

Barton Road Bridge Removal and Road Construction Project

Technical Noise Memorandum

Cities of Colton and Grand Terrace, San Bernardino County

Federal Project No. BRLS 5065(024)



November 2020

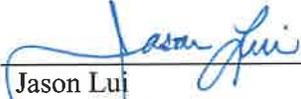
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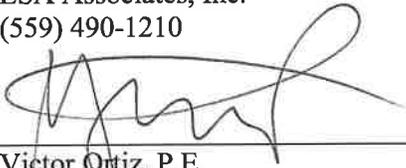
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Prepared By:  _____ Date: 12/11/2020
Jason Lui
Associate Senior Noise Specialist
LSA Associates, Inc.
(949) 553-0666

QA/QC By:  _____ Date: 12/11/2020
Amy Fischer
Principal
LSA Associates, Inc.
(559) 490-1210

Approved By:  _____ Date: 12/11/2020
Victor Ortiz, P.E.
City Engineer
City of Colton
(909) 370-5065

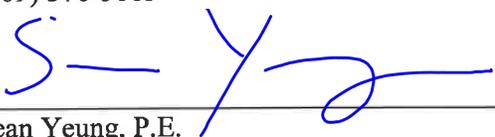
Concurred By:  _____ Date: 2/24/2021
Sean Yeung, P.E.
Senior Environmental Engineer
Caltrans, District 8, Local Assistance
(909) 383-4030

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INTRODUCTION

The Cities of Colton and Grand Terrace, in cooperation with California Department of Transportation (Caltrans), proposes to remove the Barton Road Bridge (State Bridge No. 54C0379), fill the area over the railroad track, and replace the bridge with a two-lane at-grade asphalt roadway that connects to the existing roadways to the east and west of the bridge. There is also the need to provide continuous pedestrian and bicycle access along this stretch of Barton Road through sidewalks and Class II bicycle lanes to meet the requirements of the Cities of Colton and Grand Terrace.

PURPOSE AND NEED

Purpose of the Project

The purpose of the project is to provide safe connectivity between La Cadena and the Barton Road/ Interstate 215 (I-215) interchange and to facilitate efficient access between the Cities of Colton and Grand Terrace.

Need for the Project

Barton Road Bridge was originally built in 1936 as a two-lane bridge over the Union Pacific Railroad (UPRR) railroad tracks (one lane in each direction). The bridge is structurally unsound and the 25-foot (ft) wide bridge deck does not provide adequate pedestrian or bicycle access. The sidewalk that exists on the bridge has been shut down for safety reasons. A review of the existing bridge's As-Built plans shows the design philosophy of the bridge does not account for seismic loading, which is critical for public safety in California. The Bridge Inspection Report shows a low sufficiency rating of 58.8 due to low load rating and a roadway geometry that does not meet the current standards of the American Association of State Highway and Transportation Officials (AASHTO). The railroad tracks below the bridge have been abandoned and removed. There is no longer the need to span the railroad tracks with a bridge.

PROJECT DESCRIPTION

The Cities of Colton and Grand Terrace, in cooperation with Caltrans, propose to replace the existing two-lane Barton Road Bridge (which is approximately 175 ft long by 25 ft wide) on Barton Road over an abandoned UPRR single-track railway in Colton and Grand Terrace with a two-lane, at-grade asphalt roadway. Barton Road runs through both Colton and Grand Terrace. Improvements to Barton Road will begin at the east side of the Terrace Avenue intersection in Colton and extend to approximately 100 ft west of the intersection of Grand Terrace Avenue in Grand Terrace. The curb-to-curb roadway width of 44 ft widens to approximately 70 ft west of Grand Terrace Avenue to tie into the improvements being made to the Barton Road/I-215 interchange. The total length of the roadway improvements is approximately 1,100 ft. The roadway will accommodate a 6 ft wide sidewalk on the north and south sides of Barton Road, an 8 ft wide striped Class II bicycle lane on each side of the roadway, and 14 ft wide travel lanes. Lane configurations transition to join existing improvements west of Grand Terrace Avenue.

Improvements include the following:

- Demolition and removal of the existing bridge, abutments, and retaining walls on Barton Road
- Removal and reconstruction of the drainage outlet west of Grand Terrace Avenue
- Construction of a drainage culvert across Barton Road in the vicinity of the abandoned tracks
- Relocation of the Riverside Highland Water Company line, the City of Colton waterline, fiber optic cables, and a gas line in the existing bridge and roadway and relocation of overhead telephone lines along the north side of Barton Road
- Removal of approximately 5,500 cubic yards (cy) of soil, and fill of approximately 4,300 cy to bring the bridge area to grade
- Construction of an asphalt roadway and removal of the vertical crest curve, thereby improving stopping sight distance consistent with the Cities' standards for Barton Road's roadway classification
- Construction of curb ramps to Americans with Disabilities Act (ADA) standards at the intersection of Barton Road and Terrace Avenue
- Construction of 6 ft wide sidewalks and 8 ft wide Class II bike lanes on the north and south sides, respectively, of Barton Road within the project limits
- Construction of driveway approaches joining existing driveways in compliance with Grand Terrace and Colton city standards
- Removal of a retaining wall along the north side of the Barton Road right-of-way in front of Lineage Logistics
- Identification and provision of a construction staging area in the vicinity of the improvements
- Closure of Barton Road between Terrace Avenue and Grand Terrace Avenue during construction and provision of a detour for traffic

The project will require approximately 0.60 acre of temporary construction easements and slope easements. The majority of improvements, with the exception of driveway grading to match the lowered street elevation, will be contained to within the Cities' existing right-of-way. Approximately 4,500 square feet (sf) will be acquired to increase the right-of-way at the location of the existing bridge to 50 ft in each direction. Approximately 700 sf of permanent right-of-way acquisition will be needed in front of Assessor's Parcel Number (APN) 027-522-316. The regional and project location map is provided on Figure 1 (all figures attached). Figure 2 shows the project features.

LOCAL REQUIREMENTS

City of Colton

Municipal Code. Section 18.42.050 of the City of Colton Municipal Code specifies that all activities shall be operated so as not to generate ground vibration by equipment other than motor vehicles, trains or by temporary construction or demolition that is perceptible without instruments by the average person at or beyond any lot line of the lot containing the activities.

The City of Colton does not have regulations pertaining to construction noise. Therefore, the County of San Bernardino's construction noise regulations is applicable to this project and is discussed below.

City of Grand Terrace

Municipal Code. Section 8.108.040(c) of the City of Grand Terrace Municipal Code regulates the timing of construction activities. Noise sources associated with or vibration created by construction, repair or remodeling, or grading of any real property shall occur only between the hours of 7:00 a.m. and 8:00 p.m., Monday through Saturday. No construction shall be permitted outside of these hours or on Sundays and federal holidays.

County of San Bernardino

Municipal Code. Section 24.0707(e) of the County of San Bernardino Municipal Code exempts noise sources associated with construction, maintenance, and repair operations conducted by public agencies and/or utility companies or their contractors that are deemed necessary to serve the best interest of the public and to protect the public health, welfare, and safety. This exemption includes, without limitation, sound emanating from all equipment used by such personnel, whether stationary or mobile. Although noise generated from construction activities are exempted, construction activities should comply with Section 24.0706(d), which specifies that construction shall be prohibited between the hours of 7:00 p.m. and 7:00 a.m.

TRAFFIC NOISE IMPACT

No Build Alternative

No improvements other than routine roadway maintenance would be made to the Barton Road Bridge. Receptors located within the project area would not have a new traffic noise impact.

Build Alternative

The proposed project is not considered a Type 1 project because the proposed project would replace the existing two-lane Barton Road Bridge on Barton Road over an abandoned UPRR single-track railway with a two-lane, at-grade asphalt roadway. In addition, the following situations would exist:

- The proposed project would not construct a roadway at a new location.
- The proposed project would not substantially alter the horizontal and vertical alignment of the existing roadway. Although the proposed project would alter the vertical alignment of Barton Road, the proposed project would not remove shielding at nearby receptors. Rather, it would provide more shielding at nearby receptors.
- The proposed project would not add any through-traffic lanes that function as a high-occupancy vehicle (HOV) lane, high-occupancy toll (HOT) lane, bus lane, or truck climbing lane.
- The proposed project would not add an auxiliary lane.
- The proposed project would not add or relocate interchange lanes or ramps added to a quadrant to complete an existing partial interchange.

- The proposed project would not restripe existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane.
- The proposed project would not add a new or substantially alter an existing weigh station, rest stop, ride-share lot, or toll plaza.

Based on the above information, the proposed project is not considered a Type 1 project as defined in 23 Code of Federal Regulations (CFR) 772.5. Therefore, the proposed project is considered a Type 3 project and a noise analysis is not required.

CONSTRUCTION NOISE IMPACT

No Build Alternative

No construction activities would occur under the No Build Alternative, and no short-term noise impacts would result.

Build Alternative

Two types of short-term noise impacts could occur during construction of the proposed project. First, construction crew commutes and the transport of construction equipment and materials to the site for the proposed project would incrementally increase noise levels on access roads leading to the site. Although there would be a relatively high single-event noise exposure potential causing intermittent noise nuisance (passing trucks at 50 ft would generate up to a maximum of 84 A-weighted decibels [dBA]), the effect on longer-term (hourly or daily) ambient noise levels would be small. The grading and excavation phase would generate the most trips out of all the construction phases (i.e., 84 vehicles per hour or 171 vehicles per day). Barton Road would be used to access the project site. The existing hourly/daily traffic volumes on Barton Road are estimated to be 596/7,292. Construction-related traffic would increase traffic noise levels by up to 0.6 dBA. A noise level increase of less than 3 dBA would not be perceptible to the human ear in an outdoor environment. Therefore, no short-term construction-related impacts associated with worker commute and equipment transport to the project site would occur.

The second type of short-term noise impact is related to noise generated during roadway construction. Construction is completed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These various sequential phases would change the character of the noise generated on the site as well as the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction-related noise ranges to be categorized by work phase. Table A lists typical construction equipment noise levels recommended for noise impact assessments that are based on a distance of 50 ft between the equipment and a noise receptor and are taken from the 2006 Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM).¹

¹ Federal Highway Administration (FHWA). 2006. *Highway Construction Noise Handbook*.

Table A: Typical Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor ¹ (%)	Maximum Noise Level (L_{max}) at 50 ft ²
Backhoe	40	80
Compactor (ground)	20	80
Compressor	40	80
Crane	16	85
Dozer	40	85
Dump Truck	40	84
Excavator	40	85
Flatbed Truck	40	84
Forklift	20	85
Front-End Loader	40	80
Grader	40	85
Impact Pile Driver	20	95
Jackhammer	20	85
Pavement Scarifier	20	85
Paver	50	85
Pickup Truck	40	55
Pneumatic Tools	50	85
Pump	50	77
Rock Drill	20	85
Roller	20	85
Scraper	40	85
Tractor	40	84
Welder	40	73

Source: Table 9.1, Highway Construction Noise Handbook (FHWA 2006).

Note: The noise levels reported in this table are rounded to the nearest whole number.

¹ The usage factor is the percentage of time during a construction noise operation that a piece of construction equipment is operating at full power.

² The maximum noise levels were developed based on Specification 721.560 from the CA/T program to be consistent with the City of Boston, Massachusetts, Noise Code for the "Big Dig" project.

CA/T = Central Artery/Tunnel

ft = foot/feet

FHWA = Federal Highway Administration

L_{max} = maximum instantaneous noise level

Typical noise levels at 50 ft from an active construction area range up to an 88 dBA maximum instantaneous noise level (L_{max}) during the noisiest construction phases. The site preparation phase, which includes excavation and grading of the site, tends to generate the highest noise levels because the noisiest construction equipment is earthmoving equipment. Earthmoving equipment includes excavating machinery such as backfillers, bulldozers, and front-end loaders. Earthmoving and compacting equipment includes compactors, scrapers, and graders.

Project construction of the proposed project is expected to require the use of scrapers, bulldozers, and water trucks/pickup trucks. Noise associated with each type of construction equipment is estimated between 55 dBA L_{max} and 85 dBA L_{max} at a distance of 50 ft from the active construction area for the grading phase. As shown in Table A, the maximum noise level generated by each scraper is assumed to be approximately 85 dBA L_{max} at 50 ft from the scraper in operation. Each bulldozer would generate approximately 85 dBA L_{max} at 50 ft. The maximum noise level generated by water trucks/pickup trucks would be approximately 55 dBA L_{max} at 50 ft from these vehicles. Each doubling of the sound source with equal strength increases the noise level by 3 dBA. Each piece of construction equipment operates as an individual point source. The worst-case composite noise level during this phase of construction would be 88 dBA L_{max} at a distance of 50 ft from an active construction area.

The closest residence is located approximately 90 ft from the project construction boundary and may be subject to short-term noise reaching 83 dBA L_{max} generated by construction activities along the project alignment. Compliance with Caltrans Standard Specifications, Section 14-8.02 and the construction hours specified by the County's Municipal Code will be required to minimize construction noise impacts on sensitive land uses adjacent to the project site. The County of San Bernardino prohibits construction activity between the hours of 7:00 p.m. and 7:00 a.m. In addition, Caltrans Standard Specifications, Section 14-8.02, specifies that noise levels from the Contractor's operations, between the hours of 9:00 p.m. and 6:00 a.m., shall not exceed 86 dBA L_{max} at a distance of 50 ft.

CONSTRUCTION VIBRATION IMPACT

No Build Alternative

No construction activities would occur under the No Build Alternative, and no short-term vibration impacts would result.

Build Alternative

Vibration generated by construction equipment can result in varying degrees of ground vibration, depending on the equipment. The operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings on soil near an active construction area respond to these vibrations, which range from imperceptible to low rumbling sounds with perceptible vibrations and slight damage at the highest vibration levels. Typically, construction-related vibration does not reach vibration levels that would result in damage to nearby structures.

Table B shows the vibration damage potential threshold criteria for continuous/frequent intermittent sources from the Caltrans *Transportation and Construction Vibration Guidance Manual*¹. As shown in Table B, the vibration damage potential threshold criteria for old buildings, older residential structures, and modern industrial buildings is 0.25 peak-particle velocity (PPV) (inches per second [in/sec]), 0.3 PPV (in/sec), 0.5 PPV (in/sec), respectively. In addition, Table C shows the vibration annoyance potential criteria for continuous/frequent intermittent sources from the same manual. As shown in Table C, the vibration annoyance potential criteria are: barely perceptible at 0.01 PPV (in/sec), distinctly perceptible at 0.04 PPV (in/sec), strongly perceptible at 0.1 PPV (in/sec), and severe at 0.4 PPV (in/sec). These thresholds were used to evaluate the potential for short-term construction-related ground-borne vibration during construction of the proposed project.

Table D shows the reference vibration levels at a distance of 25 ft for each type of standard construction equipment from the Caltrans *Transportation and Construction Vibration Guidance Manual*². Project construction is expected to use a large bulldozer and loaded truck, which would generate ground-borne vibration levels of 0.089 PPV (in/sec) and 0.076 PPV (in/sec), respectively, when measured at 25 ft. It should be noted that the project is not expected to use other vibration intensive equipment such as pile driving, jackhammering, or vibratory rollers.

¹ California Department of Transportation (Caltrans). 2013. *Transportation and Construction Vibration Guidance Manual*. September.

² Ibid.

Table B: Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Source: Table 19, *Transportation and Construction Vibration Guidance Manual* (Caltrans 2013).

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Caltrans = California Department of Transportation

in/sec = inches per second

PPV = peak particle velocity

Table C: Vibration Annoyance Potential Criteria

Human Response	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Barely perceptible	0.04	0.01
Distinctly perceptible	0.25	0.04
Strongly perceptible	0.9	0.1
Severe	2.0	0.4

Source: Table 20, *Transportation and Construction Vibration Guidance Manual* (Caltrans 2013).

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous/frequent intermittent sources include impact pile drivers, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

Caltrans = California Department of Transportation

in/sec = inches per second

PPV = peak particle velocity

Table D: Vibration Source Amplitudes for Construction Equipment

Equipment	Reference PPV at 25 ft (in/sec)
Vibratory roller	0.210
Large bulldozer	0.089
Caisson drilling	0.089
Loaded trucks	0.076
Jackhammer	0.035
Small bulldozer	0.003
Crack-and-seat operations	2.4

Source: Table 18, *Transportation and Construction Vibration Guidance Manual* (Caltrans 2013).

Note: Equipment and associated source vibration levels that are expected to be used on the project site are shown in **bold**.

Caltrans = California Department of Transportation

in/sec = inches per second

PPV = peak particle velocity

The distance to the nearest buildings for vibration impact analysis is measured between the nearest off-site buildings and the project boundary (assuming the construction equipment would be used at or near the project boundary) because vibration impacts occur normally within the buildings.

The formula for vibration transmission is provided below.

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

Table E lists the projected vibration levels from various construction equipment expected to be used on the project site to the nearest buildings in the project vicinity. As shown in Table E, the nearest industrial building, residential building, and old industrial building is located 15 ft, 90 ft, and 25 ft, respectively, from the project site and would experience vibration levels of up to 0.191 PPV (in/sec), 0.013 PPV (in/sec), and 0.089 PPV (in/sec), respectively. Other industrial buildings in the project area are farther away and would experience lower vibration levels that would not exceed the Caltrans' community annoyance threshold and damage threshold. These vibration levels would range from barely perceptible to strongly perceptible, which may result in community annoyance. However, these vibration levels would not exceed the damage potential threshold criteria for old buildings, old residential structures, and modern industrial buildings at 0.25 PPV (in/sec), 0.3 PPV (in/sec), and 0.5 PPV (in/sec), respectively. Therefore, no construction vibration impacts would occur and no vibration reduction measures are required.

Table E: Summary of Construction Equipment and Activity Vibration

Land Use	Direction	Equipment/ Activity	Reference Vibration Level (PPV) at 25 ft	Distance to Building (ft)	Vibration Level (PPV)
Industrial (21700 Barton Road)	North	Large Bulldozer	0.089	15	0.191
		Loaded Trucks	0.076	15	0.164
Industrial (21800 Barton Road)	North	Large Bulldozer	0.089	35	0.054
		Loaded Trucks	0.076	35	0.046
Residential	Northeast	Large Bulldozer	0.089	90	0.013
		Loaded Trucks	0.076	90	0.011
Industrial	South	Large Bulldozer	0.089	25	0.089
		Loaded Trucks	0.076	25	0.076
Old Industrial Structure	South	Large Bulldozer	0.089	25	0.089
		Loaded Trucks	0.076	25	0.076

Source: Compiled by LSA Associates, Inc. (2020).

Note: The vibration damage potential threshold criteria for old buildings, old residential structures, and modern industrial building is 0.25 PPV (in/sec), 0.3 PPV (in/sec), 0.5 PPV (in/sec), respectively.

ft = foot/feet

in/sec = inches per second

PPV = peak particle velocity

Attachments: Figure 1 – Regional and Project Location Map
Figure 2 – Project Features

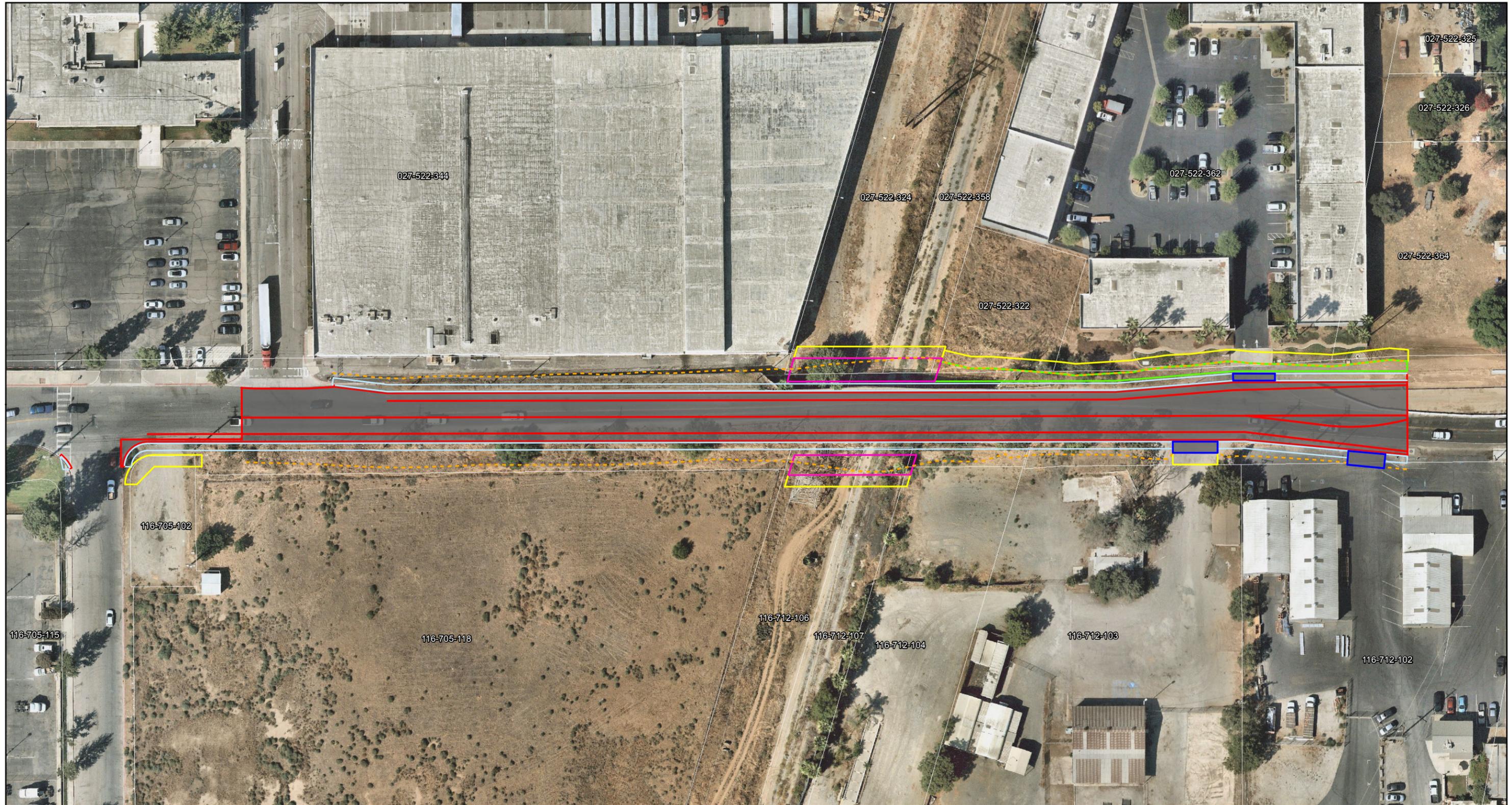


FIGURE 2

LEGEND

- | | |
|---------------------------|---|
| Proposed Project Features | — Sidewalk |
| — New Pavement | — Right-of-Way Acquisition |
| — Curb/Gutter | — Slope/Drainage Easement |
| — Driveway | — Temporary Construction Easement |
| — Toe of Slope | — Existing Right-of-Way/Parcel Boundaries |



SOURCE: Nearmap (9/20/2019); CNS Engineering (3/31/2020); County of San Bernardino (4/2019)

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Project Features

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