.00					
Citrus Avenue E of Redlands Boulevard	50.0	point135	135	20,000.0	1,000.0	100.00				Average	
		point136	136	21,000.0	1,000.0	100.00					
Church Street N of Stuart Avenue	40.0	point137	137	22,000.0	1,000.0	100.00				Average	
		point138	138	22,000.0	2,000.0	100.00					
Church Street S of Stuart Avenue	40.0	point139	139	22,000.0	100.0	100.00				Average	
		point140	140	22,000.0	1,000.0	100.00					
Stuart Avenue W of Church Street	40.0	point141	141	21,000.0	1,000.0	100.00				Average	
		point142	142	22,000.0	1,000.0	100.00					

Stuart Avenue E of Church Street	40.0	point143	143	22,000.0	1,000.0	100.00				Average	
		point144	144	23,000.0	1,000.0	100.00					
University Street N of I-10 West Ramps	60.0	point145	145	24,000.0	1,000.0	100.00				Average	
		point146	146	24,000.0	2,000.0	100.00					
University Street S of I-10 West Ramps	60.0	point147	147	24,000.0	100.0	100.00				Average	
		point148	148	24,000.0	1,000.0	100.00					
I-10 West Ramps W of University Street	25.0	point149	149	23,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point150	150	24,000.0	1,000.0	100.00					
I-10 West Ramps E of University Street	25.0	point152	152	24,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point153	153	25,000.0	1,000.0	100.00					
University Street N of I-10 East Ramps	60.0	point154	154	26,000.0	1,000.0	100.00				Average	
		point155	155	26,000.0	2,000.0	100.00					
University Street S of I-10 East Ramps	60.0	point156	156	26,000.0	100.0	100.00				Average	
		point157	157	26,000.0	1,000.0	100.00					
I-10 East Ramps W of University Street	25.0	point158	158	25,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point159	159	26,000.0	1,000.0	100.00					
I-10 East Ramps E of University Street	25.0	point160	160	26,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point161	161	27,000.0	1,000.0	100.00					

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16 August 20
TNM 2.5

INPUT: TRAFFIC FOR LAeq1h Percentages

PROJECT/CONTRACT: <Project Name?>
RUN: Rdlnds Pssngr Rail Project Existing

Roadway Name	Points Name	No.	Segment Total Volume veh/hr	Autos P %	Autos S mph	MTrucks P %	MTrucks S mph	HTrucks P %	HTrucks S mph	Buses P %	Buses S mph	Motorcycles P %	Motorcycles S mph
Sierra Way N of Mill Street	point1	1	341	98	35	1	35	1	35	0	0	0	0
	point5	5											
Sierra Way S of Mill Street	point3	3	0	98	35	1	35	1	35	0	0	0	0
	point6	6											
Mill Street W of Sierra Way	point7	7	1318	98	35	1	35	1	35	0	0	0	0
	point4	4											
Mill Street W of Sierra Way	point8	8	1241	98	35	1	35	1	35	0	0	0	0
	point2	2											
Waterman Avenue N of 9th Street	point9	9	1929	98	30	1	30	1	30	0	0	0	0
	point10	10											
Waterman Avenue S of 9th Street	point11	11	2004	98	30	1	30	1	30	0	0	0	0
	point12	12											
9th Street W of Waterman Avenue	point13	13	870	98	35	1	35	1	35	0	0	0	0
	point14	14											
9th Street E of Waterman Avenue	point15	15	923	98	35	1	35	1	35	0	0	0	0
	point16	16											
Waterman Ave N of Orange Show Rd	point17	17	1997	98	30	1	30	1	30	0	0	0	0
	point18	18											
Waterman Ave S of Orange Show Rd	point19	19	2093	98	30	1	30	1	30	0	0	0	0
	point20	20											
Orange Show Rd W of Waterman Ave	point21	21	1430	98	35	1	35	1	35	0	0	0	0
	point22	22											
Orange Show Rd E of Waterman Ave	point23	23	1230	98	35	1	35	1	35	0	0	0	0

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	point24	24											
Waterman Ave N of Dumas Street	point25	25	2135	98	30	1	30	1	30	0	0	0	0
	point26	26											
Waterman Ave S of Dumas Street	point27	27	2154	98	30	1	30	1	30	0	0	0	0
	point28	28											
Dumas Street W of Waterman Avenue	point29	29	29	98	25	1	25	1	25	0	0	0	0
	point30	30											
Dumas Street E of Waterman Avenue	point31	31	0	98	25	1	25	1	25	0	0	0	0
	point32	32											
Waterman Ave N of Washington Street	point33	33	1826	98	30	1	30	1	30	0	0	0	0
	point34	34											
Waterman Ave S of Washington Street	point35	35	32	98	30	1	30	1	30	0	0	0	0
	point36	36											
Washington Street W of Waterman Ave	point37	37	2608	98	45	1	45	1	45	0	0	0	0
	point38	38											
Washington Street E of Waterman Ave	point39	39	2442	98	45	1	45	1	45	0	0	0	0
	point40	40											
Tippecanoe Ave N of Hospitality Lane	point41	41	1804	98	35	1	35	1	35	0	0	0	0
	point42	42											
Tippecanoe Ave S of Hospitality Lane	point43	43	2250	98	35	1	35	1	35	0	0	0	0
	point44	44											
Hospitality Lane W of Tippecanoe Ave	point45	45	1357	98	35	1	35	1	35	0	0	0	0
	point46	46											
Hospitality Lane E of Tippecanoe Ave	point47	47	421	98	35	1	35	1	35	0	0	0	0
	point48	48											
Anderson Avenue N of Academy Drive	point49	49	1702	98	35	1	35	1	35	0	0	0	0
	point50	50											
Anderson Avenue S of Academy Drive	point51	51	1586	98	35	1	35	1	35	0	0	0	0
	point52	52											
Academy Drive W of Anderson Avenue	point53	53	448	98	35	1	35	1	35	0	0	0	0
	point54	54											
Academy Drive E of Anderson Avenue	point55	55	294	98	35	1	35	1	35	0	0	0	0
	point56	56											
California Street N of Redlands Blvd	point57	57	1614	98	35	1	35	1	35	0	0	0	0
	point58	58											
California Street S of Redlands Blvd	point59	59	930	98	35	1	35	1	35	0	0	0	0

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	point60	60											
Redlands Blvd W of California Street	point61	61	1287	98	35	1	35	1	35	0	0	0	0
	point62	62											
Redlands Blvd E of California Street	point63	63	1727	98	35	1	35	1	35	0	0	0	0
	point64	64											
Alabama Street N of I-10 West Ramps	point65	65	2435	98	40	1	40	1	40	0	0	0	0
	point66	66											
Alabama Street S of I-10 West Ramps	point67	67	2375	98	40	1	40	1	40	0	0	0	0
	point68	68											
I-10 West Ramps W of Alabama Street	point69	69	1070	98	65	1	65	1	65	0	0	0	0
	point70	70											
I-10 West Ramps E of Alabama Street	point71	71	688	98	65	1	65	1	65	0	0	0	0
	point72	72											
Alabama Street N of I-10 East Ramps	point73	73	2390	98	40	1	40	1	40	0	0	0	0
	point74	74											
Alabama Street S of I-10 East Ramps	point75	75	2561	98	40	1	40	1	40	0	0	0	0
	point76	76											
I-10 East Ramps W of Alabama Street	point77	77	868	98	65	1	65	1	65	0	0	0	0
	point78	78											
I-10 East Ramps E of Alabama Street	point79	79	511	98	65	1	65	1	65	0	0	0	0
	point80	80											
Texas Street N of Stuart Avenue	point81	81	779	98	35	1	35	1	35	0	0	0	0
	point82	82											
Texas Street S of Stuart Avenue	point83	83	842	98	35	1	35	1	35	0	0	0	0
	point84	84											
Stuart Avenue W of Texas Street	point85	85	108	98	25	1	25	1	25	0	0	0	0
	point86	86											
Stuart Avenue E of Texas Street	point87	87	103	98	25	1	25	1	25	0	0	0	0
	point88	88											
Eureka Street N of Pearl Avenue	point89	89	367	98	25	1	25	1	25	0	0	0	0
	point90	90											
Eureka Street S of Pearl Avenue	point91	91	895	98	25	1	25	1	25	0	0	0	0
	point92	92											
Pearl Avenue W of Eureka Street	point93	93	1239	98	30	1	30	1	30	0	0	0	0
	point94	94											
Pearl Avenue E of Eureka Street	point95	95	905	98	30	1	30	1	30	0	0	0	0

	point96	96											
Eureka Street N of Stuart Avenue	point97	97	841	98	25	1	25	1	25	0	0	0	0
	point98	98											
Eureka Street S of Stuart Avenue	point99	99	910	98	25	1	25	1	25	0	0	0	0
	point100	100											
Stuart Avenue W of Eureka Street	point101	101	108	98	25	1	25	1	25	0	0	0	0
	point102	102											
Stuart Avenue E of Eureka Street	point103	103	215	98	25	1	25	1	25	0	0	0	0
	point104	104											
Orange Street N of Colton Avenue	point105	105	1139	98	25	1	25	1	25	0	0	0	0
	point106	106											
Orange Street S of Colton Avenue	point107	107	1214	98	25	1	25	1	25	0	0	0	0
	point108	108											
Colton Avenue W of Orange Street	point109	109	1047	98	30	1	30	1	30	0	0	0	0
	point110	110											
Colton Avenue E of Orange Street	point111	111	1062	98	30	1	30	1	30	0	0	0	0
	point112	112											
6th Street N of I-10 West Ramps	point113	113	869	98	25	1	25	1	25	0	0	0	0
	point114	114											
6th Street S of I-10 West Ramps	point115	115	900	98	25	1	25	1	25	0	0	0	0
	point116	116											
I-10 West Ramps W of 6th Street	point117	117	10	98	65	1	65	1	65	0	0	0	0
	point118	118											
I-10 West Ramps E of 6th Street	point119	119	373	98	65	1	65	1	65	0	0	0	0
	point120	120											
6th Street N of Pearl Avenue	point121	121	882	98	25	1	25	1	25	0	0	0	0
	point122	122											
6th Street S of Pearl Avenue	point123	123	897	98	25	1	25	1	25	0	0	0	0
	point124	124											
Pearl Avenue W of 6th Street	point125	125	803	98	30	1	30	1	30	0	0	0	0
	point126	126											
Pearl Avenue E of 6th Street	point127	127	558	98	30	1	30	1	30	0	0	0	0
	point128	128											
Redlands Boulevard N of Citrus Avenue	point129	129	1223	98	35	1	35	1	35	0	0	0	0
	point130	130											
Redlands Boulevard S of Citrus Avenue	point131	131	1083	98	35	1	35	1	35	0	0	0	0

	point132	132											
Citrus Avenue W of Redlands Boulevard	point133	133	957	98	30	1	30	1	30	0	0	0	0
	point134	134											
Citrus Avenue E of Redlands Boulevard	point135	135	849	98	30	1	30	1	30	0	0	0	0
	point136	136											
Church Street N of Stuart Avenue	point137	137	637	98	35	1	35	1	35	0	0	0	0
	point138	138											
Church Street S of Stuart Avenue	point139	139	596	98	35	1	35	1	35	0	0	0	0
	point140	140											
Stuart Avenue W of Church Street	point141	141	121	98	25	1	25	1	25	0	0	0	0
	point142	142											
Stuart Avenue E of Church Street	point143	143	0	98	25	1	25	1	25	0	0	0	0
	point144	144											
University Street N of I-10 West Ramps	point145	145	1233	98	35	1	35	1	35	0	0	0	0
	point146	146											
University Street S of I-10 West Ramps	point147	147	1132	98	35	1	35	1	35	0	0	0	0
	point148	148											
I-10 West Ramps W of University Street	point149	149	755	98	65	1	65	1	65	0	0	0	0
	point150	150											
I-10 West Ramps E of University Street	point152	152	92	98	65	1	65	1	65	0	0	0	0
	point153	153											
University Street N of I-10 East Ramps	point154	154	1148	98	35	1	35	1	35	0	0	0	0
	point155	155											
University Street S of I-10 East Ramps	point156	156	1277	98	35	1	35	1	35	0	0	0	0
	point157	157											
I-10 East Ramps W of University Street	point158	158	1023	98	65	1	65	1	65	0	0	0	0
	point159	159											
I-10 East Ramps E of University Street	point160	160	0	98	65	1	65	1	65	0	0	0	0
	point161	161											

ICF International
M Greene

16 August 2012
TNM 2.5

INPUT: RECEIVERS
PROJECT/CONTRACT: <Project Name?>
RUN: Rdlnds Pssngr Rail Project Existing

Receiver Name	No.	#DUs	Coordinates (ground) X	Y	Z	Height above Ground	Input Sound Levels and Criteria Existing LAeq1h	Impact Criteria LAeq1h	Sub'l	NR Goal	Active in Calc.
			ft	ft	ft	ft	dBA	dBA	dB	dB	
R1 Sierra Way and Mill Street NW Quad	4	1	-337.7	1,103.4	100.00	5.00	0.00	66	10.0	8.0	Y
R2 Waterman Avenue and 9th Street NW	6	1	1,693.0	1,099.6	100.00	5.00	0.00	66	10.0	8.0	Y
R3 Waterman Avenue and Orange Show	8	1	1,700.3	3,098.6	100.00	5.00	0.00	66	10.0	8.0	Y
R4 Waterman Avenue and Dumas Street	10	1	1,748.1	4,903.9	100.00	5.00	0.00	66	10.0	8.0	Y
R5 Waterman Avenue and Washington S	12	1	1,897.3	7,156.0	100.00	5.00	0.00	66	10.0	8.0	Y
R6 Tippecanoe Avenue and Hospitality L	14	1	4,105.6	849.0	100.00	5.00	0.00	66	10.0	8.0	Y
R7 Anderson Avenue and Academy Drive	16	1	6,148.4	1,096.0	100.00	5.00	0.00	66	10.0	8.0	Y
R8 California Street and Redlands Boule	18	1	7,750.2	1,154.3	100.00	5.00	0.00	66	10.0	8.0	Y
R9 Alabama Street and I-10 West Ramps	20	1	10,451.9	1,156.6	100.00	5.00	0.00	66	10.0	8.0	Y
R10 Alabama Street and I-10 East Ramp	22	1	9,848.9	2,897.5	100.00	5.00	0.00	66	10.0	8.0	Y
R11 Texas Street and Stuart Avenue SW	24	1	11,792.3	895.8	100.00	5.00	0.00	66	10.0	8.0	Y
R12 Eureka Street and Pearl Avenue SE	28	1	14,201.0	803.2	100.00	5.00	0.00	66	10.0	8.0	Y
R13 Eureka Street and Stuart Avenue NE	30	1	14,199.8	3,100.8	100.00	5.00	0.00	66	10.0	8.0	Y
R14 Orange Street and Colton Avenue S	32	1	15,694.4	898.7	100.00	5.00	0.00	66	10.0	8.0	Y
R15 6th Street and I-10 West Ramps NE	35	1	18,150.1	1,250.5	100.00	5.00	0.00	66	10.0	8.0	Y
R16 6th Street and Pearl Avenue SE Qua	37	1	18,100.0	2,900.0	100.00	5.00	0.00	66	10.0	8.0	Y
R17 Redlands Boulevard and Citrus Aver	39	1	20,203.6	1,149.4	100.00	5.00	0.00	66	10.0	8.0	Y
R18 Church Street and Stuart Avenue SV	42	1	21,598.4	899.6	100.00	5.00	0.00	66	10.0	8.0	Y
R19 University Street and I-10 West Ram	44	1	24,104.1	1,099.2	100.00	5.00	0.00	66	10.0	8.0	Y
R20 University Street and I-10 East Ram	46	1	26,101.0	895.4	100.00	5.00	0.00	66	10.0	8.0	Y

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16 August 2012
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT:	<Project Name?>
RUN:	Rdlnds Pssngr Rail Project Existing
BARRIER DESIGN:	INPUT HEIGHTS
ATMOSPHERICS:	68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R1 Sierra Way and Mill Street NW Quad	4	1	0.0	61.7	66	61.7	10	----	61.7	0.0	8	-8.0
R2 Waterman Avenue and 9th Street NW	6	1	0.0	61.5	66	61.5	10	----	61.5	0.0	8	-8.0
R3 Waterman Avenue and Orange Show F	8	1	0.0	63.2	66	63.2	10	----	63.2	0.0	8	-8.0
R4 Waterman Avenue and Dumas Street S	10	1	0.0	57.4	66	57.4	10	----	57.4	0.0	8	-8.0
R5 Waterman Avenue and Washington St	12	1	0.0	66.8	66	66.8	10	Snd Lvl	66.8	0.0	8	-8.0
R6 Tippecanoe Avenue and Hospitality La	14	1	0.0	64.7	66	64.7	10	----	64.7	0.0	8	-8.0
R7 Anderson Avenue and Academy Drive	16	1	0.0	62.2	66	62.2	10	----	62.2	0.0	8	-8.0
R8 California Street and Redlands Boulev	18	1	0.0	61.6	66	61.6	10	----	61.6	0.0	8	-8.0
R9 Alabama Street and I-10 West Ramps	20	1	0.0	61.2	66	61.2	10	----	61.2	0.0	8	-8.0
R10 Alabama Street and I-10 East Ramps	22	1	0.0	67.6	66	67.6	10	Snd Lvl	67.6	0.0	8	-8.0
R11 Texas Street and Stuart Avenue SW	24	1	0.0	56.7	66	56.7	10	----	56.7	0.0	8	-8.0
R12 Eureka Street and Pearl Avenue SE (	28	1	0.0	57.1	66	57.1	10	----	57.1	0.0	8	-8.0
R13 Eureka Street and Stuart Avenue NE	30	1	0.0	54.9	66	54.9	10	----	54.9	0.0	8	-8.0
R14 Orange Street and Colton Avenue SV	32	1	0.0	59.9	66	59.9	10	----	59.9	0.0	8	-8.0
R15 6th Street and I-10 West Ramps NE (	35	1	0.0	56.3	66	56.3	10	----	56.3	0.0	8	-8.0
R16 6th Street and Pearl Avenue SE Quad	37	1	0.0	59.9	66	59.9	10	----	59.9	0.0	8	-8.0
R17 Redlands Boulevard and Citrus Aven	39	1	0.0	59.9	66	59.9	10	----	59.9	0.0	8	-8.0
R18 Church Street and Stuart Avenue SW	42	1	0.0	50.9	66	50.9	10	----	50.9	0.0	8	-8.0
R19 University Street and I-10 West Ramp	44	1	0.0	63.4	66	63.4	10	----	63.4	0.0	8	-8.0
R20 University Street and I-10 East Ramp	46	1	0.0	63.5	66	63.5	10	----	63.5	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB

E-12

RESULTS: SOUND LEVELS

<Project Name?>

All Selected	20	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

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16 August 2012
TNM 2.5

INPUT: ROADWAYS
PROJECT/CONTRACT: <Project Name?>
RUN: Rdlnds Pssngr Rail Project Only Yr 2018

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Roadway		Points					Flow Control			Segment	
Name	Width	Name	No.	Coordinates (pavement) X	Y	Z	Control Device	Speed Constraint	Percent Vehicles Affected	Pvmt Type	On Struct?
	ft			ft	ft	ft		mph	%		
Sierra Way N of Mill Street	75.0	point1	1	100.0	1,000.0	100.00				Average	
		point5	5	100.0	2,000.0	100.00					
Sierra Way S of Mill Street	75.0	point3	3	100.0	100.0	100.00				Average	
		point6	6	100.0	1,000.0	100.00					
Mill Street W of Sierra Way	75.0	point7	7	-900.0	1,000.0	100.00				Average	
		point4	4	100.0	1,000.0	100.00					
Mill Street W of Sierra Way	75.0	point8	8	100.0	1,000.0	100.00				Average	
		point2	2	1,000.0	1,000.0	100.00					
Waterman Avenue N of 9th Street	75.0	point9	9	2,000.0	1,000.0	100.00				Average	
		point10	10	2,000.0	2,000.0	100.00					
Waterman Avenue S of 9th Street	75.0	point11	11	2,000.0	100.0	100.00				Average	
		point12	12	2,000.0	1,000.0	100.00					
9th Street W of Waterman Avenue	75.0	point13	13	1,000.0	1,000.0	100.00				Average	
		point14	14	2,000.0	1,000.0	100.00					
9th Street E of Waterman Avenue	75.0	point15	15	2,000.0	1,000.0	100.00				Average	
		point16	16	3,000.0	1,000.0	100.00					
Waterman Ave N of Orange Show Rd	75.0	point17	17	2,000.0	3,000.0	100.00				Average	
		point18	18	2,000.0	4,000.0	100.00					
Waterman Ave S of Orange Show Rd	75.0	point19	19	2,000.0	2,000.0	100.00				Average	
		point20	20	2,000.0	3,000.0	100.00					
Orange Show Rd W of Waterman Ave	75.0	point21	21	1,000.0	3,000.0	100.00				Average	
		point22	22	2,000.0	3,000.0	100.00					
Orange Show Rd E of Waterman Ave	75.0	point23	23	2,000.0	3,000.0	100.00				Average	
		point24	24	3,000.0	3,000.0	100.00					
Waterman Ave N of Dumas Street	75.0	point25	25	2,000.0	5,000.0	100.00				Average	

E-14

		point26	26	2,000.0	6,000.0	100.00					
Waterman Ave S of Dumas Street	75.0	point27	27	2,000.0	4,000.0	100.00				Average	
		point28	28	2,000.0	5,000.0	100.00					
Dumas Street W of Waterman Avenue	30.0	point29	29	1,000.0	5,000.0	100.00				Average	
		point30	30	2,000.0	5,000.0	100.00					
Dumas Street E of Waterman Avenue	30.0	point31	31	2,000.0	5,000.0	100.00				Average	
		point32	32	3,000.0	5,000.0	100.00					
Waterman Ave N of Washington Street	80.0	point33	33	2,000.0	7,000.0	100.00				Average	
		point34	34	2,000.0	8,000.0	100.00					
Waterman Ave S of Washington Street	80.0	point35	35	2,000.0	6,000.0	100.00				Average	
		point36	36	2,000.0	7,000.0	100.00					
Washington Street W of Waterman Ave	100.0	point37	37	1,000.0	7,000.0	100.00				Average	
		point38	38	2,000.0	7,000.0	100.00					
Washington Street E of Waterman Ave	100.0	point39	39	2,000.0	7,000.0	100.00				Average	
		point40	40	3,000.0	7,000.0	100.00					
Tippecanoe Ave N of Hospitality Lane	100.0	point41	41	4,000.0	1,000.0	100.00				Average	
		point42	42	4,000.0	2,000.0	100.00					
Tippecanoe Ave S of Hospitality Lane	100.0	point43	43	4,000.0	100.0	100.00				Average	
		point44	44	4,000.0	1,000.0	100.00					
Hospitality Lane W of Tippecanoe Ave	80.0	point45	45	3,000.0	1,000.0	100.00				Average	
		point46	46	4,000.0	1,000.0	100.00					
Hospitality Lane E of Tippecanoe Ave	80.0	point47	47	4,000.0	1,000.0	100.00				Average	
		point48	48	5,000.0	1,000.0	100.00					
Anderson Avenue N of Academy Drive	80.0	point49	49	6,000.0	1,000.0	100.00				Average	
		point50	50	6,000.0	2,000.0	100.00					
Anderson Avenue S of Academy Drive	80.0	point51	51	6,000.0	100.0	100.00				Average	
		point52	52	6,000.0	1,000.0	100.00					
Academy Drive W of Anderson Avenue	80.0	point53	53	5,000.0	1,000.0	100.00				Average	
		point54	54	6,000.0	1,000.0	100.00					
Academy Drive E of Anderson Avenue	80.0	point55	55	6,000.0	1,000.0	100.00				Average	
		point56	56	7,000.0	1,000.0	100.00					
California Street N of Redlands Blvd	100.0	point57	57	8,000.0	1,000.0	100.00				Average	
		point58	58	8,000.0	2,000.0	100.00					
California Street S of Redlands Blvd	100.0	point59	59	8,000.0	100.0	100.00				Average	
		point60	60	8,000.0	1,000.0	100.00					
Redlands Blvd W of California Street	100.0	point61	61	7,000.0	1,000.0	100.00				Average	
		point62	62	8,000.0	1,000.0	100.00					
Redlands Blvd E of California Street	100.0	point63	63	8,000.0	1,000.0	100.00				Average	
		point64	64	9,000.0	1,000.0	100.00					

E-15

Alabama Street N of I-10 West Ramps	100.0	point65	65	10,000.0	1,000.0	100.00				Average	
		point66	66	10,000.0	2,000.0	100.00					
Alabama Street S of I-10 West Ramps	100.0	point67	67	10,000.0	100.0	100.00				Average	
		point68	68	10,000.0	1,000.0	100.00					
I-10 West Ramps W of Alabama Street	30.0	point69	69	9,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point70	70	10,000.0	1,000.0	100.00					
I-10 West Ramps E of Alabama Street	30.0	point71	71	10,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point72	72	11,000.0	1,000.0	100.00					
Alabama Street N of I-10 East Ramps	100.0	point73	73	10,000.0	3,000.0	100.00				Average	
		point74	74	10,000.0	4,000.0	100.00					
Alabama Street S of I-10 East Ramps	100.0	point75	75	10,000.0	2,000.0	100.00				Average	
		point76	76	10,000.0	3,000.0	100.00					
I-10 East Ramps W of Alabama Street	30.0	point77	77	9,000.0	3,000.0	100.00	Onramp	10.00	100	Average	
		point78	78	10,000.0	3,000.0	100.00					
I-10 East Ramps E of Alabama Street	30.0	point79	79	10,000.0	3,000.0	100.00	Onramp	10.00	100	Average	
		point80	80	11,000.0	3,000.0	100.00					
Texas Street N of Stuart Avenue	75.0	point81	81	12,000.0	1,000.0	100.00				Average	
		point82	82	12,000.0	2,000.0	100.00					
Texas Street S of Stuart Avenue	75.0	point83	83	12,000.0	100.0	100.00				Average	
		point84	84	12,000.0	1,000.0	100.00					
Stuart Avenue W of Texas Street	35.0	point85	85	11,000.0	1,000.0	100.00				Average	
		point86	86	12,000.0	1,000.0	100.00					
Stuart Avenue E of Texas Street	35.0	point87	87	12,000.0	1,000.0	100.00				Average	
		point88	88	13,000.0	1,000.0	100.00					
Eureka Street N of Pearl Avenue	75.0	point89	89	14,000.0	1,000.0	100.00				Average	
		point90	90	14,000.0	2,000.0	100.00					
Eureka Street S of Pearl Avenue	75.0	point91	91	14,000.0	100.0	100.00				Average	
		point92	92	14,000.0	1,000.0	100.00					
Pearl Avenue W of Eureka Street	50.0	point93	93	13,000.0	1,000.0	100.00				Average	
		point94	94	14,000.0	1,000.0	100.00					
Pearl Avenue E of Eureka Street	50.0	point95	95	14,000.0	1,000.0	100.00				Average	
		point96	96	15,000.0	1,000.0	100.00					
Eureka Street N of Stuart Avenue	75.0	point97	97	14,000.0	3,000.0	100.00				Average	
		point98	98	14,000.0	4,000.0	100.00					
Eureka Street S of Stuart Avenue	75.0	point99	99	14,000.0	2,000.0	100.00				Average	
		point100	100	14,000.0	3,000.0	100.00					
Stuart Avenue W of Eureka Street	35.0	point101	101	13,000.0	3,000.0	100.00				Average	
		point102	102	14,000.0	3,000.0	100.00					
Stuart Avenue E of Eureka Street	35.0	point103	103	14,000.0	3,000.0	100.00				Average	

		point104	104	15,000.0	3,000.0	100.00				Average	
Orange Street N of Colton Avenue	75.0	point105	105	16,000.0	1,000.0	100.00				Average	
		point106	106	16,000.0	2,000.0	100.00					
Orange Street S of Colton Avenue	75.0	point107	107	16,000.0	100.0	100.00				Average	
		point108	108	16,000.0	1,000.0	100.00					
Colton Avenue W of Orange Street	50.0	point109	109	15,000.0	1,000.0	100.00				Average	
		point110	110	16,000.0	1,000.0	100.00					
Colton Avenue E of Orange Street	50.0	point111	111	16,000.0	1,000.0	100.00				Average	
		point112	112	17,000.0	1,000.0	100.00					
6th Street N of I-10 West Ramps	50.0	point113	113	18,000.0	1,000.0	100.00				Average	
		point114	114	18,000.0	2,000.0	100.00					
6th Street S of I-10 West Ramps	50.0	point115	115	18,000.0	100.0	100.00				Average	
		point116	116	18,000.0	1,000.0	100.00					
I-10 West Ramps W of 6th Street	35.0	point117	117	17,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point118	118	18,000.0	1,000.0	100.00					
I-10 West Ramps E of 6th Street	35.0	point119	119	18,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point120	120	19,000.0	1,000.0	100.00					
6th Street N of Pearl Avenue	50.0	point121	121	18,000.0	3,000.0	100.00				Average	
		point122	122	18,000.0	4,000.0	100.00					
6th Street S of Pearl Avenue	50.0	point123	123	18,000.0	2,000.0	100.00				Average	
		point124	124	18,000.0	3,000.0	100.00					
Pearl Avenue W of 6th Street	50.0	point125	125	17,000.0	3,000.0	100.00				Average	
		point126	126	18,000.0	3,000.0	100.00					
Pearl Avenue E of 6th Street	50.0	point127	127	18,000.0	3,000.0	100.00				Average	
		point128	128	19,000.0	3,000.0	100.00					
Redlands Boulevard N of Citrus Avenue	85.0	point129	129	20,000.0	1,000.0	100.00				Average	
		point130	130	20,000.0	2,000.0	100.00					
Redlands Boulevard S of Citrus Avenue	85.0	point131	131	20,000.0	100.0	100.00				Average	
		point132	132	20,000.0	1,000.0	100.00					
Citrus Avenue W of Redlands Boulevard	50.0	point133	133	19,000.0	1,000.0	100.00				Average	
		point134	134	20,000.0	1,000.0	100.00					
Citrus Avenue E of Redlands Boulevard	50.0	point135	135	20,000.0	1,000.0	100.00				Average	
		point136	136	21,000.0	1,000.0	100.00					
Church Street N of Stuart Avenue	40.0	point137	137	22,000.0	1,000.0	100.00				Average	
		point138	138	22,000.0	2,000.0	100.00					
Church Street S of Stuart Avenue	40.0	point139	139	22,000.0	100.0	100.00				Average	
		point140	140	22,000.0	1,000.0	100.00					
Stuart Avenue W of Church Street	40.0	point141	141	21,000.0	1,000.0	100.00				Average	
		point142	142	22,000.0	1,000.0	100.00					

Stuart Avenue E of Church Street	40.0	point143	143	22,000.0	1,000.0	100.00				Average	
		point144	144	23,000.0	1,000.0	100.00					
University Street N of I-10 West Ramps	60.0	point145	145	24,000.0	1,000.0	100.00				Average	
		point146	146	24,000.0	2,000.0	100.00					
University Street S of I-10 West Ramps	60.0	point147	147	24,000.0	100.0	100.00				Average	
		point148	148	24,000.0	1,000.0	100.00					
I-10 West Ramps W of University Street	25.0	point149	149	23,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point150	150	24,000.0	1,000.0	100.00					
I-10 West Ramps E of University Street	25.0	point152	152	24,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point153	153	25,000.0	1,000.0	100.00					
University Street N of I-10 East Ramps	60.0	point154	154	26,000.0	1,000.0	100.00				Average	
		point155	155	26,000.0	2,000.0	100.00					
University Street S of I-10 East Ramps	60.0	point156	156	26,000.0	100.0	100.00				Average	
		point157	157	26,000.0	1,000.0	100.00					
I-10 East Ramps W of University Street	25.0	point158	158	25,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point159	159	26,000.0	1,000.0	100.00					
I-10 East Ramps E of University Street	25.0	point160	160	26,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point161	161	27,000.0	1,000.0	100.00					

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INPUT: TRAFFIC FOR LAeq1h Percentages
PROJECT/CONTRACT: <Project Name?>
RUN: Rdlnds Pssngr Rail Project Only Yr 2018

Roadway	Points												
Name	Name	No.	Segment										
			Total	Autos		MTrucks		HTrucks		Buses		Motorcycles	
			Volume	P	S	P	S	P	S	P	S	P	S
			veh/hr	%	mph	%	mph	%	mph	%	mph	%	mph
Sierra Way N of Mill Street	point1	1	0	98	35	1	35	1	35	0	0	0	0
	point5	5											
Sierra Way S of Mill Street	point3	3	0	98	35	1	35	1	35	0	0	0	0
	point6	6											
Mill Street W of Sierra Way	point7	7	0	98	35	1	35	1	35	0	0	0	0
	point4	4											
Mill Street W of Sierra Way	point8	8	0	98	35	1	35	1	35	0	0	0	0
	point2	2											
Waterman Avenue N of 9th Street	point9	9	17	98	30	1	30	1	30	0	0	0	0
	point10	10											
Waterman Avenue S of 9th Street	point11	11	17	98	30	1	30	1	30	0	0	0	0
	point12	12											
9th Street W of Waterman Avenue	point13	13	13	98	35	1	35	1	35	0	0	0	0
	point14	14											
9th Street E of Waterman Avenue	point15	15	13	98	35	1	35	1	35	0	0	0	0
	point16	16											
Waterman Ave N of Orange Show Rd	point17	17	3	98	30	1	30	1	30	0	0	0	0
	point18	18											
Waterman Ave S of Orange Show Rd	point19	19	3	98	30	1	30	1	30	0	0	0	0
	point20	20											
Orange Show Rd W of Waterman Ave	point21	21	2	98	35	1	35	1	35	0	0	0	0
	point22	22											
Orange Show Rd E of Waterman Ave	point23	23	2	98	35	1	35	1	35	0	0	0	0

	point24	24											
Waterman Ave N of Dumas Street	point25	25	0	98	30	1	30	1	30	0	0	0	0
	point26	26											
Waterman Ave S of Dumas Street	point27	27	0	98	30	1	30	1	30	0	0	0	0
	point28	28											
Dumas Street W of Waterman Avenue	point29	29	0	98	25	1	25	1	25	0	0	0	0
	point30	30											
Dumas Street E of Waterman Avenue	point31	31	0	98	25	1	25	1	25	0	0	0	0
	point32	32											
Waterman Ave N of Washington Street	point33	33	11	98	30	1	30	1	30	0	0	0	0
	point34	34											
Waterman Ave S of Washington Street	point35	35	12	98	30	1	30	1	30	0	0	0	0
	point36	36											
Washington Street W of Waterman Ave	point37	37	15	98	45	1	45	1	45	0	0	0	0
	point38	38											
Washington Street E of Waterman Ave	point39	39	18	98	45	1	45	1	45	0	0	0	0
	point40	40											
Tippecanoe Ave N of Hospitality Lane	point41	41	22	98	35	1	35	1	35	0	0	0	0
	point42	42											
Tippecanoe Ave S of Hospitality Lane	point43	43	22	98	35	1	35	1	35	0	0	0	0
	point44	44											
Hospitality Lane W of Tippecanoe Ave	point45	45	18	98	35	1	35	1	35	0	0	0	0
	point46	46											
Hospitality Lane E of Tippecanoe Ave	point47	47	13	98	35	1	35	1	35	0	0	0	0
	point48	48											
Anderson Avenue N of Academy Drive	point49	49	19	98	35	1	35	1	35	0	0	0	0
	point50	50											
Anderson Avenue S of Academy Drive	point51	51	16	98	35	1	35	1	35	0	0	0	0
	point52	52											
Academy Drive W of Anderson Avenue	point53	53	11	98	35	1	35	1	35	0	0	0	0
	point54	54											
Academy Drive E of Anderson Avenue	point55	55	10	98	35	1	35	1	35	0	0	0	0
	point56	56											
California Street N of Redlands Blvd	point57	57	0	98	35	1	35	1	35	0	0	0	0
	point58	58											
California Street S of Redlands Blvd	point59	59	0	98	35	1	35	1	35	0	0	0	0

	point60	60											
Redlands Blvd W of California Street	point61	61	0	98	35	1	35	1	35	0	0	0	0
	point62	62											
Redlands Blvd E of California Street	point63	63	0	98	35	1	35	1	35	0	0	0	0
	point64	64											
Alabama Street N of I-10 West Ramps	point65	65	6	98	40	1	40	1	40	0	0	0	0
	point66	66											
Alabama Street S of I-10 West Ramps	point67	67	7	98	40	1	40	1	40	0	0	0	0
	point68	68											
I-10 West Ramps W of Alabama Street	point69	69	2	98	65	1	65	1	65	0	0	0	0
	point70	70											
I-10 West Ramps E of Alabama Street	point71	71	4	98	65	1	65	1	65	0	0	0	0
	point72	72											
Alabama Street N of I-10 East Ramps	point73	73	41	98	40	1	40	1	40	0	0	0	0
	point74	74											
Alabama Street S of I-10 East Ramps	point75	75	26	98	40	1	40	1	40	0	0	0	0
	point76	76											
I-10 East Ramps W of Alabama Street	point77	77	18	98	65	1	65	1	65	0	0	0	0
	point78	78											
I-10 East Ramps E of Alabama Street	point79	79	3	98	65	1	65	1	65	0	0	0	0
	point80	80											
Texas Street N of Stuart Avenue	point81	81	0	98	35	1	35	1	35	0	0	0	0
	point82	82											
Texas Street S of Stuart Avenue	point83	83	0	98	35	1	35	1	35	0	0	0	0
	point84	84											
Stuart Avenue W of Texas Street	point85	85	0	98	25	1	25	1	25	0	0	0	0
	point86	86											
Stuart Avenue E of Texas Street	point87	87	0	98	25	1	25	1	25	0	0	0	0
	point88	88											
Eureka Street N of Pearl Avenue	point89	89	2	98	25	1	25	1	25	0	0	0	0
	point90	90											
Eureka Street S of Pearl Avenue	point91	91	2	98	25	1	25	1	25	0	0	0	0
	point92	92											
Pearl Avenue W of Eureka Street	point93	93	1	98	30	1	30	1	30	0	0	0	0
	point94	94											
Pearl Avenue E of Eureka Street	point95	95	2	98	30	1	30	1	30	0	0	0	0

	point96	96											
Eureka Street N of Stuart Avenue	point97	97	16	98	25	1	25	1	25	0	0	0	0
	point98	98											
Eureka Street S of Stuart Avenue	point99	99	17	98	25	1	25	1	25	0	0	0	0
	point100	100											
Stuart Avenue W of Eureka Street	point101	101	11	98	25	1	25	1	25	0	0	0	0
	point102	102											
Stuart Avenue E of Eureka Street	point103	103	11	98	25	1	25	1	25	0	0	0	0
	point104	104											
Orange Street N of Colton Avenue	point105	105	0	98	25	1	25	1	25	0	0	0	0
	point106	106											
Orange Street S of Colton Avenue	point107	107	0	98	25	1	25	1	25	0	0	0	0
	point108	108											
Colton Avenue W of Orange Street	point109	109	0	98	30	1	30	1	30	0	0	0	0
	point110	110											
Colton Avenue E of Orange Street	point111	111	0	98	30	1	30	1	30	0	0	0	0
	point112	112											
6th Street N of I-10 West Ramps	point113	113	1	98	25	1	25	1	25	0	0	0	0
	point114	114											
6th Street S of I-10 West Ramps	point115	115	1	98	25	1	25	1	25	0	0	0	0
	point116	116											
I-10 West Ramps W of 6th Street	point117	117	0	98	65	1	65	1	65	0	0	0	0
	point118	118											
I-10 West Ramps E of 6th Street	point119	119	0	98	65	1	65	1	65	0	0	0	0
	point120	120											
6th Street N of Pearl Avenue	point121	121	4	98	25	1	25	1	25	0	0	0	0
	point122	122											
6th Street S of Pearl Avenue	point123	123	3	98	25	1	25	1	25	0	0	0	0
	point124	124											
Pearl Avenue W of 6th Street	point125	125	3	98	30	1	30	1	30	0	0	0	0
	point126	126											
Pearl Avenue E of 6th Street	point127	127	2	98	30	1	30	1	30	0	0	0	0
	point128	128											
Redlands Boulevard N of Citrus Avenue	point129	129	0	98	35	1	35	1	35	0	0	0	0
	point130	130											
Redlands Boulevard S of Citrus Avenue	point131	131	0	98	35	1	35	1	35	0	0	0	0

INPUT: TRAFFIC FOR LAeq1h Percentages **<Project Name?>**

	point132	132											
Citrus Avenue W of Redlands Boulevard	point133	133	0	98	30	1	30	1	30	0	0	0	0
	point134	134											
Citrus Avenue E of Redlands Boulevard	point135	135	0	98	30	1	30	1	30	0	0	0	0
	point136	136											
Church Street N of Stuart Avenue	point137	137	36	98	35	1	35	1	35	0	0	0	0
	point138	138											
Church Street S of Stuart Avenue	point139	139	25	98	35	1	35	1	35	0	0	0	0
	point140	140											
Stuart Avenue W of Church Street	point141	141	13	98	25	1	25	1	25	0	0	0	0
	point142	142											
Stuart Avenue E of Church Street	point143	143	1	98	25	1	25	1	25	0	0	0	0
	point144	144											
University Street N of I-10 West Ramps	point145	145	0	98	35	1	35	1	35	0	0	0	0
	point146	146											
University Street S of I-10 West Ramps	point147	147	0	98	35	1	35	1	35	0	0	0	0
	point148	148											
I-10 West Ramps W of University Street	point149	149	0	98	65	1	65	1	65	0	0	0	0
	point150	150											
I-10 West Ramps E of University Street	point152	152	0	98	65	1	65	1	65	0	0	0	0
	point153	153											
University Street N of I-10 East Ramps	point154	154	0	98	35	1	35	1	35	0	0	0	0
	point155	155											
University Street S of I-10 East Ramps	point156	156	0	98	35	1	35	1	35	0	0	0	0
	point157	157											
I-10 East Ramps W of University Street	point158	158	0	98	65	1	65	1	65	0	0	0	0
	point159	159											
I-10 East Ramps E of University Street	point160	160	0	98	65	1	65	1	65	0	0	0	0
	point161	161											

ICF International
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16 August 2012
TNM 2.5

INPUT: RECEIVERS
PROJECT/CONTRACT: <Project Name?>
RUN: Rdlnds Pssngr Rail Project Only Yr 2018

Receiver Name	No.	#DUs	Coordinates (ground) X	Y	Z	Height above Ground	Input Sound Levels and Criteria Existing LAeq1h	Impact Criteria LAeq1h	Sub'l	NR Goal	Active in Calc.
			ft	ft	ft	ft	dBA	dBA	dB	dB	
R1 Sierra Way and Mill Street NW Quad	4	1	-337.7	1,103.4	100.00	5.00	0.00	66	10.0	8.0	Y
R2 Waterman Avenue and 9th Street NW	6	1	1,693.0	1,099.6	100.00	5.00	0.00	66	10.0	8.0	Y
R3 Waterman Avenue and Orange Show	8	1	1,700.3	3,098.6	100.00	5.00	0.00	66	10.0	8.0	Y
R4 Waterman Avenue and Dumas Street	10	1	1,748.1	4,903.9	100.00	5.00	0.00	66	10.0	8.0	Y
R5 Waterman Avenue and Washington S	12	1	1,897.3	7,156.0	100.00	5.00	0.00	66	10.0	8.0	Y
R6 Tippecanoe Avenue and Hospitality L	14	1	4,105.6	849.0	100.00	5.00	0.00	66	10.0	8.0	Y
R7 Anderson Avenue and Academy Drive	16	1	6,148.4	1,096.0	100.00	5.00	0.00	66	10.0	8.0	Y
R8 California Street and Redlands Boule	18	1	7,750.2	1,154.3	100.00	5.00	0.00	66	10.0	8.0	Y
R9 Alabama Street and I-10 West Ramps	20	1	10,451.9	1,156.6	100.00	5.00	0.00	66	10.0	8.0	Y
R10 Alabama Street and I-10 East Ramp	22	1	9,848.9	2,897.5	100.00	5.00	0.00	66	10.0	8.0	Y
R11 Texas Street and Stuart Avenue SW	24	1	11,792.3	895.8	100.00	5.00	0.00	66	10.0	8.0	Y
R12 Eureka Street and Pearl Avenue SE	28	1	14,201.0	803.2	100.00	5.00	0.00	66	10.0	8.0	Y
R13 Eureka Street and Stuart Avenue NE	30	1	14,199.8	3,100.8	100.00	5.00	0.00	66	10.0	8.0	Y
R14 Orange Street and Colton Avenue S	32	1	15,694.4	898.7	100.00	5.00	0.00	66	10.0	8.0	Y
R15 6th Street and I-10 West Ramps NE	35	1	18,150.1	1,250.5	100.00	5.00	0.00	66	10.0	8.0	Y
R16 6th Street and Pearl Avenue SE Qua	37	1	18,100.0	2,900.0	100.00	5.00	0.00	66	10.0	8.0	Y
R17 Redlands Boulevard and Citrus Aver	39	1	20,203.6	1,149.4	100.00	5.00	0.00	66	10.0	8.0	Y
R18 Church Street and Stuart Avenue SV	42	1	21,598.4	899.6	100.00	5.00	0.00	66	10.0	8.0	Y
R19 University Street and I-10 West Ram	44	1	24,104.1	1,099.2	100.00	5.00	0.00	66	10.0	8.0	Y
R20 University Street and I-10 East Ram	46	1	26,101.0	895.4	100.00	5.00	0.00	66	10.0	8.0	Y

RESULTS: SOUND LEVELS <Project Name?>

ICF International
M Greene

16 August 2012
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: <Project Name?>
RUN: Rdlnds Pssngr Rail Project Only Yr 2018
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R1 Sierra Way and Mill Street NW Quad	4	1	0.0	21.4	66	21.4	10	----	21.4	0.0	8	-8.0
R2 Waterman Avenue and 9th Street NW	6	1	0.0	42.6	66	42.6	10	----	42.6	0.0	8	-8.0
R3 Waterman Avenue and Orange Show F	8	1	0.0	34.9	66	34.9	10	----	34.9	0.0	8	-8.0
R4 Waterman Avenue and Dumas Street S	10	1	0.0	22.4	66	22.4	10	----	22.4	0.0	8	-8.0
R5 Waterman Avenue and Washington St	12	1	0.0	44.7	66	44.7	10	----	44.7	0.0	8	-8.0
R6 Tippecanoe Avenue and Hospitality La	14	1	0.0	45.5	66	45.5	10	----	45.5	0.0	8	-8.0
R7 Anderson Avenue and Academy Drive	16	1	0.0	44.1	66	44.1	10	----	44.1	0.0	8	-8.0
R8 California Street and Redlands Bouleva	18	1	0.0	25.2	66	25.2	10	----	25.2	0.0	8	-8.0
R9 Alabama Street and I-10 West Ramps	20	1	0.0	38.0	66	38.0	10	----	38.0	0.0	8	-8.0
R10 Alabama Street and I-10 East Ramps	22	1	0.0	49.6	66	49.6	10	----	49.6	0.0	8	-8.0
R11 Texas Street and Stuart Avenue SW	24	1	0.0	23.4	66	23.4	10	----	23.4	0.0	8	-8.0
R12 Eureka Street and Pearl Avenue SE C	28	1	0.0	30.6	66	30.6	10	----	30.6	0.0	8	-8.0
R13 Eureka Street and Stuart Avenue NE	30	1	0.0	39.8	66	39.8	10	----	39.8	0.0	8	-8.0
R14 Orange Street and Colton Avenue SV	32	1	0.0	18.1	66	18.1	10	----	18.1	0.0	8	-8.0
R15 6th Street and I-10 West Ramps NE C	35	1	0.0	25.8	66	25.8	10	----	25.8	0.0	8	-8.0
R16 6th Street and Pearl Avenue SE Quad	37	1	0.0	35.5	66	35.5	10	----	35.5	0.0	8	-8.0
R17 Redlands Boulevard and Citrus Aven	39	1	0.0	21.6	66	21.6	10	----	21.6	0.0	8	-8.0
R18 Church Street and Stuart Avenue SW	42	1	0.0	39.1	66	39.1	10	----	39.1	0.0	8	-8.0
R19 University Street and I-10 West Ramp	44	1	0.0	16.6	66	16.6	10	----	16.6	0.0	8	-8.0
R20 University Street and I-10 East Ramp	46	1	0.0	11.0	66	11.0	10	----	11.0	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB

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RESULTS: SOUND LEVELS

<Project Name?>

All Selected	20	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

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16 August 2012
TNM 2.5

INPUT: ROADWAYS
PROJECT/CONTRACT: <Project Name?>
RUN: Rdlnds Pssngr Rail Project Only Yr 2038

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Roadway Name	Width	Points Name	No.	Coordinates (pavement) X	Y	Z	Flow Control Control Device	Speed Constraint	Percent Vehicles Affected	Segment Pvmt Type	On Struct?
	ft			ft	ft	ft		mph	%		
Sierra Way N of Mill Street	75.0	point1	1	100.0	1,000.0	100.00				Average	
		point5	5	100.0	2,000.0	100.00					
Sierra Way S of Mill Street	75.0	point3	3	100.0	100.0	100.00				Average	
		point6	6	100.0	1,000.0	100.00					
Mill Street W of Sierra Way	75.0	point7	7	-900.0	1,000.0	100.00				Average	
		point4	4	100.0	1,000.0	100.00					
Mill Street W of Sierra Way	75.0	point8	8	100.0	1,000.0	100.00				Average	
		point2	2	1,000.0	1,000.0	100.00					
Waterman Avenue N of 9th Street	75.0	point9	9	2,000.0	1,000.0	100.00				Average	
		point10	10	2,000.0	2,000.0	100.00					
Waterman Avenue S of 9th Street	75.0	point11	11	2,000.0	100.0	100.00				Average	
		point12	12	2,000.0	1,000.0	100.00					
9th Street W of Waterman Avenue	75.0	point13	13	1,000.0	1,000.0	100.00				Average	
		point14	14	2,000.0	1,000.0	100.00					
9th Street E of Waterman Avenue	75.0	point15	15	2,000.0	1,000.0	100.00				Average	
		point16	16	3,000.0	1,000.0	100.00					
Waterman Ave N of Orange Show Rd	75.0	point17	17	2,000.0	3,000.0	100.00				Average	
		point18	18	2,000.0	4,000.0	100.00					
Waterman Ave S of Orange Show Rd	75.0	point19	19	2,000.0	2,000.0	100.00				Average	
		point20	20	2,000.0	3,000.0	100.00					
Orange Show Rd W of Waterman Ave	75.0	point21	21	1,000.0	3,000.0	100.00				Average	
		point22	22	2,000.0	3,000.0	100.00					
Orange Show Rd E of Waterman Ave	75.0	point23	23	2,000.0	3,000.0	100.00				Average	
		point24	24	3,000.0	3,000.0	100.00					
Waterman Ave N of Dumas Street	75.0	point25	25	2,000.0	5,000.0	100.00				Average	

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		point26	26	2,000.0	6,000.0	100.00					
Waterman Ave S of Dumas Street	75.0	point27	27	2,000.0	4,000.0	100.00				Average	
		point28	28	2,000.0	5,000.0	100.00					
Dumas Street W of Waterman Avenue	30.0	point29	29	1,000.0	5,000.0	100.00				Average	
		point30	30	2,000.0	5,000.0	100.00					
Dumas Street E of Waterman Avenue	30.0	point31	31	2,000.0	5,000.0	100.00				Average	
		point32	32	3,000.0	5,000.0	100.00					
Waterman Ave N of Washington Street	80.0	point33	33	2,000.0	7,000.0	100.00				Average	
		point34	34	2,000.0	8,000.0	100.00					
Waterman Ave S of Washington Street	80.0	point35	35	2,000.0	6,000.0	100.00				Average	
		point36	36	2,000.0	7,000.0	100.00					
Washington Street W of Waterman Ave	100.0	point37	37	1,000.0	7,000.0	100.00				Average	
		point38	38	2,000.0	7,000.0	100.00					
Washington Street E of Waterman Ave	100.0	point39	39	2,000.0	7,000.0	100.00				Average	
		point40	40	3,000.0	7,000.0	100.00					
Tippecanoe Ave N of Hospitality Lane	100.0	point41	41	4,000.0	1,000.0	100.00				Average	
		point42	42	4,000.0	2,000.0	100.00					
Tippecanoe Ave S of Hospitality Lane	100.0	point43	43	4,000.0	100.0	100.00				Average	
		point44	44	4,000.0	1,000.0	100.00					
Hospitality Lane W of Tippecanoe Ave	80.0	point45	45	3,000.0	1,000.0	100.00				Average	
		point46	46	4,000.0	1,000.0	100.00					
Hospitality Lane E of Tippecanoe Ave	80.0	point47	47	4,000.0	1,000.0	100.00				Average	
		point48	48	5,000.0	1,000.0	100.00					
Anderson Avenue N of Academy Drive	80.0	point49	49	6,000.0	1,000.0	100.00				Average	
		point50	50	6,000.0	2,000.0	100.00					
Anderson Avenue S of Academy Drive	80.0	point51	51	6,000.0	100.0	100.00				Average	
		point52	52	6,000.0	1,000.0	100.00					
Academy Drive W of Anderson Avenue	80.0	point53	53	5,000.0	1,000.0	100.00				Average	
		point54	54	6,000.0	1,000.0	100.00					
Academy Drive E of Anderson Avenue	80.0	point55	55	6,000.0	1,000.0	100.00				Average	
		point56	56	7,000.0	1,000.0	100.00					
California Street N of Redlands Blvd	100.0	point57	57	8,000.0	1,000.0	100.00				Average	
		point58	58	8,000.0	2,000.0	100.00					
California Street S of Redlands Blvd	100.0	point59	59	8,000.0	100.0	100.00				Average	
		point60	60	8,000.0	1,000.0	100.00					
Redlands Blvd W of California Street	100.0	point61	61	7,000.0	1,000.0	100.00				Average	
		point62	62	8,000.0	1,000.0	100.00					
Redlands Blvd E of California Street	100.0	point63	63	8,000.0	1,000.0	100.00				Average	
		point64	64	9,000.0	1,000.0	100.00					

Alabama Street N of I-10 West Ramps	100.0	point65	65	10,000.0	1,000.0	100.00				Average	
		point66	66	10,000.0	2,000.0	100.00					
Alabama Street S of I-10 West Ramps	100.0	point67	67	10,000.0	100.0	100.00				Average	
		point68	68	10,000.0	1,000.0	100.00					
I-10 West Ramps W of Alabama Street	30.0	point69	69	9,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point70	70	10,000.0	1,000.0	100.00					
I-10 West Ramps E of Alabama Street	30.0	point71	71	10,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point72	72	11,000.0	1,000.0	100.00					
Alabama Street N of I-10 East Ramps	100.0	point73	73	10,000.0	3,000.0	100.00				Average	
		point74	74	10,000.0	4,000.0	100.00					
Alabama Street S of I-10 East Ramps	100.0	point75	75	10,000.0	2,000.0	100.00				Average	
		point76	76	10,000.0	3,000.0	100.00					
I-10 East Ramps W of Alabama Street	30.0	point77	77	9,000.0	3,000.0	100.00	Onramp	10.00	100	Average	
		point78	78	10,000.0	3,000.0	100.00					
I-10 East Ramps E of Alabama Street	30.0	point79	79	10,000.0	3,000.0	100.00	Onramp	10.00	100	Average	
		point80	80	11,000.0	3,000.0	100.00					
Texas Street N of Stuart Avenue	75.0	point81	81	12,000.0	1,000.0	100.00				Average	
		point82	82	12,000.0	2,000.0	100.00					
Texas Street S of Stuart Avenue	75.0	point83	83	12,000.0	100.0	100.00				Average	
		point84	84	12,000.0	1,000.0	100.00					
Stuart Avenue W of Texas Street	35.0	point85	85	11,000.0	1,000.0	100.00				Average	
		point86	86	12,000.0	1,000.0	100.00					
Stuart Avenue E of Texas Street	35.0	point87	87	12,000.0	1,000.0	100.00				Average	
		point88	88	13,000.0	1,000.0	100.00					
Eureka Street N of Pearl Avenue	75.0	point89	89	14,000.0	1,000.0	100.00				Average	
		point90	90	14,000.0	2,000.0	100.00					
Eureka Street S of Pearl Avenue	75.0	point91	91	14,000.0	100.0	100.00				Average	
		point92	92	14,000.0	1,000.0	100.00					
Pearl Avenue W of Eureka Street	50.0	point93	93	13,000.0	1,000.0	100.00				Average	
		point94	94	14,000.0	1,000.0	100.00					
Pearl Avenue E of Eureka Street	50.0	point95	95	14,000.0	1,000.0	100.00				Average	
		point96	96	15,000.0	1,000.0	100.00					
Eureka Street N of Stuart Avenue	75.0	point97	97	14,000.0	3,000.0	100.00				Average	
		point98	98	14,000.0	4,000.0	100.00					
Eureka Street S of Stuart Avenue	75.0	point99	99	14,000.0	2,000.0	100.00				Average	
		point100	100	14,000.0	3,000.0	100.00					
Stuart Avenue W of Eureka Street	35.0	point101	101	13,000.0	3,000.0	100.00				Average	
		point102	102	14,000.0	3,000.0	100.00					
Stuart Avenue E of Eureka Street	35.0	point103	103	14,000.0	3,000.0	100.00				Average	

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		point104	104	15,000.0	3,000.0	100.00					
Orange Street N of Colton Avenue	75.0	point105	105	16,000.0	1,000.0	100.00				Average	
		point106	106	16,000.0	2,000.0	100.00					
Orange Street S of Colton Avenue	75.0	point107	107	16,000.0	100.0	100.00				Average	
		point108	108	16,000.0	1,000.0	100.00					
Colton Avenue W of Orange Street	50.0	point109	109	15,000.0	1,000.0	100.00				Average	
		point110	110	16,000.0	1,000.0	100.00					
Colton Avenue E of Orange Street	50.0	point111	111	16,000.0	1,000.0	100.00				Average	
		point112	112	17,000.0	1,000.0	100.00					
6th Street N of I-10 West Ramps	50.0	point113	113	18,000.0	1,000.0	100.00				Average	
		point114	114	18,000.0	2,000.0	100.00					
6th Street S of I-10 West Ramps	50.0	point115	115	18,000.0	100.0	100.00				Average	
		point116	116	18,000.0	1,000.0	100.00					
I-10 West Ramps W of 6th Street	35.0	point117	117	17,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point118	118	18,000.0	1,000.0	100.00					
I-10 West Ramps E of 6th Street	35.0	point119	119	18,000.0	1,000.0	100.00	Onramp	10.00	100	Average	
		point120	120	19,000.0	1,000.0	100.00					
6th Street N of Pearl Avenue	50.0	point121	121	18,000.0	3,000.0	100.00				Average	
		point122	122	18,000.0	4,000.0	100.00					
6th Street S of Pearl Avenue	50.0	point123	123	18,000.0	2,000.0	100.00				Average	
		point124	124	18,000.0	3,000.0	100.00					
Pearl Avenue W of 6th Street	50.0	point125	125	17,000.0	3,000.0	100.00				Average	
		point126	126	18,000.0	3,000.0	100.00					
Pearl Avenue E of 6th Street	50.0	point127	127	18,000.0	3,000.0	100.00				Average	
		point128	128	19,000.0	3,000.0	100.00					
Redlands Boulevard N of Citrus Avenue	85.0	point129	129	20,000.0	1,000.0	100.00				Average	
		point130	130	20,000.0	2,000.0	100.00					
Redlands Boulevard S of Citrus Avenue	85.0	point131	131	20,000.0	100.0	100.00				Average	
		point132	132	20,000.0	1,000.0	100.00					
Citrus Avenue W of Redlands Boulevard	50.0	point133	133	19,000.0	1,000.0	100.00				Average	
		point134	134	20,000.0	1,000.0	100.00					
Citrus Avenue E of Redlands Boulevard	50.0	point135	135	20,000.0	1,000.0	100.00				Average	
		point136	136	21,000.0	1,000.0	100.00					
Church Street N of Stuart Avenue	40.0	point137	137	22,000.0	1,000.0	100.00				Average	
		point138	138	22,000.0	2,000.0	100.00					
Church Street S of Stuart Avenue	40.0	point139	139	22,000.0	100.0	100.00				Average	
		point140	140	22,000.0	1,000.0	100.00					
Stuart Avenue W of Church Street	40.0	point141	141	21,000.0	1,000.0	100.00				Average	
		point142	142	22,000.0	1,000.0	100.00					

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Stuart Avenue E of Church Street	40.0	point143	143	22,000.0	1,000.0	100.00					Average	
		point144	144	23,000.0	1,000.0	100.00						
University Street N of I-10 West Ramps	60.0	point145	145	24,000.0	1,000.0	100.00					Average	
		point146	146	24,000.0	2,000.0	100.00						
University Street S of I-10 West Ramps	60.0	point147	147	24,000.0	100.0	100.00					Average	
		point148	148	24,000.0	1,000.0	100.00						
I-10 West Ramps W of University Street	25.0	point149	149	23,000.0	1,000.0	100.00	Onramp	10.00	100		Average	
		point150	150	24,000.0	1,000.0	100.00						
I-10 West Ramps E of University Street	25.0	point152	152	24,000.0	1,000.0	100.00	Onramp	10.00	100		Average	
		point153	153	25,000.0	1,000.0	100.00						
University Street N of I-10 East Ramps	60.0	point154	154	26,000.0	1,000.0	100.00					Average	
		point155	155	26,000.0	2,000.0	100.00						
University Street S of I-10 East Ramps	60.0	point156	156	26,000.0	100.0	100.00					Average	
		point157	157	26,000.0	1,000.0	100.00						
I-10 East Ramps W of University Street	25.0	point158	158	25,000.0	1,000.0	100.00	Onramp	10.00	100		Average	
		point159	159	26,000.0	1,000.0	100.00						
I-10 East Ramps E of University Street	25.0	point160	160	26,000.0	1,000.0	100.00	Onramp	10.00	100		Average	
		point161	161	27,000.0	1,000.0	100.00						

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INPUT: TRAFFIC FOR LAeq1h Percentages

PROJECT/CONTRACT: <Project Name?>

RUN: Rdlnds Pssngr Rail Project Only Yr 2038

Roadway Name	Points Name	No.	Segment Total Volume veh/hr	Autos P %	Autos S mph	MTrucks P %	MTrucks S mph	HTrucks P %	HTrucks S mph	Buses P %	Buses S mph	Motorcycles P %	Motorcycles S mph
Sierra Way N of Mill Street	point1	1	0	98	35	1	35	1	35	0	0	0	0
	point5	5											
Sierra Way S of Mill Street	point3	3	0	98	35	1	35	1	35	0	0	0	0
	point6	6											
Mill Street W of Sierra Way	point7	7	0	98	35	1	35	1	35	0	0	0	0
	point4	4											
Mill Street W of Sierra Way	point8	8	0	98	35	1	35	1	35	0	0	0	0
	point2	2											
Waterman Avenue N of 9th Street	point9	9	0	98	30	1	30	1	30	0	0	0	0
	point10	10											
Waterman Avenue S of 9th Street	point11	11	0	98	30	1	30	1	30	0	0	0	0
	point12	12											
9th Street W of Waterman Avenue	point13	13	0	98	35	1	35	1	35	0	0	0	0
	point14	14											
9th Street E of Waterman Avenue	point15	15	0	98	35	1	35	1	35	0	0	0	0
	point16	16											
Waterman Ave N of Orange Show Rd	point17	17	0	98	30	1	30	1	30	0	0	0	0
	point18	18											
Waterman Ave S of Orange Show Rd	point19	19	0	98	30	1	30	1	30	0	0	0	0
	point20	20											
Orange Show Rd W of Waterman Ave	point21	21	0	98	35	1	35	1	35	0	0	0	0
	point22	22											
Orange Show Rd E of Waterman Ave	point23	23	0	98	35	1	35	1	35	0	0	0	0

	point24	24											
Waterman Ave N of Dumas Street	point25	25	0	98	30	1	30	1	30	0	0	0	0
	point26	26											
Waterman Ave S of Dumas Street	point27	27	0	98	30	1	30	1	30	0	0	0	0
	point28	28											
Dumas Street W of Waterman Avenue	point29	29	0	98	25	1	25	1	25	0	0	0	0
	point30	30											
Dumas Street E of Waterman Avenue	point31	31	0	98	25	1	25	1	25	0	0	0	0
	point32	32											
Waterman Ave N of Washington Street	point33	33	9	98	30	1	30	1	30	0	0	0	0
	point34	34											
Waterman Ave S of Washington Street	point35	35	10	98	30	1	30	1	30	0	0	0	0
	point36	36											
Washington Street W of Waterman Ave	point37	37	12	98	45	1	45	1	45	0	0	0	0
	point38	38											
Washington Street E of Waterman Ave	point39	39	15	98	45	1	45	1	45	0	0	0	0
	point40	40											
Tippecanoe Ave N of Hospitality Lane	point41	41	0	98	35	1	35	1	35	0	0	0	0
	point42	42											
Tippecanoe Ave S of Hospitality Lane	point43	43	0	98	35	1	35	1	35	0	0	0	0
	point44	44											
Hospitality Lane W of Tippecanoe Ave	point45	45	0	98	35	1	35	1	35	0	0	0	0
	point46	46											
Hospitality Lane E of Tippecanoe Ave	point47	47	0	98	35	1	35	1	35	0	0	0	0
	point48	48											
Anderson Avenue N of Academy Drive	point49	49	39	98	35	1	35	1	35	0	0	0	0
	point50	50											
Anderson Avenue S of Academy Drive	point51	51	32	98	35	1	35	1	35	0	0	0	0
	point52	52											
Academy Drive W of Anderson Avenue	point53	53	22	98	35	1	35	1	35	0	0	0	0
	point54	54											
Academy Drive E of Anderson Avenue	point55	55	21	98	35	1	35	1	35	0	0	0	0
	point56	56											
California Street N of Redlands Blvd	point57	57	0	98	35	1	35	1	35	0	0	0	0
	point58	58											
California Street S of Redlands Blvd	point59	59	0	98	35	1	35	1	35	0	0	0	0

INPUT: TRAFFIC FOR LAeq1h Percentages **<Project Name?>**

	point60	60											
Redlands Blvd W of California Street	point61	61	0	98	35	1	35	1	35	0	0	0	0
	point62	62											
Redlands Blvd E of California Street	point63	63	0	98	35	1	35	1	35	0	0	0	0
	point64	64											
Alabama Street N of I-10 West Ramps	point65	65	6	98	40	1	40	1	40	0	0	0	0
	point66	66											
Alabama Street S of I-10 West Ramps	point67	67	8	98	40	1	40	1	40	0	0	0	0
	point68	68											
I-10 West Ramps W of Alabama Street	point69	69	3	98	65	1	65	1	65	0	0	0	0
	point70	70											
I-10 West Ramps E of Alabama Street	point71	71	5	98	65	1	65	1	65	0	0	0	0
	point72	72											
Alabama Street N of I-10 East Ramps	point73	73	7	98	40	1	40	1	40	0	0	0	0
	point74	74											
Alabama Street S of I-10 East Ramps	point75	75	4	98	40	1	40	1	40	0	0	0	0
	point76	76											
I-10 East Ramps W of Alabama Street	point77	77	3	98	65	1	65	1	65	0	0	0	0
	point78	78											
I-10 East Ramps E of Alabama Street	point79	79	1	98	65	1	65	1	65	0	0	0	0
	point80	80											
Texas Street N of Stuart Avenue	point81	81	0	98	35	1	35	1	35	0	0	0	0
	point82	82											
Texas Street S of Stuart Avenue	point83	83	0	98	35	1	35	1	35	0	0	0	0
	point84	84											
Stuart Avenue W of Texas Street	point85	85	0	98	25	1	25	1	25	0	0	0	0
	point86	86											
Stuart Avenue E of Texas Street	point87	87	0	98	25	1	25	1	25	0	0	0	0
	point88	88											
Eureka Street N of Pearl Avenue	point89	89	7	98	25	1	25	1	25	0	0	0	0
	point90	90											
Eureka Street S of Pearl Avenue	point91	91	8	98	25	1	25	1	25	0	0	0	0
	point92	92											
Pearl Avenue W of Eureka Street	point93	93	5	98	30	1	30	1	30	0	0	0	0
	point94	94											
Pearl Avenue E of Eureka Street	point95	95	6	98	30	1	30	1	30	0	0	0	0

	point96	96											
Eureka Street N of Stuart Avenue	point97	97	27	98	25	1	25	1	25	0	0	0	0
	point98	98											
Eureka Street S of Stuart Avenue	point99	99	29	98	25	1	25	1	25	0	0	0	0
	point100	100											
Stuart Avenue W of Eureka Street	point101	101	19	98	25	1	25	1	25	0	0	0	0
	point102	102											
Stuart Avenue E of Eureka Street	point103	103	19	98	25	1	25	1	25	0	0	0	0
	point104	104											
Orange Street N of Colton Avenue	point105	105	3	98	25	1	25	1	25	0	0	0	0
	point106	106											
Orange Street S of Colton Avenue	point107	107	3	98	25	1	25	1	25	0	0	0	0
	point108	108											
Colton Avenue W of Orange Street	point109	109	2	98	30	1	30	1	30	0	0	0	0
	point110	110											
Colton Avenue E of Orange Street	point111	111	2	98	30	1	30	1	30	0	0	0	0
	point112	112											
6th Street N of I-10 West Ramps	point113	113	0	98	25	1	25	1	25	0	0	0	0
	point114	114											
6th Street S of I-10 West Ramps	point115	115	0	98	25	1	25	1	25	0	0	0	0
	point116	116											
I-10 West Ramps W of 6th Street	point117	117	0	98	65	1	65	1	65	0	0	0	0
	point118	118											
I-10 West Ramps E of 6th Street	point119	119	0	98	65	1	65	1	65	0	0	0	0
	point120	120											
6th Street N of Pearl Avenue	point121	121	0	98	25	1	25	1	25	0	0	0	0
	point122	122											
6th Street S of Pearl Avenue	point123	123	0	98	25	1	25	1	25	0	0	0	0
	point124	124											
Pearl Avenue W of 6th Street	point125	125	0	98	30	1	30	1	30	0	0	0	0
	point126	126											
Pearl Avenue E of 6th Street	point127	127	0	98	30	1	30	1	30	0	0	0	0
	point128	128											
Redlands Boulevard N of Citrus Avenue	point129	129	0	98	35	1	35	1	35	0	0	0	0
	point130	130											
Redlands Boulevard S of Citrus Avenue	point131	131	0	98	35	1	35	1	35	0	0	0	0

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	point132	132											
Citrus Avenue W of Redlands Boulevard	point133	133	0	98	30	1	30	1	30	0	0	0	0
	point134	134											
Citrus Avenue E of Redlands Boulevard	point135	135	0	98	30	1	30	1	30	0	0	0	0
	point136	136											
Church Street N of Stuart Avenue	point137	137	0	98	35	1	35	1	35	0	0	0	0
	point138	138											
Church Street S of Stuart Avenue	point139	139	0	98	35	1	35	1	35	0	0	0	0
	point140	140											
Stuart Avenue W of Church Street	point141	141	0	98	25	1	25	1	25	0	0	0	0
	point142	142											
Stuart Avenue E of Church Street	point143	143	0	98	25	1	25	1	25	0	0	0	0
	point144	144											
University Street N of I-10 West Ramps	point145	145	0	98	35	1	35	1	35	0	0	0	0
	point146	146											
University Street S of I-10 West Ramps	point147	147	0	98	35	1	35	1	35	0	0	0	0
	point148	148											
I-10 West Ramps W of University Street	point149	149	0	98	65	1	65	1	65	0	0	0	0
	point150	150											
I-10 West Ramps E of University Street	point152	152	0	98	65	1	65	1	65	0	0	0	0
	point153	153											
University Street N of I-10 East Ramps	point154	154	0	98	35	1	35	1	35	0	0	0	0
	point155	155											
University Street S of I-10 East Ramps	point156	156	0	98	35	1	35	1	35	0	0	0	0
	point157	157											
I-10 East Ramps W of University Street	point158	158	0	98	65	1	65	1	65	0	0	0	0
	point159	159											
I-10 East Ramps E of University Street	point160	160	0	98	65	1	65	1	65	0	0	0	0
	point161	161											

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16 August 2012
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INPUT: RECEIVERS
PROJECT/CONTRACT: <Project Name?>
RUN: Rdlnds Pssngr Rail Project Only Yr 2038

Receiver												
Name	No.	#DUs	Coordinates (ground)			Height above Ground	Input Sound Levels and Criteria				Active in Calc.
			X	Y	Z		Existing LAeq1h	Impact Criteria LAeq1h	Sub'l	NR Goal	
			ft	ft	ft	ft	dBA	dBA	dB	dB	
R1 Sierra Way and Mill Street NW Quad	4	1	-337.7	1,103.4	100.00	5.00	0.00	66	10.0	8.0	Y
R2 Waterman Avenue and 9th Street NW	6	1	1,693.0	1,099.6	100.00	5.00	0.00	66	10.0	8.0	Y
R3 Waterman Avenue and Orange Show	8	1	1,700.3	3,098.6	100.00	5.00	0.00	66	10.0	8.0	Y
R4 Waterman Avenue and Dumas Street	10	1	1,748.1	4,903.9	100.00	5.00	0.00	66	10.0	8.0	Y
R5 Waterman Avenue and Washington S	12	1	1,897.3	7,156.0	100.00	5.00	0.00	66	10.0	8.0	Y
R6 Tippecanoe Avenue and Hospitality L	14	1	4,105.6	849.0	100.00	5.00	0.00	66	10.0	8.0	Y
R7 Anderson Avenue and Academy Drive	16	1	6,148.4	1,096.0	100.00	5.00	0.00	66	10.0	8.0	Y
R8 California Street and Redlands Boule	18	1	7,750.2	1,154.3	100.00	5.00	0.00	66	10.0	8.0	Y
R9 Alabama Street and I-10 West Ramps	20	1	10,451.9	1,156.6	100.00	5.00	0.00	66	10.0	8.0	Y
R10 Alabama Street and I-10 East Ramp	22	1	9,848.9	2,897.5	100.00	5.00	0.00	66	10.0	8.0	Y
R11 Texas Street and Stuart Avenue SW	24	1	11,792.3	895.8	100.00	5.00	0.00	66	10.0	8.0	Y
R12 Eureka Street and Pearl Avenue SE	28	1	14,201.0	803.2	100.00	5.00	0.00	66	10.0	8.0	Y
R13 Eureka Street and Stuart Avenue NE	30	1	14,199.8	3,100.8	100.00	5.00	0.00	66	10.0	8.0	Y
R14 Orange Street and Colton Avenue S	32	1	15,694.4	898.7	100.00	5.00	0.00	66	10.0	8.0	Y
R15 6th Street and I-10 West Ramps NE	35	1	18,150.1	1,250.5	100.00	5.00	0.00	66	10.0	8.0	Y
R16 6th Street and Pearl Avenue SE Qua	37	1	18,100.0	2,900.0	100.00	5.00	0.00	66	10.0	8.0	Y
R17 Redlands Boulevard and Citrus Aver	39	1	20,203.6	1,149.4	100.00	5.00	0.00	66	10.0	8.0	Y
R18 Church Street and Stuart Avenue SV	42	1	21,598.4	899.6	100.00	5.00	0.00	66	10.0	8.0	Y
R19 University Street and I-10 West Ram	44	1	24,104.1	1,099.2	100.00	5.00	0.00	66	10.0	8.0	Y
R20 University Street and I-10 East Ram	46	1	26,101.0	895.4	100.00	5.00	0.00	66	10.0	8.0	Y

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16 August 2012
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: <Project Name?>
RUN: Rdlnds Pssngr Rail Project Only Yr 2038
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R1 Sierra Way and Mill Street NW Quad	4	1	0.0	11.4	66	11.4	10	----	11.4	0.0	8	-8.0
R2 Waterman Avenue and 9th Street NW	6	1	0.0	15.7	66	15.7	10	----	15.7	0.0	8	-8.0
R3 Waterman Avenue and Orange Show	8	1	0.0	14.6	66	14.6	10	----	14.6	0.0	8	-8.0
R4 Waterman Avenue and Dumas Street	10	1	0.0	19.9	66	19.9	10	----	19.9	0.0	8	-8.0
R5 Waterman Avenue and Washington St	12	1	0.0	43.8	66	43.8	10	----	43.8	0.0	8	-8.0
R6 Tippecanoe Avenue and Hospitality La	14	1	0.0	25.5	66	25.5	10	----	25.5	0.0	8	-8.0
R7 Anderson Avenue and Academy Drive	16	1	0.0	47.3	66	47.3	10	----	47.3	0.0	8	-8.0
R8 California Street and Redlands Bouleva	18	1	0.0	27.0	66	27.0	10	----	27.0	0.0	8	-8.0
R9 Alabama Street and I-10 West Ramps	20	1	0.0	38.5	66	38.5	10	----	38.5	0.0	8	-8.0
R10 Alabama Street and I-10 East Ramps	22	1	0.0	41.9	66	41.9	10	----	41.9	0.0	8	-8.0
R11 Texas Street and Stuart Avenue SW	24	1	0.0	23.9	66	23.9	10	----	23.9	0.0	8	-8.0
R12 Eureka Street and Pearl Avenue SE	28	1	0.0	35.8	66	35.8	10	----	35.8	0.0	8	-8.0
R13 Eureka Street and Stuart Avenue NE	30	1	0.0	42.1	66	42.1	10	----	42.1	0.0	8	-8.0
R14 Orange Street and Colton Avenue SV	32	1	0.0	33.1	66	33.1	10	----	33.1	0.0	8	-8.0
R15 6th Street and I-10 West Ramps NE	35	1	0.0	14.2	66	14.2	10	----	14.2	0.0	8	-8.0
R16 6th Street and Pearl Avenue SE Quad	37	1	0.0	12.9	66	12.9	10	----	12.9	0.0	8	-8.0
R17 Redlands Boulevard and Citrus Aven	39	1	0.0	9.6	66	9.6	10	----	9.6	0.0	8	-8.0
R18 Church Street and Stuart Avenue SW	42	1	0.0	7.8	66	7.8	10	----	7.8	0.0	8	-8.0
R19 University Street and I-10 West Ramp	44	1	0.0	5.6	66	5.6	10	----	5.6	0.0	8	-8.0
R20 University Street and I-10 East Ramp	46	1	0.0	4.2	66	4.2	10	----	4.2	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB

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RESULTS: SOUND LEVELS

<Project Name?>

All Selected	20	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Appendix F

Rail Station Parking Lot Noise Analysis

Input and Output

Screening Level Assessment, Stations

Ref: Page 4-2, FTA Transit Noise and Vibration Impact Assessment manual and FTA Spreadsheet model.

Per current project information:	24	trains each way
	21	during daytime hours (7 am - 10 pm)
	3	during nighttime hours (10 am - 7 pm)

Assuming that each train trip generates approximately the same number of vehicle trips to and from the station:

Thus number of autos per hour daytime = 87.5% %

Thus number of autos per hour nighttime = 12.5% %

Per current project information for the stations:

Station Name	Number of Parking Spaces[1]	Notes	Other	Number of Autos per hour daytime	Number of Autos per hour nighttime	Number of Busses per hour daytime	Number of Busses per hour nighttime	FTA Screening Distance [2]	Sensitive Land Uses in Vicinity ?
E Street	265	may be reduced to 45	Need to add the RPRP / Omnitrans trips	304	46	56	10	325	No
Tippecanoe Street	82	(up to)		72	10	0	0	60	No
New York Street	60	(up to)		53	8	0	0	55	No
Downtown Redlands	200	(up to)		175	25	0	0	80	No
University	42	(up to)		37	5	0	0	50	No

1. Parking space quantities are from Table 5.7 of the Draft Technical Memorandum Redlands Passenger Rail Project Model Application and Ridership Forecasts. The highest peak hour (AM or PM peak hour) value was used.

2. Per Page 4-2 of FTA Manual, the FTA spreadsheet model (see attached) was used to arrive at the adjusted screening distances, using the inputs for numbers of autos above.

Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: Screening Dist's for E Street Station

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	50	49	42
Source 1	50	49	42
Source 2	0	0	0
Source 3	0	0	0
Source 4	0	0	0
Source 5	0	0	0
Source 6	0	0	0
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS						
Parameter	**Source 1**		**Source 2**		**Source 3**	
Source Num.	Park & Ride Lot	23				
Distance (source to receiver)	distance (ft)	325				
Daytime Hours (7 AM - 10 PM)	autos/hour buses/hour	304 56 1				
Nighttime Hours (10 PM - 7 AM)	autos/hour buses/hour	46 10 1				
Wheel Flats?		0.00%				
Jointed Track?		N				
Embedded Track?		N				
Aerial Structure?		N				
Barrier Present?	Y/N	N				
Intervening Rows of of Buildings	number of rows	0				

SOURCE REFERENCE LIST	
Source	**Number**
Commuter Electric Locomotive	1
Commuter Diesel Locomotive	2
Commuter Rail Cars	3
RRT/LRT	4
AGT, Steel Wheel	5
AGT, Rubber Tire	6
Monorail	7
Maglev	8
Freight Locomotive	9
Freight Cars	10
Hopper Cars (empty)	11
Hopper Cars (full)	12
Crossover	13
Automobiles	14
City Buses	15
Commuter Buses	16
Rail Yard or Shop	17
Layover Tracks	18
Bus Storage Yard	19
Bus Op. Facility	20
Bus Transit Center	21
Parking Garage	22
Park & Ride Lot	23

Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: Screening Dist's for Tippecanoe Street Station

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	50	49	41
Source 1	50	49	41
Source 2	0	0	0
Source 3	0	0	0
Source 4	0	0	0
Source 5	0	0	0
Source 6	0	0	0
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS						
Parameter	**Source 1**		**Source 2**		**Source 3**	
Source Num.	Park & Ride Lot	23				
Distance (source to receiver)	distance (ft)	60				
Daytime Hours (7 AM - 10 PM)	autos/hour buses/hour	72 0 0				
Nighttime Hours (10 PM - 7 AM)	autos/hour buses/hour	10 0 0				
Wheel Flats?		0.00%				
Jointed Track?		N				
Embedded Track?		N				
Aerial Structure?		N				
Barrier Present?	Y/N	N				
Intervening Rows of of Buildings	number of rows	0				

SOURCE REFERENCE LIST	
Source	**Number**
Commuter Electric Locomotive	1
Commuter Diesel Locomotive	2
Commuter Rail Cars	3
RRT/LRT	4
AGT, Steel Wheel	5
AGT, Rubber Tire	6
Monorail	7
Maglev	8
Freight Locomotive	9
Freight Cars	10
Hopper Cars (empty)	11
Hopper Cars (full)	12
Crossover	13
Automobiles	14
City Buses	15
Commuter Buses	16
Rail Yard or Shop	17
Layover Tracks	18
Bus Storage Yard	19
Bus Op. Facility	20
Bus Transit Center	21
Parking Garage	22
Park & Ride Lot	23

Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: Screening Dist's for New York Street Station

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	50	49	41
Source 1	50	49	41
Source 2	0	0	0
Source 3	0	0	0
Source 4	0	0	0
Source 5	0	0	0
Source 6	0	0	0
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS						
Parameter	**Source 1**		**Source 2**		**Source 3**	
Source Num.	Park & Ride Lot	23				
Distance (source to receiver)	distance (ft)	55				
Daytime Hours **(7 AM - 10 PM)**	autos/hour buses/hour	53 0 0				
Nighttime Hours **(10 PM - 7 AM)**	autos/hour buses/hour	8 0 0				
Wheel Flats?		0.00%				
Jointed Track?		N				
Embedded Track?		N				
Aerial Structure?		N				
Barrier Present?	Y/N	N				
Intervening Rows of of Buildings	number of rows	0				

SOURCE REFERENCE LIST	
Source	**Number**
Commuter Electric Locomotive	1
Commuter Diesel Locomotive	2
Commuter Rail Cars	3
RRT/LRT	4
AGT, Steel Wheel	5
AGT, Rubber Tire	6
Monorail	7
Maglev	8
Freight Locomotive	9
Freight Cars	10
Hopper Cars (empty)	11
Hopper Cars (full)	12
Crossover	13
Automobiles	14
City Buses	15
Commuter Buses	16
Rail Yard or Shop	17
Layover Tracks	18
Bus Storage Yard	19
Bus Op. Facility	20
Bus Transit Center	21
Parking Garage	22
Park & Ride Lot	23

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Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: Screening Dist's for Downtown Redlands Station

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	50	50	41
Source 1	50	50	41
Source 2	0	0	0
Source 3	0	0	0
Source 4	0	0	0
Source 5	0	0	0
Source 6	0	0	0
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS						
Parameter	**Source 1**		**Source 2**		**Source 3**	
Source Num.	Park & Ride Lot	23				
Distance (source to receiver)	distance (ft)	80				
Daytime Hours (7 AM - 10 PM)	autos/hour buses/hour	175 0 0				
Nighttime Hours (10 PM - 7 AM)	autos/hour buses/hour	25 0 0				
Wheel Flats?		0.00%				
Jointed Track?		N				
Embedded Track?		N				
Aerial Structure?		N				
Barrier Present?	Y/N	N				
Intervening Rows of of Buildings	number of rows	0				

SOURCE REFERENCE LIST	
Source	**Number**
Commuter Electric Locomotive	1
Commuter Diesel Locomotive	2
Commuter Rail Cars	3
RRT/LRT	4
AGT, Steel Wheel	5
AGT, Rubber Tire	6
Monorail	7
Maglev	8
Freight Locomotive	9
Freight Cars	10
Hopper Cars (empty)	11
Hopper Cars (full)	12
Crossover	13
Automobiles	14
City Buses	15
Commuter Buses	16
Rail Yard or Shop	17
Layover Tracks	18
Bus Storage Yard	19
Bus Op. Facility	20
Bus Transit Center	21
Parking Garage	22
Park & Ride Lot	23

Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: Screening Dist's for University Station

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	49	48	40
Source 1	49	48	40
Source 2	0	0	0
Source 3	0	0	0
Source 4	0	0	0
Source 5	0	0	0
Source 6	0	0	0
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS						
Parameter	**Source 1**		**Source 2**		**Source 3**	
Source Num.	Park & Ride Lot	23				
Distance (source to receiver)	distance (ft)	50				
Daytime Hours (7 AM - 10 PM)	autos/hour buses/hour	37 0 0				
Nighttime Hours (10 PM - 7 AM)	autos/hour buses/hour	5 0 0				
Wheel Flats?		0.00%				
Jointed Track?		N				
Embedded Track?		N				
Aerial Structure?		N				
Barrier Present?	Y/N	N				
Intervening Rows of of Buildings	number of rows	0				

SOURCE REFERENCE LIST	
Source	**Number**
Commuter Electric Locomotive	1
Commuter Diesel Locomotive	2
Commuter Rail Cars	3
RRT/LRT	4
AGT, Steel Wheel	5
AGT, Rubber Tire	6
Monorail	7
Maglev	8
Freight Locomotive	9
Freight Cars	10
Hopper Cars (empty)	11
Hopper Cars (full)	12
Crossover	13
Automobiles	14
City Buses	15
Commuter Buses	16
Rail Yard or Shop	17
Layover Tracks	18
Bus Storage Yard	19
Bus Op. Facility	20
Bus Transit Center	21
Parking Garage	22
Park & Ride Lot	23

Appendix G

Layover Facility Noise Analysis

Input and Output

Noise Model Based on Federal Transit Adminstration General Transit Noise Assessment
Developed for Chicago Create Project

Case: Screening Dist's for Layover Facility

RESULTS			
Noise Source	**Ldn (dB)**	**Leq - daytime (dB)**	**Leq - nighttime (dB)**
All Sources	50	44	44
Source 1	50	44	44
Source 2	0	0	0
Source 3	0	0	0
Source 4	0	0	0
Source 5	0	0	0
Source 6	0	0	0
Source 7	0	0	0
Source 8	0	0	0

Enter noise receiver land use category below.

LAND USE CATEGORY	
Noise receiver land use category (1, 2 or 3)	2

Enter data for up to 8 noise sources below - see reference list for source numbers.

NOISE SOURCE PARAMETERS						
Parameter	**Source 1**		**Source 2**		**Source 3**	
Source Num.	Rail Yard or Shop	17				
Distance (source to receiver)	distance (ft)	85				
Daytime Hours (7 AM - 10 PM)	trains/hour	0				
Nighttime Hours (10 PM - 7 AM)	trains/hour	0.333				
Wheel Flats?		0.00%				
Jointed Track?		N				
Embedded Track?		N				
Aerial Structure?		N				
Barrier Present?	Y/N	N				
Intervening Rows of of Buildings	number of rows	0				

SOURCE REFERENCE LIST	
Source	**Number**
Commuter Electric Locomotive	1
Commuter Diesel Locomotive	2
Commuter Rail Cars	3
RRT/LRT	4
AGT, Steel Wheel	5
AGT, Rubber Tire	6
Monorail	7
Maglev	8
Freight Locomotive	9
Freight Cars	10
Hopper Cars (empty)	11
Hopper Cars (full)	12
Crossover	13
Automobiles	14
City Buses	15
Commuter Buses	16
Rail Yard or Shop	17
Layover Tracks	18
Bus Storage Yard	19
Bus Op. Facility	20
Bus Transit Center	21
Parking Garage	22
Park & Ride Lot	23

Appendix H

Operational Vibration Analysis

Input and Output

TABLE H-1

Ground-borne Noise and Vibration Analysis - Operational

Potentially Impacted [1] Receiver #	Receiver Location Description	Land Use Description	Number of Vibration-Sensitive Sites Represented	Distance to BNSF Track Centerline (Feet)	RMS Velocity Level VdB re 1 micro in/sec [2]	Adjustments [3]												Resultant Ground-borne Vibration Levels	FTA Ground-borne Vibration Criteria [4]	Impact ?	Recommended Abatement Measures	Estimated Level of Reduction	Ground-borne Vibration Levels after Abatement	Abated to below Impact Level ?	Resultant Ground-borne Noise	FTA Ground-borne Noise Criteria [4]	Impact ?
						Source Factors				Factors Affecting Vibration Path				Factors Affecting Vibration Receiver		Net Total Adjustments	Conver-sion to Ground-borne Noise										
						Speed	Vehicle Parameters	Track Conditions	Track Treatments	Resiliently Supported Ties	Track Configuration	Geologic Conditions that Promote Efficient Vibration Propagation	Coupling to Building Foundations	Floor-to-Floor Attenuation	Amplification Due to Reso-nances of Floors, Walls, and Ceilings												
1	Commercial/ Transient Residential use e of N. E St. and n of alignment	Transient Residential / Commercial (Motel)	1	200	71	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	67	75	No Impact	n/a	n/a	n/a	n/a	17	38	No Impact
2	200' to 400' s of alignment, w of Pershing Ave	Residential	2	200	71	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	67	75	No Impact	n/a	n/a	n/a	n/a	17	38	No Impact
3	50' to 100' e of alignment, e of Dorothy St	Residential	3	75	80	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	76	75	**Impact**	Resiliently Supported Ties or Ballast Mats	-10	66	No Residual Impact	26	38	No Impact
4	100 to 200' e of alignment, e of Dorothy St	Residential	3	150	74	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	70	75	No Impact	n/a	n/a	n/a	n/a	20	38	No Impact
8	50' to 100' e of alignment, e of Dorothy St	Residential	5	75	80	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	76	75	**Impact**	Resiliently Supported Ties or Ballast Mats	-10	66	No Residual Impact	26	38	No Impact
9	100 to 200' e of alignment, e of Dorothy St	Residential	1	150	74	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	70	75	No Impact	n/a	n/a	n/a	n/a	20	38	No Impact
13	100 to 200' e of alignment, e of Lincoln Ave	Residential	6	100	78	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	74	75	No Impact	n/a	n/a	n/a	n/a	24	38	No Impact
14	50' to 100' w of alignment, e of S Washington Ave	Residential	1	75	80	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	76	75	**Impact**	Resiliently Supported Ties or Ballast Mats	-10	66	No Residual Impact	26	38	No Impact
15	100' to 200' w of alignment, e of S Washington Ave	Residential	2	125	76	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	72	75	No Impact	n/a	n/a	n/a	n/a	22	38	No Impact
17	200' to 400' w of alignment, e of S Washington Ave	Residential	2	200	71	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	67	75	No Impact	n/a	n/a	n/a	n/a	17	38	No Impact
18	100' to 200' e of alignment, s of Ennis St	Residential	1	150	74	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	70	75	No Impact	n/a	n/a	n/a	n/a	20	38	No Impact
19	200' to 400' e of alignment, e of Lincoln Ave	Residential	2	200	71	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	67	75	No Impact	n/a	n/a	n/a	n/a	17	38	No Impact

TABLE H-1, COT'D

22	50' to 100' sw of alignment, n of Dumas St	Residential	1	50	84	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	80	75	**Impact**	Resiliently Supported Ties or Ballast Mats	-10	70	No Residual Impact	30	38	No Impact
23	100' to 200' sw of alignment, n of Dumas St	Residential	2	140	75	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	71	75	No Impact	n/a	n/a	n/a	n/a	21	38	No Impact
25	100' to 200' s of alignment, e of Tippecanoe Ave	Residential	3	140	75	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	71	75	No Impact	n/a	n/a	n/a	n/a	21	38	No Impact
27	100' to 200' s of alignment, e of Tippecanoe Ave	Residential	8	175	73	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	69	75	No Impact	n/a	n/a	n/a	n/a	19	38	No Impact
28	100' to 200' s of alignment, w of S Richardson St	Residential	18	175	73	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	69	75	No Impact	n/a	n/a	n/a	n/a	19	38	No Impact
30	100' to 200' s of alignment, e of S Richardson St	Recreation (School Athletic Fields) and School	1	175	73	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	69	78	No Impact	n/a	n/a	n/a	n/a	19	43	No Impact
31	100' to 200' n of alignment, e of S Richardson St	Residential	6	100	78	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	74	75	No Impact	n/a	n/a	n/a	n/a	24	38	No Impact
33	100' to 200' n of alignment, s of Victoria Ave	Residential	8	150	74	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	70	75	No Impact	n/a	n/a	n/a	n/a	20	38	No Impact
34	100' to 200' n of alignment, s of Victoria Ave	Residential	4	150	74	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	70	75	No Impact	n/a	n/a	n/a	n/a	20	38	No Impact
35	100' to 200' s of alignment, n of E Gould St	Residential	8	175	73	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	69	75	No Impact	n/a	n/a	n/a	n/a	19	38	No Impact
36	100' to 200' s of alignment, n of E Gould St	Residential	10	150	74	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	70	75	No Impact	n/a	n/a	n/a	n/a	20	38	No Impact
39	100' to 200' n of alignment, s of Victoria Ave	Residential	3	125	76	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	72	75	No Impact	n/a	n/a	n/a	n/a	22	38	No Impact
41	50' to 100' n of alignment, e of Mountain View Ave	Residential	6	50	84	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	80	75	Impact	n/a	n/a	n/a	n/a	30	38	No Impact
42	100' to 200' s of alignment, e of Bryn Mawr Ave	Residential	8	150	74	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	70	75	No Impact	n/a	n/a	n/a	n/a	20	38	No Impact
43	50' to 100' n of alignment, e of Nevada St	Transient Residential / Commercial (Motel)	1	75	80	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	76	75	**Impact**	Resiliently Supported Ties or Ballast Mats	-10	66	No Residual Impact	26	38	No Impact
44	100' to 200' s of alignment, s of Redlands Blvd	Residential	6	150	74	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	70	75	No Impact	n/a	n/a	n/a	n/a	20	38	No Impact

TABLE H-1, CONT'D

46	0' to 100' n of alignment, w of Tennessee St	Transient Residential / Commercial (Motel)	1	75	80	-3	0	0	0	0	0	0	-5	-2	6	-4.1	-50	76	75	**Impact**	Resiliently Supported Ties or Ballast Mats	-10	66	No Residual Impact	26	38	No Impact
47	100' to 200' n of alignment, w of New York St	Residential	1	175	73	-8	0	0	0	0	0	0	-5	-2	6	-9.0	-50	64	75	No Impact	n/a	n/a	n/a	n/a	14	38	No Impact
48	200' to 400' s of alignment, s of Redlands Blvd	Recreation (Park)	1	200	71	-8	0	0	0	0	0	0	-5	-2	6	-9.0	-50	62	78	No Impact	n/a	n/a	n/a	n/a	12	43	No Impact
54	50' to 100' n of alignment, w of 9th St	Residential	3	75	80	-5	0	0	0	0	0	0	-5	-2	6	-6.0	-50	74	75	No Impact	n/a	n/a	n/a	n/a	24	38	No Impact
55	50' to 100' n of alignment, w of 9th St	Church	1	80	81	-5	0	0	0	0	0	0	-5	-2	6	-6.0	-50	75	78	No Impact	n/a	n/a	n/a	n/a	25	43	No Impact
61	50' to 100' n of alignment, e of Church St	Residential	6	50	84	-5	0	0	0	0	0	0	-5	-2	6	-6.0	-50	78	75	**Impact**	Resiliently Supported Ties or Ballast Mats	-10	68	No Residual Impact	28	38	No Impact
63	50' to 100' n of alignment, n of Park Ave	Recreation (Park)	1	75	80	-5	0	0	0	0	0	0	-5	-2	6	-6.0	-50	74	78	No Impact	n/a	n/a	n/a	n/a	24	43	No Impact
64	100' to 200' s of alignment, w of University St	Residential	1	100	78	-5	0	0	0	0	0	0	-5	-2	6	-6.0	-50	72	75	No Impact	n/a	n/a	n/a	n/a	22	38	No Impact
65	100' to 200' s of alignment, w of University St	Residential	8	100	78	-5	0	0	0	0	0	0	-5	-2	6	-6.0	-50	72	75	No Impact	n/a	n/a	n/a	n/a	22	38	No Impact
66	100' to 200' s of alignment, w of University St	Residential	10	175	73	-5	0	0	0	0	0	0	-5	-2	6	-6.0	-50	67	75	No Impact	n/a	n/a	n/a	n/a	17	38	No Impact
68	50' to 100' s of alignment, e of University St	Residential	6	75	80	-5	0	0	0	0	0	0	-5	-2	6	-6.0	-50	74	75	No Impact	n/a	n/a	n/a	n/a	24	38	No Impact
69	100' to 200' s of alignment, e of University St	Residential	7	150	74	-5	0	0	0	0	0	0	-5	-2	6	-6.0	-50	68	75	No Impact	n/a	n/a	n/a	n/a	18	38	No Impact
72	100' to 200' s of alignment, e of Cook St	Residential	6	125	73	-5	0	0	0	0	0	0	-5	-2	6	-6.0	-50	67	75	No Impact	n/a	n/a	n/a	n/a	17	38	No Impact

1 - Per Table 9-2 of the General Vibration Assessment, FTA Transit Noise and Vibration Impact Assessment manual, the screening distance for vibration assessment for conventional commuter rail is 600 feet for Category 1 land uses, 200 feet for Category 2 land uses and 120 feet for Category 3 land uses. The nearest known Category 1 land use is located approximately 1500 feet away and is thus beyond the applicable screening distance. Category 2 (residential) land uses existing within 200 feet of the alignment and Category 3 land uses within 120 feet are addressed in this table.

2 - Based on Figure 10-1, page 10-3, Chapter 10, ibid.

Appendix I

Construction Noise Analysis

Input and Output

FTA Methodology Construction Calculations

Based on input from HDR, it is assumed that construction phases and consists would be comparable to the DSBPRP, with the addition of bridge and layover work. Because the estimated schedule for bridge and layover work coincides only with one of the two construction scenarios found to be worst-case (Area 4, Crew T3) for the DSBPRP, the appropriate equipment consists for bridge and layover work were added to this Case Description.

Ref: Chapter 12, Noise and Vibration During Construction, Transit Noise and Vibration Impact Assessment manua

Leq(equip)= E.L. + 10*Log(U.F.) - 20*Log(D/50) - 10*G*Log(D/50)

E.L. = noise emission level - derived from Table 12-1 of the FTA manua
U.F. = utilization factor - derived from the defaults of the RCNM
D=distance

Case Description:	Redlands Passenger Rail - Area 4, CrewT3			
Equip Typ	units*hrs per unit	Coded as	E.L.	U.F
Truck 3/4T pickup	6	Truck	88	0.75
Truck - 2500 gal water	1	Truck	88	0.125
Excavator - Rubber Tir	4	Truck	88	0.5
Loader - Rubber Tire	2	Loader	85	0.25
Roller - Vibratory	2	Roller	74	0.25
Roller - Static	2	Roller	74	0.25
Air Compressor	4	Air Compressor	81	0.5
Generator - portable	6	Generator	81	0.75
Truck -Fltbd w/boom c	2	Crane, Mobile	83	0.25
Forklift	1	Loader	85	0.125
Grader	1	Grader	85	0.125
Speed Swing	1	Tie Handler	80	0.125
Rail Saw	1	Rail Saw	90	0.125
Rail Welder	2	Generator	81	0.25
Ballast Regulator	1	Ballast Equalizer	82	0.125
Ballast Tamper	1	Ballast Tamber	82	0.125
Impact Wrench	1	Impact Wrench	85	0.125
Pneumatic or Elec Tool	1	Pneumative Tool	85	0.125
Total Leq				

Case Description: Bridges				
	units*hrs per unit	Coded as	E.L.	U.F
Cranes	8	Crane, Mobile	83	1
Excavators	8	Truck	88	1
Graders	8	Grader	85	1
Other Construction Eq	8	Truck	88	1
Rubber Tired Loaders	8	Loader	85	1
Scrapers	8	Scraper	89	1
Bore/Drill Rigs	8	Crane, Derrick	88	1
Cement and Mortar Mi	8	Concrete Mixer	85	1
Cranes	8	Crane, Mobile	83	1
Pumps	8	Pump	76	1
Rubber Tired Loaders	8	Loader	85	1
Bore/Drill Rigs(aka vib	8	Truck	88	1
Rubber Tired Loaders	8	Loader	85	1

Case Description: Layover Facility				
Cranes	4	Crane, Mobile	83	0.5
Forklifts	12	Truck	88	1.5
Tractors/Loaders/Back	16	Backhoe	80	2

Case Description:	**Redlands Passenger Rail - Area 4, CrewD2**			
Equip Typ	units*hrs per unit	Coded as	E.L.	U.F
Truck 3/4T pickup	6	Truck	88	0.75
Truck 10-wheel Dump	8	Truck	88	1
Truck - 2500 gal water	3	Truck	88	0.375
Excavator - Track	8	Scraper	89	1
Loader - Rubber Tire	6	Loader	85	0.75
Air Compressor	18	Air Compressor	81	2.25
Jack Hammer	12	Jack Hammer	88	1.5
Concrete or Asphalt Sa	4	Saw	76	0.5
Excavator w/HoRam	4	Jack Hammer	88	0.5
Total Leq				

FTA's Table 12-1. Construction Equipment Noise Emission Levels

Equipment	Typical Noise Level (dBA) 50 ft from Source
Air Compressor	81
Backhoe	80
Ballast Equalizer	82
Ballast Tamper	83
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Dozer	85
Generator	81
Grader	85
Impact Wrench	85
Jack Hammer	88
Loader	85
Paver	89
Pile-driver (Impact)	101
Pile-driver (Sonic)	96
Pneumatic Tool	85
Pump	76
Rail Saw	90
Rock Drill	98
Roller	74
Saw	76
Scarifier	83
Scraper	89
Shovel	82
Spike Driver	77
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	88
Table based on an EPA Report, (4) measured data from railroad construction equipmenttaken during the Northeast Corridor Improvement Project, and other measured data .	

Acoustically-averaged distances for typical noise level	
50	102
75	127
80	131
100	164
125	187
140	215
150	224
175	247
200	284
220	302
225	306
240	319
250	343
250	343
275	365
300	418
320	436
325	440
340	453
350	462
375	500
380	504
390	513
400	537
475	603
500	640
550	684

TABLE I-1

Case Description: Redlands Passenger Rail - Area 4, CrewT3 Plus Bridges and Layover

Receiver Distance (Perpendicular Distance to Alignment (feet))	50	75	80	100	125	140	150	175	200	220	225	240	250	250	275	300	320	325	340	350	375	380	390	400	475	500	550
Equipment Type																											
Truck 3/4T pickup	80.6	78.7	78.4	76.4	75.3	74.1	73.7	72.9	71.7	71.1	71.0	70.7	70.0	70.0	69.5	68.3	67.9	67.9	67.6	67.4	66.8	66.7	66.5	66.1	65.1	64.6	64.0
Truck - 2500 gal water	72.8	70.9	70.6	68.6	67.5	66.3	65.9	65.1	63.9	63.4	63.2	62.9	62.2	62.2	61.7	60.5	60.2	60.1	59.8	59.7	59.0	58.9	58.7	58.3	57.3	56.8	56.2
Excavator - Rubber Tire	78.8	76.9	76.6	74.7	73.5	72.3	72.0	71.1	69.9	69.4	69.3	68.9	68.3	68.3	67.7	66.5	66.2	66.1	65.8	65.7	65.0	64.9	64.8	64.4	63.4	62.8	62.3
Loader - Rubber Tire	72.8	70.9	70.6	68.7	67.5	66.3	65.9	65.1	63.9	63.4	63.2	62.9	62.2	62.2	61.7	60.5	60.2	60.1	59.8	59.7	59.0	58.9	58.8	58.4	57.4	56.8	56.3
Roller - Vibratory	61.8	59.9	59.6	57.7	56.5	55.3	54.9	54.1	52.9	52.4	52.2	51.9	51.2	51.2	50.7	49.5	49.2	49.1	48.8	48.7	48.0	47.9	47.8	47.4	46.4	45.8	45.3
Roller - Static	61.8	59.9	59.6	57.7	56.5	55.3	54.9	54.1	52.9	52.4	52.2	51.9	51.2	51.2	50.7	49.5	49.2	49.1	48.8	48.7	48.0	47.9	47.8	47.4	46.4	45.8	45.3
Air Compressor	71.8	69.9	69.6	67.7	66.5	65.3	65.0	64.1	62.9	62.4	62.3	61.9	61.3	61.3	60.7	59.5	59.2	59.1	58.8	58.7	58.0	57.9	57.8	57.4	56.4	55.8	55.3
Generator - portable	73.6	71.7	71.4	69.4	68.3	67.1	66.7	65.9	64.7	64.1	64.0	63.7	63.0	63.0	62.5	61.3	60.9	60.9	60.6	60.4	59.8	59.7	59.5	59.1	58.1	57.6	57.0
Truck -Fltbd w/boom crane	70.8	68.9	68.6	66.7	65.5	64.3	63.9	63.1	61.9	61.4	61.2	60.9	60.2	60.2	59.7	58.5	58.2	58.1	57.8	57.7	57.0	56.9	56.8	56.4	55.4	54.8	54.3
Forklift	69.8	67.9	67.6	65.6	64.5	63.3	62.9	62.1	60.9	60.4	60.2	59.9	59.2	59.2	58.7	57.5	57.2	57.1	56.8	56.7	56.0	55.9	55.7	55.3	54.3	53.8	53.2
Grader	69.8	67.9	67.6	65.6	64.5	63.3	62.9	62.1	60.9	60.4	60.2	59.9	59.2	59.2	58.7	57.5	57.2	57.1	56.8	56.7	56.0	55.9	55.7	55.3	54.3	53.8	53.2
Speed Swing	64.8	62.9	62.6	60.6	59.5	58.3	57.9	57.1	55.9	55.4	55.2	54.9	54.2	54.2	53.7	52.5	52.2	52.1	51.8	51.7	51.0	50.9	50.7	50.3	49.3	48.8	48.2
Rail Saw	74.8	72.9	72.6	70.6	69.5	68.3	67.9	67.1	65.9	65.4	65.2	64.9	64.2	64.2	63.7	62.5	62.2	62.1	61.8	61.7	61.0	60.9	60.7	60.3	59.3	58.8	58.2
Rail Welder	68.8	66.9	66.6	64.7	63.5	62.3	61.9	61.1	59.9	59.4	59.2	58.9	58.2	58.2	57.7	56.5	56.2	56.1	55.8	55.7	55.0	54.9	54.8	54.4	53.4	52.8	52.3
Ballast Regulator	66.8	64.9	64.6	62.6	61.5	60.3	59.9	59.1	57.9	57.4	57.2	56.9	56.2	56.2	55.7	54.5	54.2	54.1	53.8	53.7	53.0	52.9	52.7	52.3	51.3	50.8	50.2
Ballast Tamper	66.8	64.9	64.6	62.6	61.5	60.3	59.9	59.1	57.9	57.4	57.2	56.9	56.2	56.2	55.7	54.5	54.2	54.1	53.8	53.7	53.0	52.9	52.7	52.3	51.3	50.8	50.2
Impact Wrench	69.8	67.9	67.6	65.6	64.5	63.3	62.9	62.1	60.9	60.4	60.2	59.9	59.2	59.2	58.7	57.5	57.2	57.1	56.8	56.7	56.0	55.9	55.7	55.3	54.3	53.8	53.2
Pneumatic or Elec Tools	69.8	67.9	67.6	65.6	64.5	63.3	62.9	62.1	60.9	60.4	60.2	59.9	59.2	59.2	58.7	57.5	57.2	57.1	56.8	56.7	56.0	55.9	55.7	55.3	54.3	53.8	53.2
Total Leq	**85.7**	**83.8**	**83.5**	**81.5**	**80.4**	**79.2**	**78.8**	**78.0**	**76.8**	**76.2**	**76.1**	**75.8**	**75.1**	**75.1**	**74.6**	**73.4**	**73.0**	**73.0**	**72.7**	**72.5**	**71.9**	**71.8**	**71.6**	**71.2**	**70.2**	**69.7**	**69.1**

Case Description: Bridges

Receiver Distance (Perpendicular Distance to Alignment (feet))	50	75	80	100	125	140	150	175	200	220	225	240	250	250	275	300	320	325	340	350	375	380	390	400	475	500	550
Equipment Type																											
Cranes	76.8	74.9	74.6	72.7	71.5	70.3	70.0	69.1	67.9	67.4	67.3	66.9	66.3	66.3	65.7	64.6	64.2	64.1	63.8	63.7	63.0	62.9	62.8	62.4	61.4	60.9	60.3
Excavators	81.8	79.9	79.6	77.7	76.5	75.3	75.0	74.1	72.9	72.4	72.3	71.9	71.3	71.3	70.7	69.6	69.2	69.1	68.8	68.7	68.0	67.9	67.8	67.4	66.4	65.9	65.3
Graders	78.8	76.9	76.6	74.7	73.5	72.3	72.0	71.1	69.9	69.4	69.3	68.9	68.3	68.3	67.7	66.6	66.2	66.1	65.8	65.7	65.0	64.9	64.8	64.4	63.4	62.9	62.3
Other Construction Equipmer	81.8	79.9	79.6	77.7	76.5	75.3	75.0	74.1	72.9	72.4	72.3	71.9	71.3	71.3	70.7	69.6	69.2	69.1	68.8	68.7	68.0	67.9	67.8	67.4	66.4	65.9	65.3
Rubber Tired Loaders	78.8	76.9	76.6	74.7	73.5	72.3	72.0	71.1	69.9	69.4	69.3	68.9	68.3	68.3	67.7	66.6	66.2	66.1	65.8	65.7	65.0	64.9	64.8	64.4	63.4	62.9	62.3
Scrapers	82.8	80.9	80.6	78.7	77.5	76.3	76.0	75.1	73.9	73.4	73.3	72.9	72.3	72.3	71.7	70.6	70.2	70.1	69.8	69.7	69.0	68.9	68.8	68.4	67.4	66.9	66.3
Bore/Drill Rigs	81.8	79.9	79.6	77.7	76.5	75.3	75.0	74.1	72.9	72.4	72.3	71.9	71.3	71.3	70.7	69.6	69.2	69.1	68.8	68.7	68.0	67.9	67.8	67.4	66.4	65.9	65.3
Cement and Mortar Mixers	78.8	76.9	76.6	74.7	73.5	72.3	72.0	71.1	69.9	69.4	69.3	68.9	68.3	68.3	67.7	66.6	66.2	66.1	65.8	65.7	65.0	64.9	64.8	64.4	63.4	62.9	62.3
Cranes	76.8	74.9	74.6	72.7	71.5	70.3	70.0	69.1	67.9	67.4	67.3	66.9	66.3	66.3	65.7	64.6	64.2	64.1	63.8	63.7	63.0	62.9	62.8	62.4	61.4	60.9	60.3
Pumps	69.8	67.9	67.6	65.7	64.5	63.3	63.0	62.1	60.9	60.4	60.3	59.9	59.3	59.3	58.7	57.6	57.2	57.1	56.8	56.7	56.0	55.9	55.8	55.4	54.4	53.9	53.3
Rubber Tired Loaders	78.8	76.9	76.6	74.7	73.5	72.3	72.0	71.1	69.9	69.4	69.3	68.9	68.3	68.3	67.7	66.6	66.2	66.1	65.8	65.7	65.0	64.9	64.8	64.4	63.4	62.9	62.3
Bore/Drill Rigs(aka vibrating p	81.8	79.9	79.6	77.7	76.5	75.3	75.0	74.1	72.9	72.4	72.3	71.9	71.3	71.3	70.7	69.6	69.2	69.1	68.8	68.7	68.0	67.9	67.8	67.4	66.4	65.9	65.3
Rubber Tired Loaders	78.8	76.9	76.6	74.7	73.5	72.3	72.0	71.1	69.9	69.4	69.3	68.9	68.3	68.3	67.7	66.6	66.2	66.1	65.8	65.7	65.0	64.9	64.8	64.4	63.4	62.9	62.3
Total Leq	**91.1**	**89.2**	**88.9**	**87.0**	**85.8**	**84.6**	**84.2**	**83.4**	**82.2**	**81.7**	**81.5**	**81.2**	**80.5**	**80.5**	**80.0**	**78.8**	**78.5**	**78.4**	**78.1**	**78.0**	**77.3**	**77.2**	**77.1**	**76.7**	**75.6**	**75.1**	**74.5**
Case Description:	Layover Facility																										
Cranes	73.8	71.9	71.6	69.7	68.5	67.3	67.0	66.1	64.9	64.4	64.3	63.9	63.3	63.3	62.7	61.5	61.2	61.1	60.8	60.7	60.0	59.9	59.8	59.4	58.4	57.8	57.3
Forklifts	83.6	81.7	81.4	79.4	78.3	77.1	76.7	75.9	74.7	74.2	74.0	73.7	73.0	73.0	72.5	71.3	71.0	70.9	70.6	70.4	69.8	69.7	69.5	69.1	68.1	67.6	67.0
Tractors/Loaders/Backhoes	76.9	74.9	74.6	72.7	71.6	70.3	70.0	69.2	67.9	67.4	67.3	66.9	66.3	66.3	65.7	64.6	64.2	64.1	63.9	63.7	63.0	62.9	62.8	62.4	61.4	60.9	60.3
Total Leq	**84.8**	**82.9**	**82.6**	**80.6**	**79.5**	**78.3**	**77.9**	**77.1**	**75.9**	**75.3**	**75.2**	**74.9**	**74.2**	**74.2**	**73.7**	**72.5**	**72.1**	**72.1**	**71.8**	**71.6**	**71.0**	**70.9**	**70.7**	**70.3**	**69.3**	**68.8**	**68.2**
Combined Total	**92.9**	**91.0**	**90.7**	**88.8**	**87.6**	**86.4**	**86.1**	**85.2**	**84.0**	**83.5**	**83.4**	**83.0**	**82.4**	**82.4**	**81.8**	**80.6**	**80.3**	**80.2**	**79.9**	**79.8**	**79.1**	**79.0**	**78.9**	**78.5**	**77.5**	**76.9**	**76.4**

TABLE I-1, CONT'D

Case Description: Redlands Passenger Rail - Area 4, CrewD2

Receiver Distance (Perpendicular Distance to Alignment (feet))	50	75	80	100	125	140	150	175	200	220	225	240	250	250	275	300	320	325	340	350	375	380	390	400	475	500	550
Equipment Type																											
Truck 3/4T pickup	80.6	78.7	78.4	76.4	75.3	74.1	73.7	72.9	71.7	71.1	71.0	70.7	70.0	70.0	69.5	68.3	67.9	67.9	67.6	67.4	66.8	66.7	66.5	66.1	65.1	64.6	64.0
Truck 10-wheel Dump	81.8	79.9	79.6	77.7	76.5	75.3	75.0	74.1	72.9	72.4	72.3	71.9	71.3	71.3	70.7	69.6	69.2	69.1	68.8	68.7	68.0	67.9	67.8	67.4	66.4	65.9	65.3
Truck - 2500 gal water	77.6	75.7	75.4	73.4	72.3	71.1	70.7	69.9	68.7	68.1	68.0	67.6	67.0	67.0	66.5	65.3	64.9	64.8	64.6	64.4	63.7	63.7	63.5	63.1	62.1	61.6	61.0
Excavator - Track	82.8	80.9	80.6	78.7	77.5	76.3	76.0	75.1	73.9	73.4	73.3	72.9	72.3	72.3	71.7	70.6	70.2	70.1	69.8	69.7	69.0	68.9	68.8	68.4	67.4	66.9	66.3
Loader - Rubber Tire	77.6	75.7	75.4	73.4	72.3	71.1	70.7	69.9	68.7	68.1	68.0	67.7	67.0	67.0	66.5	65.3	64.9	64.9	64.6	64.4	63.8	63.7	63.5	63.1	62.1	61.6	61.0
Air Compressor	78.4	76.5	76.1	74.2	73.1	71.8	71.5	70.7	69.4	68.9	68.8	68.4	67.8	67.8	67.2	66.1	65.7	65.6	65.4	65.2	64.5	64.5	64.3	63.9	62.9	62.4	61.8
Jack Hammer	83.6	81.7	81.4	79.4	78.3	77.1	76.7	75.9	74.7	74.2	74.0	73.7	73.0	73.0	72.5	71.3	71.0	70.9	70.6	70.4	69.8	69.7	69.5	69.1	68.1	67.6	67.0
Concrete or Asphalt Saw	66.8	64.9	64.6	62.7	61.5	60.3	60.0	59.1	57.9	57.4	57.3	56.9	56.3	56.3	55.7	54.5	54.2	54.1	53.8	53.7	53.0	52.9	52.8	52.4	51.4	50.8	50.3
Excavator w/HoRam	78.8	76.9	76.6	74.7	73.5	72.3	72.0	71.1	69.9	69.4	69.3	68.9	68.3	68.3	67.7	66.5	66.2	66.1	65.8	65.7	65.0	64.9	64.8	64.4	63.4	62.8	62.3
Total Leq	**89.8**	**87.9**	**87.6**	**85.6**	**84.5**	**83.3**	**82.9**	**82.1**	**80.9**	**80.3**	**80.2**	**79.9**	**79.2**	**79.2**	**78.7**	**77.5**	**77.1**	**77.1**	**76.8**	**76.6**	**76.0**	**75.9**	**75.7**	**75.3**	**74.3**	**73.8**	**73.2**

TABLE I-2

Construction Noise Data Summary

Receiver Distance (Perpendicular Distance to Alignment (feet))	Crew T3 plus Bridge and Layover Total Leq	Crew D2 Total Leq	Worst-Case Construction Noise Levels (Leq) No Shielding	Shielding Effects (from Operational Rail Analysis)	Estimated Construction Noise Levels 8-Hour Leq	FTA Criteria for Residential Land Uses (8-Hour Leq)		FTA Criteria Exceeded ?[1]	
						Day	Night	Day	Night
50	92.9	89.8	92.9	0	93	80	70	Yes	Yes
75	91.0	87.9	91.0	0	91	80	70	Yes	Yes
80	90.7	87.6	90.7	0	91	80	70	Yes	Yes
100	88.8	85.6	88.8	0	89	80	70	Yes	Yes
125	87.6	84.5	87.6	0	88	80	70	Yes	Yes
140	86.4	83.3	86.4	0	86	80	70	Yes	Yes
150	86.1	82.9	86.1	0	86	80	70	Yes	Yes
175	85.2	82.1	85.2	0	85	80	70	Yes	Yes
200	84.0	80.9	84.0	0	84	80	70	Yes	Yes
220	83.5	80.3	83.5	0	83	80	70	Yes	Yes
225	83.4	80.2	83.4	5	78	80	70	No	Yes
240	83.0	79.9	83.0	5	78	80	70	No	Yes
250	82.4	79.2	82.4	5	77	80	70	No	Yes
250	82.4	79.2	82.4	5	77	80	70	No	Yes
275	81.8	78.7	81.8	5	77	80	70	No	Yes
300	80.6	77.5	80.6	5	76	80	70	No	Yes
320	80.3	77.1	80.3	5	75	80	70	No	Yes
325	80.2	77.1	80.2	0	80	80	70	Yes	Yes
340	79.9	76.8	79.9	0	80	80	70	No	Yes
350	79.8	76.6	79.8	0	80	80	70	No	Yes
375	79.1	76.0	79.1	0	79	80	70	No	Yes
380	79.0	75.9	79.0	0	79	80	70	No	Yes
390	78.9	75.7	78.9	5	74	80	70	No	Yes
400	78.5	75.3	78.5	6.5	72	80	70	No	Yes
475	77.5	74.3	77.5	5	72	80	70	No	Yes
500	76.9	73.8	76.9	6.5	70	80	70	No	Yes
550	76.4	73.2	76.4	6.5	70	80	70	No	No

1 - FTA Criteria from page 12-8, detailed assessment for construction noise.