# CITY OF SAN BERNARDINO CITY-WIDE TRUCK ROUTE STUDY

DRAFT – NOVEMBER 2022


SAN BERNARDINO 2050
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# 1 INTRODUCTION

This Truck Route Study was developed for the City of San Bernardino, as an effort directly related to the larger General Plan update. The study analysis and report were undertaken by KOA Corporation, with The Tioga Group, Inc. as a subconsultant.

The goals of the study are the following:

- Determine the existing pattern of medium-duty and heavy-duty truck trips.
- Identify the reasons behind those truck trip patterns.
- Determine likely future shifts or increases in those trip patterns from internal or external development.
- Identify potential conflicts between truck routing patterns and community preferences.
- Develop an understanding of future commercial and industrial land development plans on the cities bordering the city and as well as the greater Inland Empire's surrounding communities
- Prepare truck route system options to balance the need for truck access and through movements with local community preferences.

Establishment and enforcement of a truck route network can reduce damage to smaller local city streets, and also can reduce the number of trucks that drive past schools and residential neighborhoods.

The adoption of the recommendations in the Truck Route Study, and subsequent passing of an ordinance, will allow the City Council to designate the routes that trucks must use when passing through and traveling to and from points within San Bernardino. The ordinance will define the ability of the City to legally enforce the truck routes. Truck route signage will be installed along the truck routes as part of the implementation. Truck prohibition or "no trucks" signs will also need to be installed at locations where truck routes end at industrial parcels, to avoid routes through nearby residential neighborhoods.

The analysis of potential truck routes included consideration of land use, roadway functional classification, pavement conditions, industrial corridors and single site locations, interagency linkages, truck delivery needs, and overall city circulation needs. Local truck trip patterns are determined as much or more by adjoining city land uses as by San Bernardino's own development patterns.

This study provides the following results, from this analysis and definition of routes:

- Defines the basis of compliance with federal and California Vehicle Code trucking regulations
- Identifies existing policies and regulations at all government levels that enable and define trucking operations on public roadways
- Provides the basis for commercial vehicles and truck regulations through ordinances or resolutions so that commercial and industrial areas within the City limits can be served fairly while prohibiting commercial vehicles and trucks from using certain highways within residential areas
- Defines the regulatory routes that control both truck travel and parking locations
- Summarizes the characteristics of each truck route segment, including roadway and lane widths, and overlap with future bicycle projects
- Supports the diversion of trucks from residential areas and Downtown
- Recommends Municipal Code changes on truck regulations
- Provides a framework for regulatory truck route sign placement

A truck route map is included in this report. A table that lists the proposed truck route segments is also included, including all segments by roadway, and pavement quality, curb lane widths, and proposed bicycle facility segments under the City Active Transportation Plan (ATP). Pavement quality values were compiled from the City pavement management system. Curb lane widths were compiled as well, to determine if widths are adequate for truck travel. Data on proposed bicycle facilities indicates where bicycle facility implementation may be in conflict with the truck routes. Pavement rehabilitation and/or roadway improvements may be necessary before truck route implementation.

Selected intersections along the proposed truck routes were analyzed for potential truck turning issues. The roadway intersections were selected for this analysis to identify potential restrictions in geometry where trucks would be turning. These locations may have to be evaluated further and potentially improved as part of the implementation of the truck routes.

# 2 REGULATORY FRAMEWORK

Existing federal and state laws are reviewed in this section, as these laws affect how trucks can use national and regional freeway and highway networks, and they also affect how local jurisdictions can regulate truck travel. Existing City of San Bernardino regulations on trucking are also reviewed in this section.

## 2.1 FEDERAL REGULATIONS

Federal law sets the maximum gross vehicle weights and axle loads on the Interstate System, at 80,000 pounds gross vehicle weight, 20,000 pounds for each single axle, and 34,000 pounds for each set of tandem axles. The National Network includes the Interstate highways and certain roadways designated by each state, and there are Federal standards on the Network for truck length and width.

The 1982 federal Surface Transportation Assistance Act (STAA) allowed larger trucks on the National Network. These larger trucks are called "STAA vehicles". Federal regulations prohibit states and local jurisdictions from enacting or enforcing any law denying reasonable access to STAA vehicles between the National Network and terminals or trucking destinations for loading/unloading, including facilities for food, fuel, repairs, and rest.

The Senate Joint Resolution Number 7 of 2003 maintained the current federal truck size and weight limitations at the time, and rejected proposals to experiment with longer and heavier trucks on public highways. This was done as part of the reauthorization of the federal Transportation Equity Act for the 21st Century.

States may not enact or enforce any law that denies access within one road-mile from the National Network, for trucks that use the most reasonable and practicable route available. Specific safety reasons on individual routes can justify mandating that alternate routes be used. Vehicle dimension limits on state or local regulations are not permitted to be more restrictive than federal requirements.

Truck operators may request access from the National Network, if such a route is not defined by State truck network maps, by specific truck types along specific routes to points of loading and unloading. States are required to have defined procedures for the review of new route requests within a 90-day period.

# 2.2 STATE REGULATION

The movement of trucks is regulated by the State of California for State highways and Interstate routes within California, and local jurisdictions are permitted by State law to regulate access by trucks to local roadways. Other policies, establishing the right to regulate truck trips and enforce weight limits, are defined by the California Vehicle Code (CVC).

Maximum truck size and weight regulations in the CVC ensure that trucks have safe operating characteristics, such as clearance under bridges, turning radius at corners, and stopping capability. The regulations also insure that truck movements and parking do not damage state and local highways and roadways. The CVC allows local jurisdictions to issue permits to vehicles in excess of these size or weight standards. The CVC includes sections that define how truck size and weight limits may be enforced, and provides authority to local jurisdictions to establish truck routes on specific streets and to prohibit trucks on other streets.

Caltrans District 8, which encompasses San Bernardino County, publishes a *Truck Networks on California State Highways* map, as do the other Caltrans districts throughout California. The National Network within the County is defined by this map, as are the STAA truck terminal routes and California Legal Routes.

Truck size, weight, and route regulations at the State level are discussed below.

## 2.2.1. Truck Size Limits

Caltrans defines the following combinations as legal when operating on the "designated system." The designated system is a network of highways defined by these criteria:

1. *Qualified by the U.S. Secretary of Transportation (National Network or the Interstate System) and*
2. *Identified by the Department of Transportation (Caltrans) or 35401.5(a) by local authorities as Terminal Access. VC These combinations may leave the designated system at identified signs at points of egress and ingress for access to terminals. VC These combinations may leave the designated system at identified signs at points of egress and ingress, where they may travel one mile to the facilities for food, fuel, lodging and repair.*

The California Legal trucks and other truck sizes are defined by the Length Sections 35400-35414, Width Sections 35100-35111, and Height Section 35250 of the California Vehicle Code (CVC).

The legal maximum size of trucks, as truck tractor-semitrailers, in California are "green" trucks that are Interstate STAA type and "black" trucks that are California Legal trucks. Table 2-1 provides the maximum allowed lengths for these two truck tractor-semitrailers types.

**Table 2-1 Vehicle Lengths**

| LENGTHS | "GREEN" STAA TRUCKS | | "BLACK" CALIFORNIA LEGAL TRUCKS |
|---|---|---|---|
| |  |  |  |
| Overall Length: | unlimited | Unlimited | 65 feet Max |
| Semitrailer: | 53 feet Max | 48 feet Max | unlimited |
| KPRA (kingpin-to-rearmost-axle distance): | 40 feet Max (two-axle semitrailer); 38 feet Max (single-axle | unlimited | 40 feet Max (two-axle semitrailer); 38 feet Max (single-axle |

Source: Caltrans Quick Guide: Truck Lengths & Routes

## 2.2.2. Weight Limits

Caltrans has also established standardized maximum vehicle weights across the State of California in CVC Weight Sections 35550 - 35558. The following are the basic rules on maximum vehicle weights:

- **Vehicle Combination Weight:** 80,000 pounds
- **Axle Weight, each single axle:** 20,000 pounds
- **Axle Group Weight, less than 8'-6" (8-feet-6-inches) between outer axles:** 34,000 pounds

For other unique configurations where the distance between axles is higher, a weight chart is provided in the CVC for those calculations.

A gross vehicle weight rating (GVWR) is also defined to classify trucks by weight, per Section 350 of the CVC. The GVWR is the manufacturer-specified loaded weight of vehicles, as the maximum allowable total weight of a road vehicle or trailer that is loaded, including the base vehicle weight, fuel, passengers, cargo, and trailer weight.

The categories of these ratings are the following:

- **Class 1**: <6,000 lb GVWR, light trucks, 2 axles
- **Class 2:** 6,000 – 10,000 lb GVWR, light trucks, 2 axles
- **Class 3:** 10,000 – 14,000 lb GVWR, medium-duty trucks, 2 axles
- **Class 4:** 14,000 – 16,000 lb GVWR, medium-duty trucks, 2 axles
- **Class 5:** 16,000 – 19,500 lb GVWR**,** medium-duty trucks, 2 axles
- **Class 6:** 19,500 **–** 26,000 lb GVWR, light-heavy-duty trucks, 3 axles
- **Class 7:** 26,000 – 33,000 lb GVWR**,** heavy-duty trucks, 3 axles
- **Class 8:** >33,000 lb GVWR**,** heavy-duty trucks, 3 or more axles

## 2.2.3. Establishment of Local Truck Routes

The State of California Vehicle Code, in Division 11, Rules of the Road Section 21000-23336, Article 3, states the following:

> *"Local authorities, for those highways under their jurisdiction, may adopt rules and regulations by ordinance or resolution…Prohibiting the use of particular highways by certain vehicles…."*

The California Vehicle Code allows for local definition and control of truck routes on city roadways, in Division 15 (Size, Weight, and Load), Chapter 4, Section 35401.5. The following section provides for truck access on routes identified by "local authorities" or cities, and defines the maximum length of trucks with trailers:

> *(a) A combination of vehicles consisting of a truck tractor and semitrailer, or of a truck tractor, semitrailer, and trailer, is not subject to the limitations of…[Sections 35400 (special vehicle types and accessories) and 35401 (multiple trailer configurations)…], when operating on the Dwight D. Eisenhower National System of Interstate and Defense Highways or when using those portions of federal-aid primary system highways that have been qualified by the United States Secretary of Transportation for that use, or when using routes appropriately identified by the Department of Transportation or local authorities as provided in subdivision (c) or (d), if all of the following conditions are met:*

> *(1) The length of the semitrailer in exclusive combination with a truck tractor does not exceed 48 feet. A semitrailer not more than 53 feet in length shall satisfy this requirement when configured with two or more rear axles, the rearmost of which is located 40 feet or less from the kingpin or when configured with a single axle which is located 38 feet or less from the kingpin.*
>
> *(2) Neither the length of the semitrailer nor the length of the trailer when simultaneously in combination with a truck tractor exceeds 28 feet 6 inches.*

Connections to trucking destinations that are off of designated highways and local roadways are permitted by the following within the same Vehicle Code section, within a one-mile distance when the need for access can be defined in this manner:

> *(c) Combinations of vehicles operated pursuant to subdivision (a) may also use highways not specified in subdivision (a) that provide reasonable access to terminals and facilities for purposes limited to fuel, food, lodging, and repair when that access is consistent with the safe operation of the combinations of vehicles and when the facility is within one road mile of identified points of ingress and egress to or from highways specified in subdivision (a) for use by those combinations of vehicles.*

The following clause defines a process for adding routes to local truck networks, if needed to access new land uses that generate regular truck trips:

> *(d) The Department of Transportation or local authorities may establish a process whereby access to terminals or services may be applied for upon a route not previously established as an access route. The denial of a request for access to terminals and services shall be only on the basis of safety and an engineering analysis of the proposed access route. If a written request for access has been properly submitted and has not been acted upon within 90 days of receipt by the department or the appropriate local agency, the access shall be deemed automatically approved. Thereafter, the route shall be deemed open for access by all other vehicles of the same type regardless of ownership. In lieu of processing an access application, the Department of Transportation or local authorities with respect to highways under their respective jurisdictions may provide signing, mapping, or a listing of highways as necessary to indicate the use of specific routes as terminal access routes.*

A "terminal" is where freight originates, terminates, or is handled, or where a motor carrier maintains operating facilities.

The following clause allows for moving trucks to access residential areas that are outside of the truck routes:

> *(f) Notwithstanding subdivision (d), the limitations of access specified in that subdivision do not apply to licensed carriers of household goods when directly en route to or from a point of loading or unloading of household goods, if travel on highways other than those specified in subdivision (a) is necessary and incidental to the shipment of the household goods.*

# 2.3 LOCAL REGULATION

The current General Plan has the following policies related to trucking. These are listed in the General Plan under Goal 6.5, which is entitled "Develop a transportation system that reduces conflicts between commercial trucking, private/public transportation, and land uses":

> *6.5.1 Provide designated truck routes for use by commercial/industrial trucking that minimize impacts on local traffic and neighborhoods.*
>
> *6.5.2 Continue to regulate on-street parking of trucks to prevent truck parking on residential streets or in other locations where they are incompatible with adjacent land uses. The use of signs, restricted parking, limited parking times, and the posting of "no overnight" parking signs are mechanisms that can be employed depending upon the specific needs of the affected area.*
>
> *6.5.3 Prepare neighborhood protection plans for areas of the City where heavy vehicle traffic or parking becomes a significant enforcement problem. (C-2)*
>
> *6.5.4 Require that on-site loading areas minimize interference of truck loading activities with efficient traffic circulation on adjacent roadways. (LU-1)*

There are existing Municipal Code provisions that govern the use of trucks or parking of trucks on specific streets within San Bernardino. The Code text establishes limits for these activities on the roadways based on vehicle weight, through the following sections. The primary Code section text is provided, and the locations listed in each section were mapped and are shown on Figure 2-1:

> *10.24.190 Commercial Vehicles Prohibited on Certain Streets*
> *A Pursuant to the authority and restrictions of Vehicle Code Sections 35701 , et seq., no person shall operate or drive any commercial vehicle upon the following streets, and the Traffic Engineer shall cause appropriate signage to be erected giving notice thereof…*
>
> *B. Pursuant to the authority and restrictions of Vehicle Code Sections 35701 , et seq., no person shall operate or drive any vehicle exceeding a maximum gross weight*

*limit of ten thousand pounds upon the following streets, and the Director of Public Services shall cause appropriate signs to be erected giving notice of such weight limitation prohibition…*

*C. Pursuant to the authority and restrictions of Vehicle Code Sections 35701, 35703, et seq., no person shall operate or drive any commercial vehicle having a manufacturer's Gross Vehicle Weight rating (GVWR) exceeding thirty thousand (30,000) pounds upon the following streets, and the Director of Public Services shall cause appropriate signs to be erected giving notice of such weight limitation prohibition…*

The following Municipal Code text establishes prohibitions for parking of trucks on public roadways under specific conditions. An exception is defined for trucks involved in construction activities:

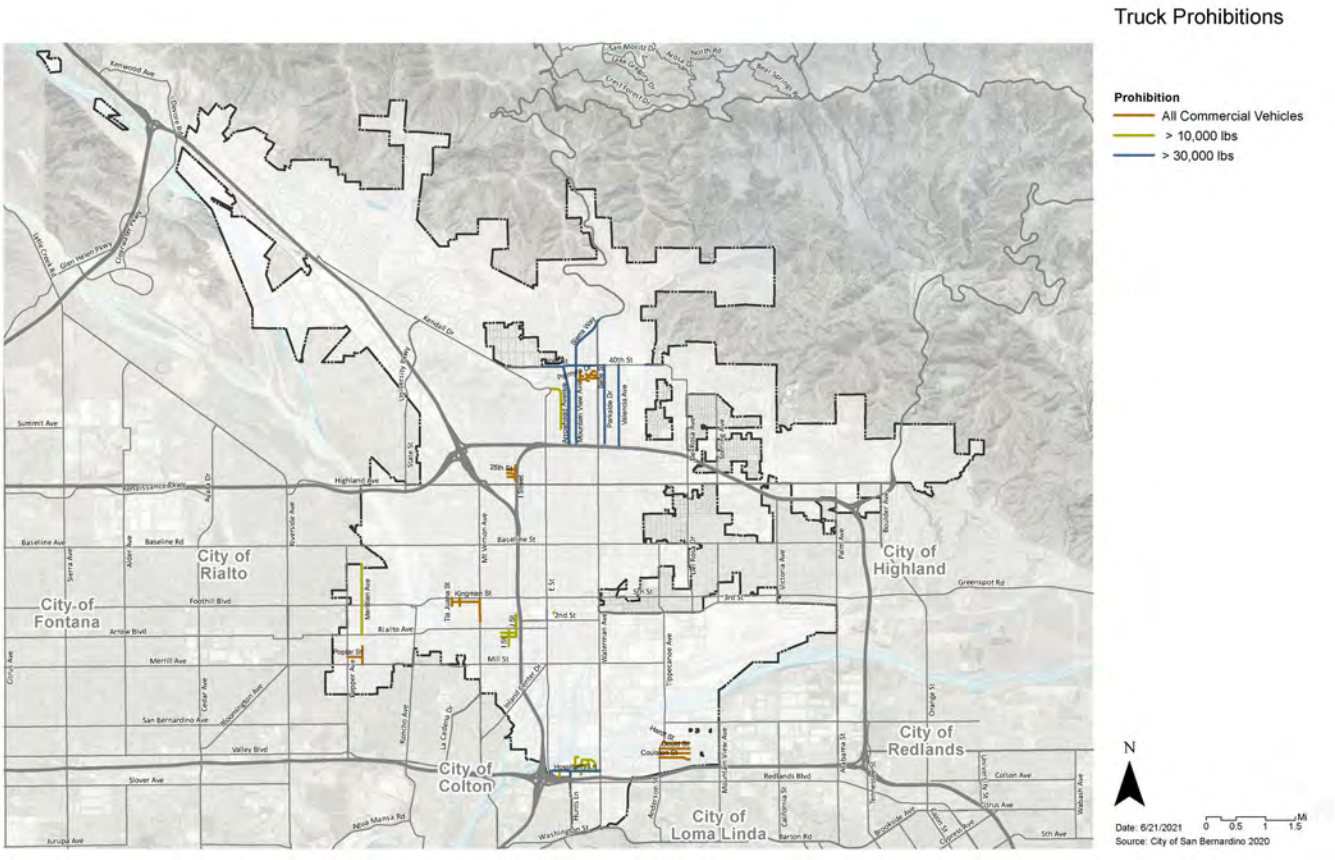
*10.16.120 Parking of Commercial Vehicles Prohibited on Public Streets and Rights-of-Way; Exceptions*
*A. No person shall park or stand any commercial vehicle, truck tractor, semitrailer or trailer having a manufacturer's gross vehicle weight rating of ten thousand (10,000) pounds or more on any street, alley or parkway in any residential district, or on any residentially zoned property in the city.*

*B. No person shall park or stand any commercial vehicle, truck tractor, semitrailer or trailer having a manufacturer's gross vehicle weight rating of ten thousand (10,000) pounds or more for a continuous period of time in excess of two (2) hours on any street, alley or parkway in any nonresidential district of the city. Each consecutive two (2) hour period shall be considered a separate violation for the purpose of this subsection.*

*C. The provisions of this section shall not apply to:*
*1. Any vehicle or trailer component thereof, making pick ups or deliveries of goods, wares or merchandise from or to any building or structure located on the restricted streets and highways, or for the purpose of delivering materials to be used in the actual and bona fide repair, alteration, remodeling or construction of any building or structure upon the restricted streets or highways for which a building permit has previously been obtained….*

*E. Any commercial vehicle, truck tractor, semitrailer or trailer having a manufacturer's gross vehicle weight rating of ten thousand (10,000) pounds or more left parked or standing on any street, alley or parkway in excess of twenty four (24) hours may be towed away pursuant to California Vehicle Code section 22651(n)….*

**Figure 2-1 – Current Roadway Truck Travel and Parking Prohibitions**




Sources: City of San Bernardino Municipal Code, KOA

With the establishment of regulatory truck routes defined by this document, and as adopted under future action by the City, the existing prohibitions on truck travel under Code section 10.24.190 can be removed from City regulations, or can remain to reinforce the use of the truck route network near these areas.

The proposed local truck route network defines permitted truck routes. Other roadways would be prohibited locations for truck travel and parking. The truck parking prohibitions defined under Code section 10.16.120 can continue to be enforced on all roadways, but truck movements to and from on-street parking, would be prohibited on roadways outside of the regulatory truck network within the city.

# 3 EXISTING TRUCKING CONDITIONS

## 3.1 ROADWAYS AND LAND USE

The existing land use, as defined by current General Plan analysis efforts, was mapped along with the local roadway network. This provided for the analysis of potential truck routes the consideration of patterns of industrial and commercial land uses that generally require deliveries or shipments of goods and materials by large tractor-trailer trucks. It also provided for an analysis of the framework of primary roadways that provide routes from these land uses to regional highway and freeway travel routes.

Figure 3-1 provides the roadway classifications within the city, with freeways as the highest order of travelway and providing regional access and access to local roadway interchanges. Highways and major arterials link with the freeway interchanges and regional route access points and provide access to all other local roadways. Trucks must use all levels of this network to travel between regional destinations and local land uses.

Figure 3-2 provides the existing land uses within the city. The first two categories in the legend were the primary targets for the analysis of land use – commercial (shown in red color) and industrial (shown in a dark grey-blue color). The city truck route network must serve all of these locations that require access by large trucks for daily operations and commerce.

**Figure 3-1 – Existing City Roadway Classifications**

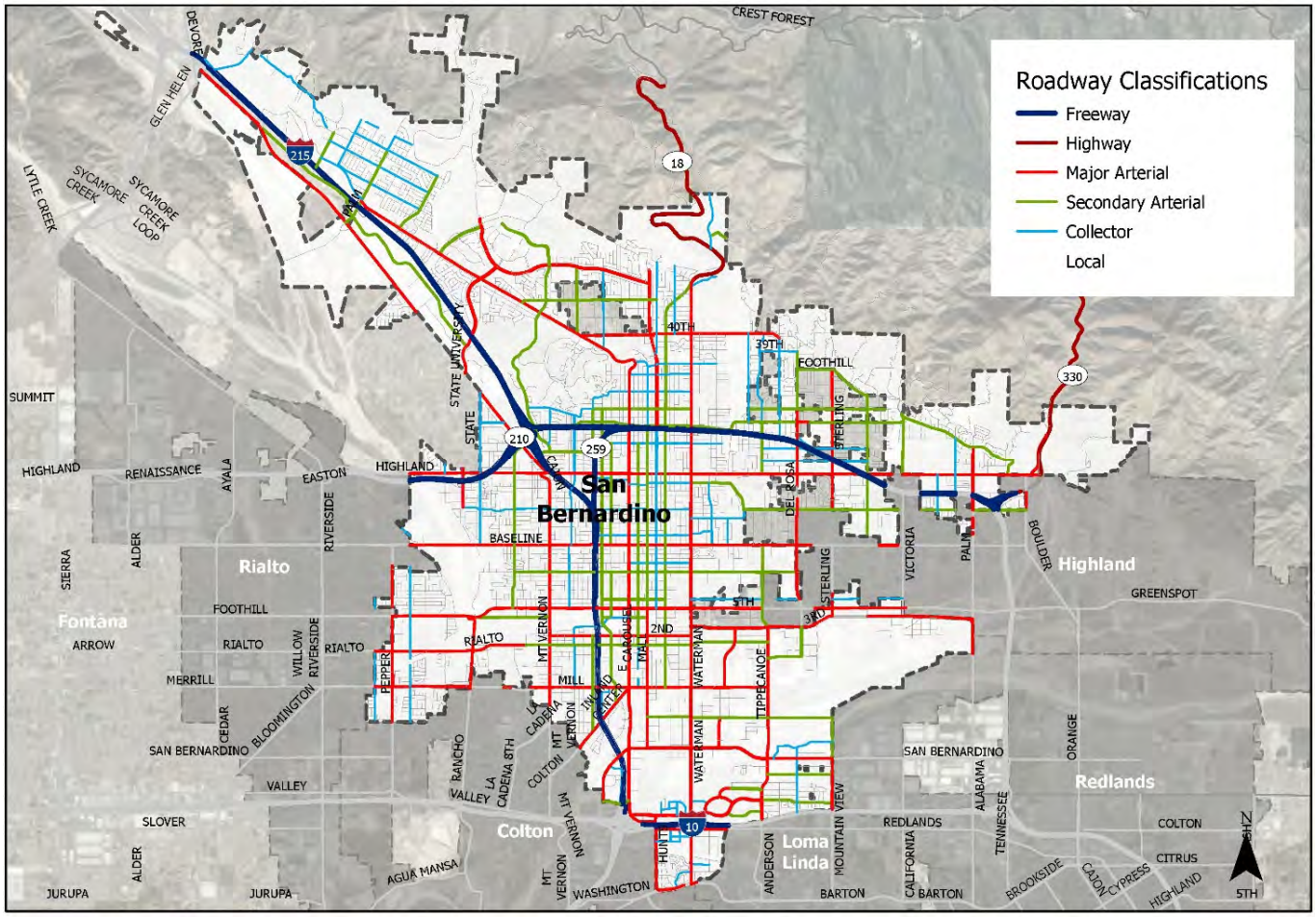
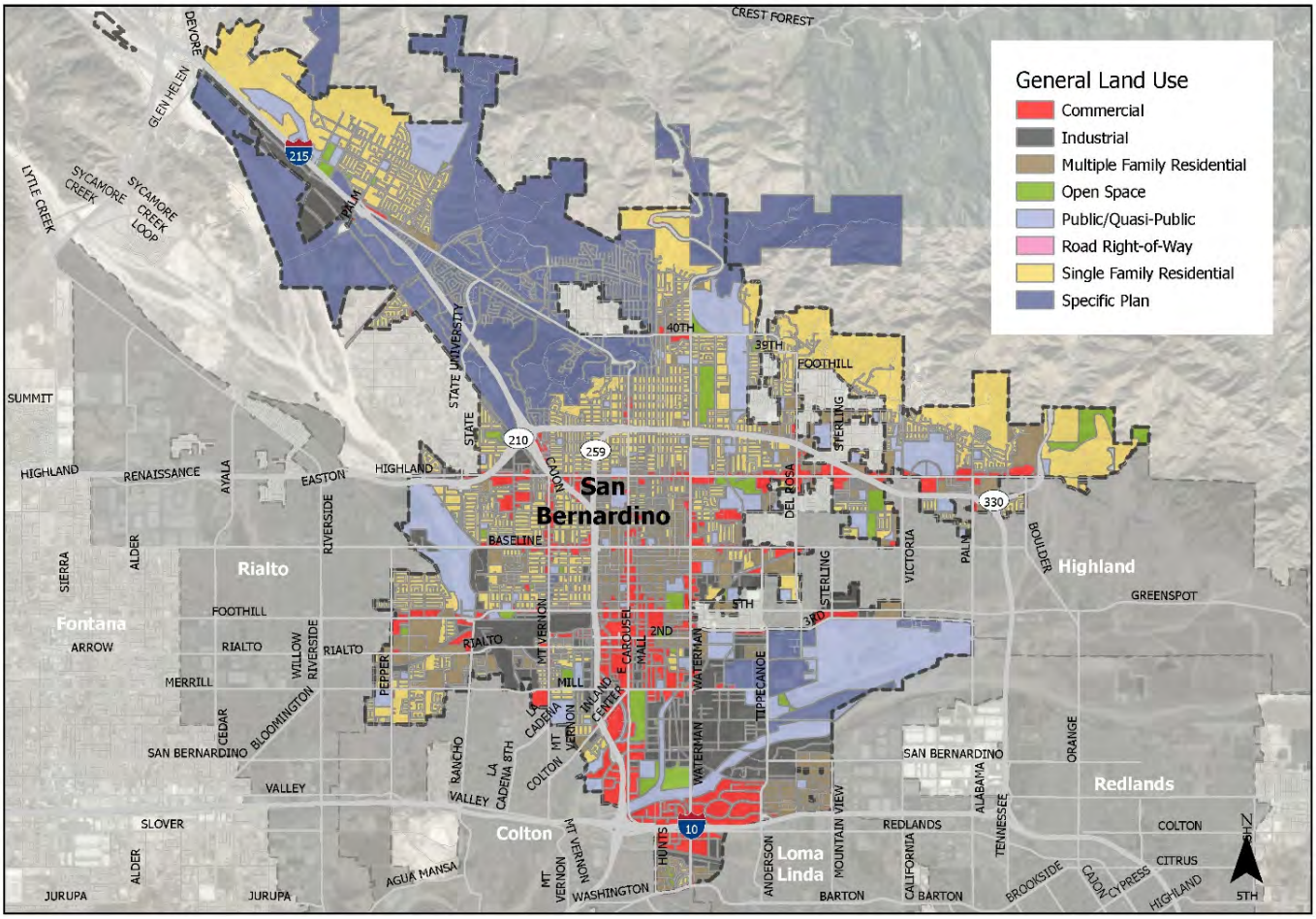


**Figure 3-2 – Existing City Land Use Patterns**




# 3.2 PAVEMENT CONDITIONS

Pavement conditions data, taken from visual surveys on roadways across the city that were conducted as input to the pavement management system, was mapped by location to create Figure 3-3. The information was compiled from the most recent data compiled for current pavement management actions by the City. The data is summarized as a Pavement Conditions Index (PCI) score.

The PCI value is a standard measurement in civil engineering to rate the condition of roadways. From visual surveys of pavement conditions, roadways are assigned a value within the range of 0 to 100. The value of 100 represents excellent pavement condition. Table 3-1 describes the ranges of PCI scores.

**Table 3-1 Pavement Condition Index (PCI) Values**

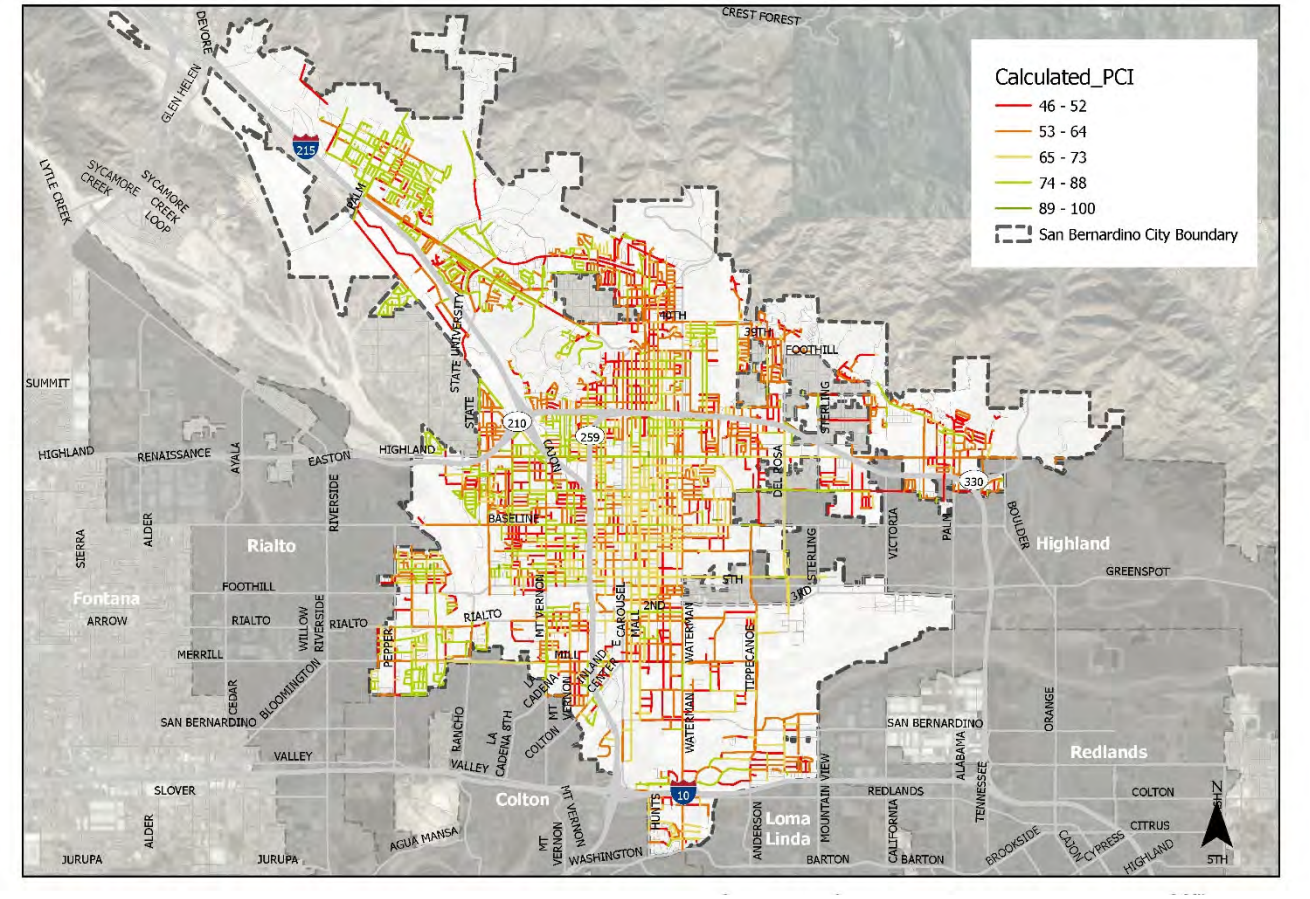
| PCI SCORE | CONDITION | DESCRIPTION |
|---|---|---|
| 100 – 70 | Very Good | Pavements that have no distress and require mostly preventative maintenance. |
| 70 – 50 | Good | Pavement in this range offers acceptable ride quality, though road surfaces are becoming worn to the point where rehabilitation is needed to prevent rapid deterioration. |
| 50 – 30 | Poor | Pavements that have extensive amounts of distress and require major rehabilitation or reconstruction. |
| 30 – 0 | Very Poor | |

Source: Street Saver software website

Figure 3-3 provides an illustration of the PCI values across the city. Segments with red color denote the lowest pavement quality category depicted at a value of 52 or lower. Each of five categories of values is shown, with the color changing from red to orange, to yellow, and to green, to denote the lowest to highest quality pavement categories.

A review was conducted of trucking terminals and other trucking destinations that are on roadways with low pavement ratings. These selected locations were identified through field visits and map searches. The review of these locations is provided in Appendix A.

**Figure 3-3 – Existing City Roadway Pavement Conditions**

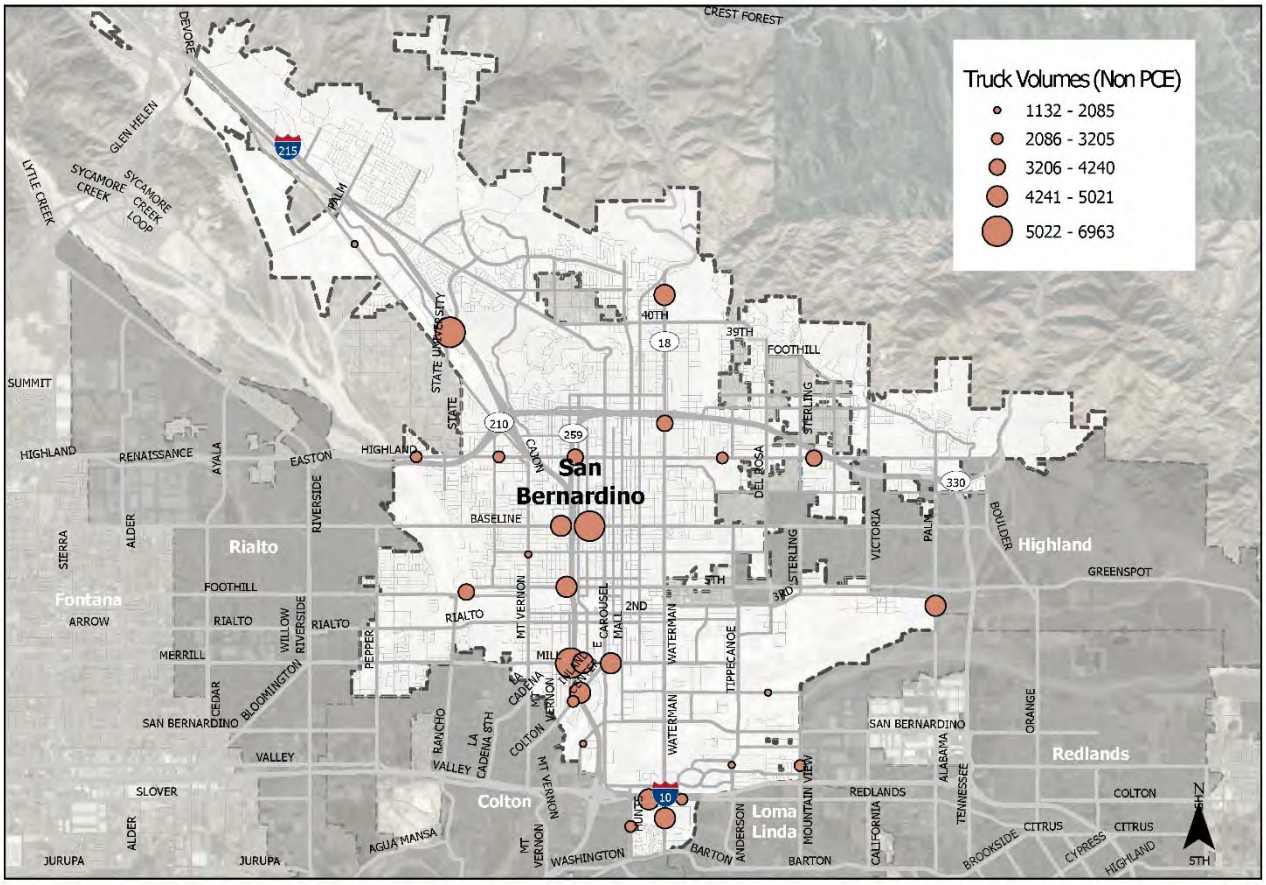



# 3.3 EXISTING ROADWAY VOLUMES

Roadway daily vehicle volumes were mapped, using data from the General Plan mobility analysis from the year 2021 and from new counts conducted for this study in 2022. The volumes are truck volumes only, without PCE (passenger car equivalency) factoring that is typically done for operations analysis.

The highest volumes are on State University Parkway, near the northern industrial corridors along Cajon Boulevard, on Waterman Avenue at the I-10 interchange and at the northern end of the city on the route to the mountain areas, on Baseline Avenue near the I-215 interchange, on 5th Street in the vicinity of the rail yards, on Mill Street near the I-215 interchange, and in the airport industrial areas on the southeast.

**Figure 3-4 – Current Roadway Truck Travel and Parking Prohibitions**



# 3.4 EXISTING TRUCK TRAVEL PATTERNS

Existing truck trip patterns were analyzed using data from the American Transportation Research Institute (ATRI), a company that compiles information from fleet GPS data. The data is aggregated, anonymized, and is non-customer specific. In order to have data across multiple seasons, to analyzed patterns across various time of the year, four time periods of data were acquired. The data attributes included a unique vehicle number, latitude, longitude, and speed.

The time periods of the dataset applied to this analysis were within the months of August 2021, November 2021, February 2022, and May 2022, for a two-week time period within each month. The geographic boundaries of the dataset was defined as a two-mile distance from the City of San Bernardino boundaries. The boundary was extended past the City limits, in order to include patterns within travel corridors that extend outward to other communities or regional connections. The data was used to identify major trucking routes and locations of terminals and other destinations, for the development of the proposed truck routes.

Figure 3-5 provides an illustration of the truck trip data points from one of the data sets, for the month where the level of trucking activity was the highest. Figure 3-6 provides a conglomeration of these data points, analyzing the data by density of trips and reducing the data down to major sites and corridors.

Two other elements of the analysis of existing truck trips that were applied to this study were a mapping of truck routing patterns provided by trucking mobile apps and in-field truck following. A summary of the analysis of the trucking mobile apps is provided in Appendix B, and a map of routes identified and the locations of terminals on these routes is provided in Appendix C. Results of the field following of trucks, over a three day period, is provided on the Appendix D figure. All of these efforts were used to define the proposed truck routes.

**Figure 3-5 – Existing Truck Activity**

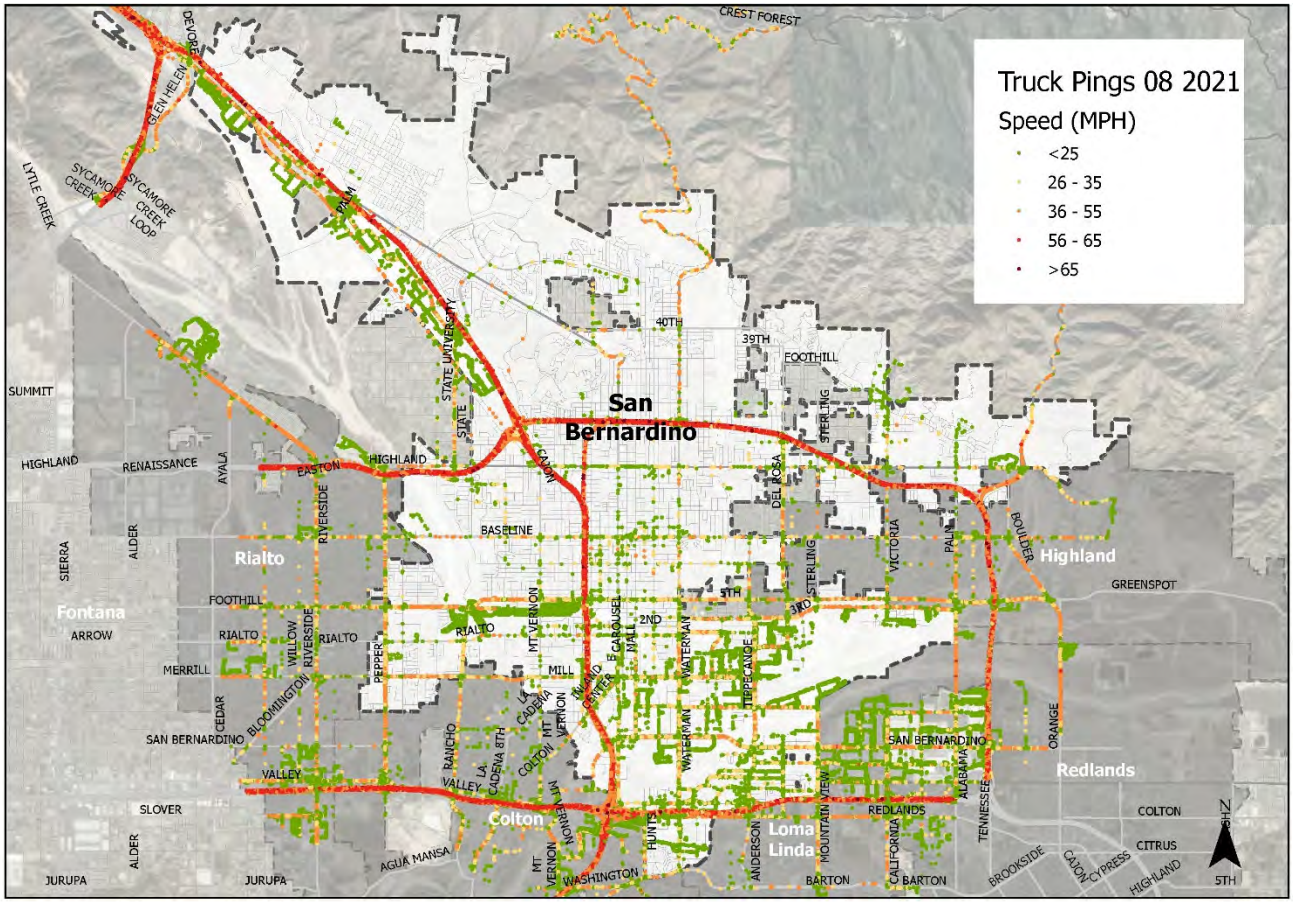
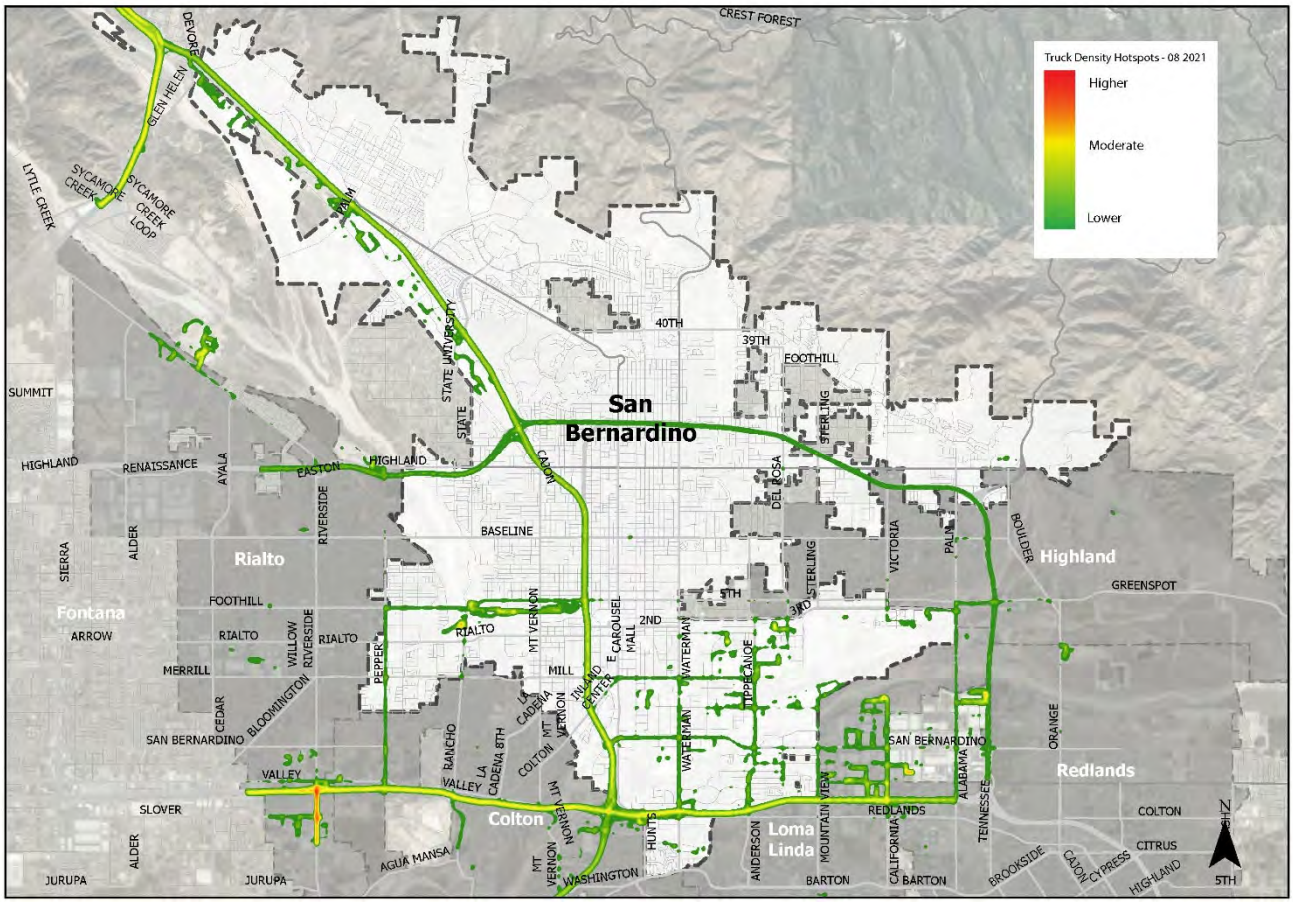


**Figure 3-6 – Existing Truck Trip Density**



# 4 IMPLEMENTATION

Implementation of the proposed truck routes requires posting of route regulatory signs, modification of the Municipal Code, further evaluation of overall roadway and lane widths, further evaluation of turning radius issues and potential improvements, overlap of routes with proposed bicycle facility locations, and neighboring agency coordination. These implementation steps are discussed in the sections below.

## 4.1 SUMMARY OF RECOMMENDED TRUCK ROUTES

Based on the analysis of roadway characteristics and trucking activity summarized in Section 3, a set of recommended truck routes within the city was developed, and is provided in Figure 4-1.

Most of the proposed truck route segments connect to regional routes on State Route highways or freeway interchanges, or link into other routes in neighboring cities. Others end at industrial parcels that require access, but do not continue further into nearby residential areas. A summary table of all recommended truck route segments is provided later in this section.

Figure 4-2 provides a map of the proposed truck routes with the existing land use. The coverage of the truck routes includes all major commercial areas and industrial parcels. Internal road networks within commercial centers and industrial centers were not included, as those roads are generally private and not controlled by the City.

**Figure 4-1 – Proposed Regulatory Truck Routes**

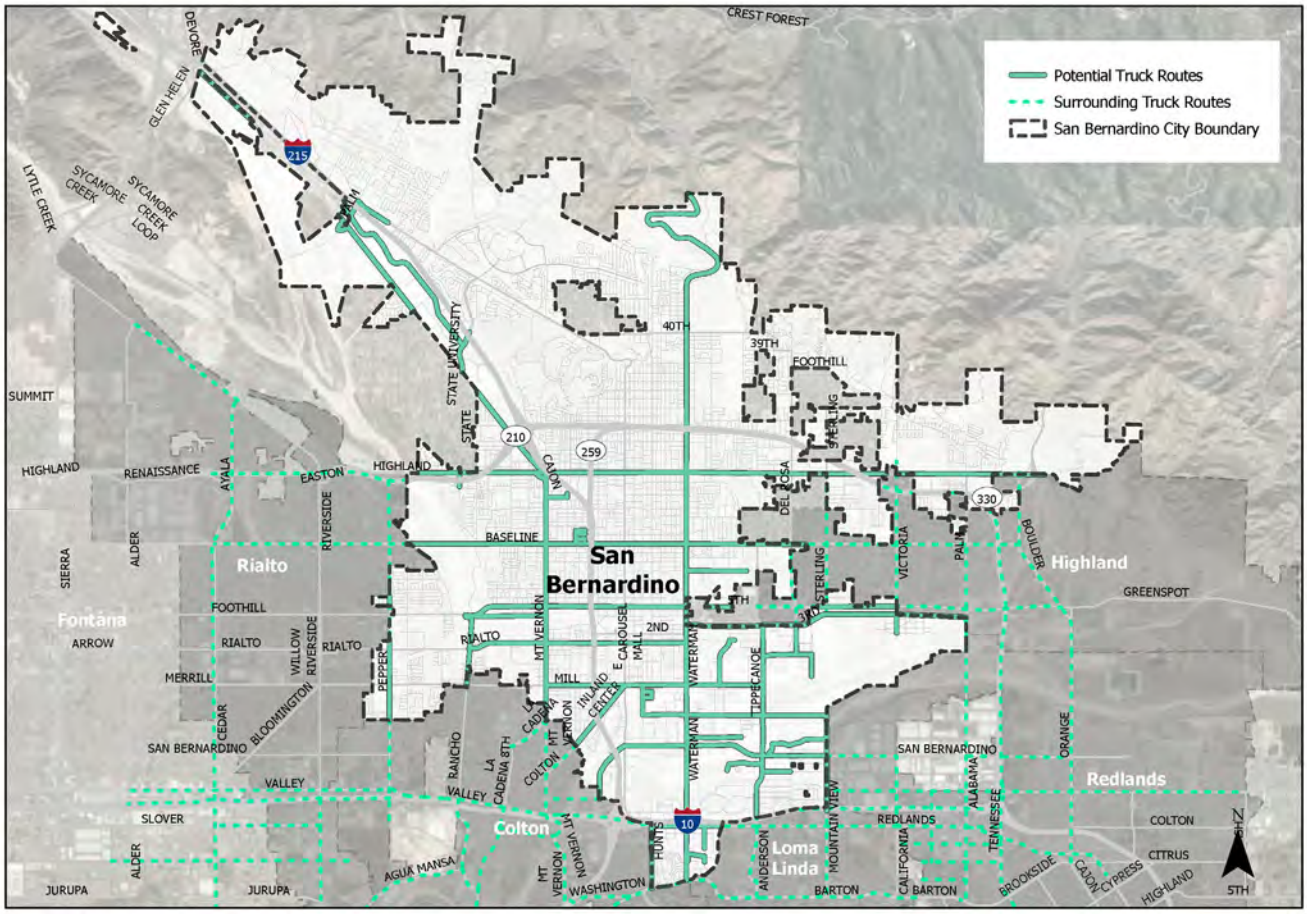


**Figure 4-2 – Proposed Regulatory Truck Routes with Land use**

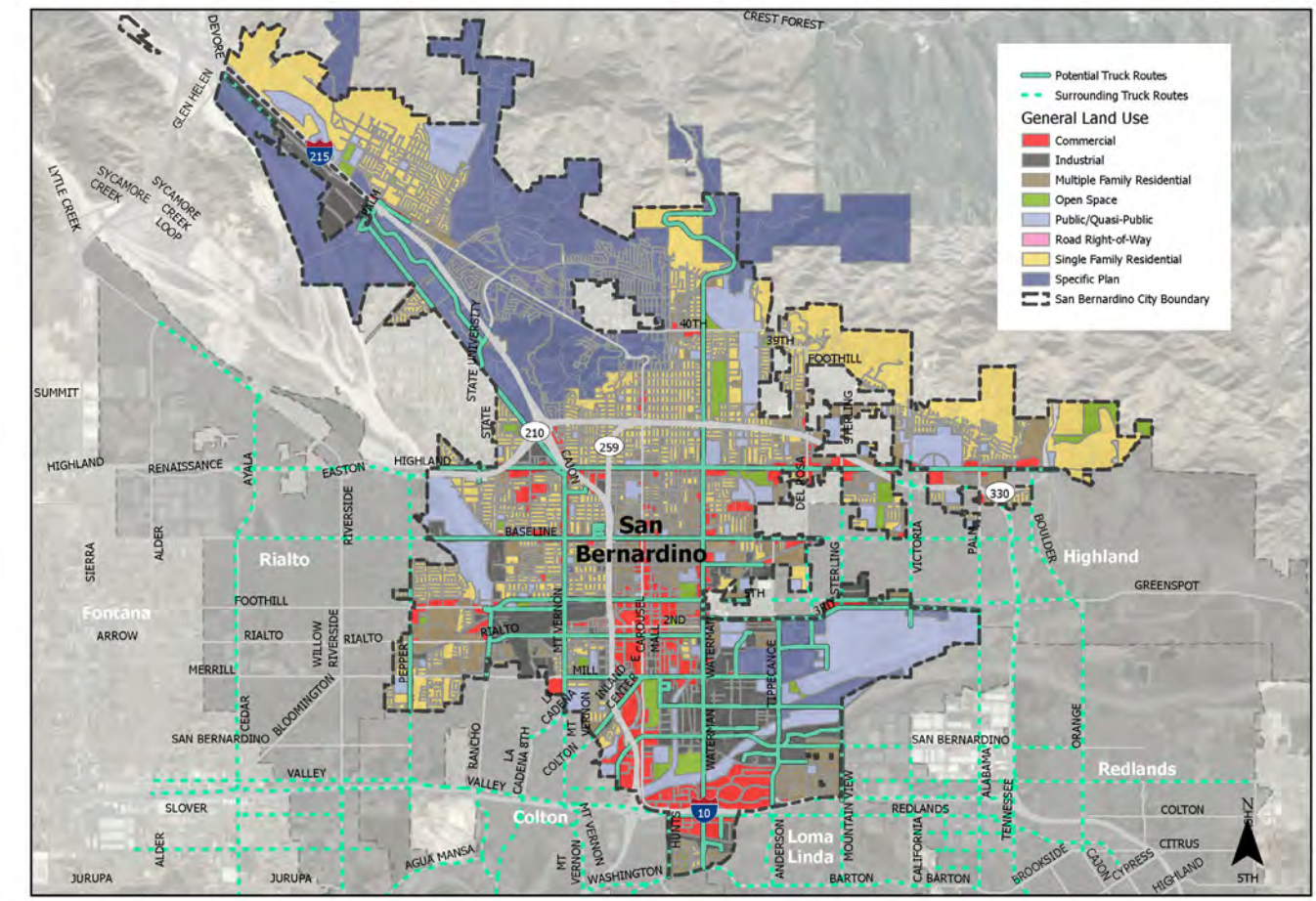



Table 4-1 provides a summary of all proposed truck routes with major categories of characteristics for each. Data on pavement quality from the City pavement management system is included, with high and low values across the total segments listed for each row of the table. The curb lane widths are also shown as high and low values across the segment. This width, minus areas permitted for on-street parking, should be 12 feet or wider for truck travel. Dimensions that are less than this are highlighted in blue in the table.

Proposed bicycle facilities from the Active Transportation Plan (ATP) of the City were included in the table, indicating where bicycle facility implementation may be in conflict with truck routes. If bicycle facilities are constructed within on-street parking areas, they would not affect lane widths. Reconfiguration of travel lanes for bicycle projects, however, could create lane widths that are less than 12 feet.

**Table 4-1 Truck Route Segment Characteristics**

| ROADWAY SEGMENT | FROM | TO | PAVEMENT QUALITY (PCI) - LOW VALUE | PAVEMENT QUALITY HIGH VALUE | CURB LANE WIDTH LOW VALUE | CURB LANE WIDTH HIGH VALUE | CURB LANE WIDTH MINUS PARKING | PROPOSED BICYCLE FACILITY |
|---|---|---|---|---|---|---|---|---|
| 13TH ST | PERRIS ST | END | | 46 | | 18 | 10 | |
| 17TH ST | MT VERNON AV | MASSACHUSETTS AV | | 64 | | 14 | * | |
| 3RD ST | WATERMAN AV | TIPPECANOE AV | 64 | | 16 | 17 | 11 | |
| 3RD ST | VICTORIA AV | ALABAMA ST | | | | 13 | 13 | |
| 3RD ST | TIPPECANOE AV | DEL ROSA AV | 52 | | 15 | 30 | 30 | |
| 3RD ST | DEL ROSA AV | VICTORIA AV | 100 | 100 | | 15 | 15 | |
| 4TH ST | 5TH ST | TIA JUANA ST | | 52 | 18 | 18 | 10 | |
| 4TH ST | TIA JUANA ST | END ST | | 76 | | 25 | 17 | |
| 5TH ST | CITY LIMIT AT WASH | CITY LIMIT NEAR PEDLEY RD | 64 | | 12 | 13 | 13 | |
| 5TH ST | I-215 NB | WATERMAN AV | 64 | 82 | | 17 | 9 | II |
| 5TH ST | RANCHO AV | MT VERNON AV | | 100 | 16 | 20 | 12 | II |
| 5TH ST | MT VERNON | I-215 SB | | | | 15 | 15 | II |
| 5TH ST | STERLING AV | VICTORIA AV | | 100 | | 13 | 13 | |

**Table 4-1 Truck Route Segment Characteristics**

| ROADWAY SEGMENT | FROM | TO | PAVEMENT QUALITY (PCI) - LOW VALUE | PAVEMENT QUALITY HIGH VALUE | CURB LANE WIDTH LOW VALUE | CURB LANE WIDTH HIGH VALUE | CURB LANE WIDTH MINUS PARKING | PROPOSED BICYCLE FACILITY |
|---|---|---|---|---|---|---|---|---|
| 9TH ST | WATERMAN AV | 760 FT EAST OF PEDLEY RD | 64 | 70 | | 16 | 8 | II |
| ARROWHEAD AV | MILL ST | CENTRAL AV | | 70 | 12 | 14 | 14 | II |
| AUTO CENTER RD | I-215 FWY | FAIRWAY DR | | 64 | | 11 | 11 | |
| BASELINE ST | WATERMAN AV | OSBUN RD | 64 | 100 | 16 | 18 | 18 | IV |
| BASELINE ST | I-215 NB | WATERMAN AV | 64 | 88 | | 16 | 16 | IV |
| BASELINE ST | MEDICAL CENTER DR | I-215 SB | 52 | 82 | 14 | 18 | 18 | IV |
| BASELINE ST | WEST CITY LIMIT | MEDICAL CENTER DR | 46 | 58 | 17 | 20 | 20 | IV |
| CAJON BL | CALIFORNIA ST | MEDICAL CTR DR | | 76 | | 12 | 12 | IV |
| CAJON BL | MEDICAL CTR DR | HIGHLAND AV | 70 | 76 | | 12 | 12 | IV |
| CAJON BL | REX COLE RD | KENDALL DR | 64 | 100 | 12 | 16 | 16 | |
| CAJON BL | PALM AV | JUNE ST | 52 | 100 | | 20 | 20 | IV |
| CENTRAL AV | TIPPECANOE AV | MOUNTAIN VIEW AV | | 76 | | 13 | 13 | |
| CENTRAL AV | WATERMAN AV | TIPPECANOE AV | 52 | 70 | 12 | 18 | 18 | |

**Table 4-1 Truck Route Segment Characteristics**

| ROADWAY SEGMENT | FROM | TO | PAVEMENT QUALITY (PCI) - LOW VALUE | PAVEMENT QUALITY HIGH VALUE | CURB LANE WIDTH LOW VALUE | CURB LANE WIDTH HIGH VALUE | CURB LANE WIDTH MINUS PARKING | PROPOSED BICYCLE FACILITY |
|---|---|---|---|---|---|---|---|---|
| CENTRAL AV | ARROWHEAD AV | WATERMAN AV | | 64 | | 20 | 20 | |
| COMMERCIAL RD | WATERMAN AV | WATERMAN FRONTAGE RD | | 70 | | 32 | 32 | |
| COOLEY AV | SUNNYSIDE AV | TIPPECANOE AV | | 70 | 15 | 17 | 17 | |
| COOLEY AV | END | SUNNYSIDE AV | 52 | 64 | | 22 | 14 | |
| DEL ROSA DR | 3RD ST | HARRY SHEPPARD BL | | 70 | 14 | 18 | 18 | |
| ESPERANZA ST | ARROWHEAD AV | MOUNTAIN VIEW AV | | | | 16 | * | |
| GARDENA ST | REDLANDS BLVD | END | | | | 14 | * | |
| HARRY SHEPPARD BL | TIPPECANOE AV | DEL ROSA DR | | 70 | 15 | 16 | 16 | |
| HARRY SHEPPARD BL | DEL ROSA DR | LELAND NORTON WY | | | | 13 | 13 | |
| HIGHLAND AV | WEST CITY LIMIT | MT VERNON AV | 64 | 76 | 13 | 20 | 20 | IV |
| HIGHLAND AV | I-215 FWY | SR-259 | 58 | 100 | 12 | 14 | 14 | IV |
| HIGHLAND AV | SR-259 | WATERMAN AV | 64 | 100 | 16 | 17 | 9 | IV |
| HIGHLAND AV | WATERMAN AV | DEL ROSA AV | 64 | 88 | 13 | 17 | 17 | IV |
| HIGHLAND AV | DEL ROSA AV | VICTORIA AV | 58 | 64 | 16 | 25 | 25 | IV |

**Table 4-1 Truck Route Segment Characteristics**

| ROADWAY SEGMENT | FROM | TO | PAVEMENT QUALITY (PCI) - LOW VALUE | PAVEMENT QUALITY HIGH VALUE | CURB LANE WIDTH LOW VALUE | CURB LANE WIDTH HIGH VALUE | CURB LANE WIDTH MINUS PARKING | PROPOSED BICYCLE FACILITY |
|---|---|---|---|---|---|---|---|---|
| HIGHLAND AV | VICTORIA AV | PALM AV | 52 | 58 | 16 | 20 | 12 | IV |
| HIGHLAND AV | PALM AV | SUMMERT RAIL PL | 58 | 64 | 12 | 15 | 15 | IV |
| HOME AV | PERRIS ST | END | | 64 | | 15 | * | |
| HUFF ST | ARROWHEAD AV | MOUNTAIN VIEW AV | | 46 | | | * | |
| HUNTS LN | REDLANDS BL | WASHINGTON ST | 52 | 100 | | 16 | 16 | |
| INDUSTRIAL PKWY | KENDALL DR | UNIVERSITY PKWY | | 52 | | 12 | 12 | |
| INDUSTRIAL RD | WATERMAN FRONTAGE RD | STEELE RD | | 70 | | 19 | * | |
| INLAND CENTER DR | MILL ST | CITY LIMIT | 58 | 100 | | 14 | 14 | |
| KENDALL DR | PALM AV | PINE AV | | 64 | 13 | 22 | 22 | |
| LELAND NORTON WY | HARRY SHEPPARD BL | END | | | 12 | 19 | 19 | |
| LENA RD | RIALTO AV | MILL ST | | 64 | | 13 | 13 | |
| MASSACHUSETTS AV | MASSACHUSETTS DEVIATION TO BRIDGE | 17TH ST | | | 15 | 18 | 10 | NS |
| MASSACHUSETTS AV | 150 FT NORTH OF MASSACHUSETTS BRIDGE DEVIATION | MASSACHUSETTS AV | | | 11 | 13 | * | |

**Table 4-1 Truck Route Segment Characteristics**

| ROADWAY SEGMENT | FROM | TO | PAVEMENT QUALITY (PCI) - LOW VALUE | PAVEMENT QUALITY HIGH VALUE | CURB LANE WIDTH LOW VALUE | CURB LANE WIDTH HIGH VALUE | CURB LANE WIDTH MINUS PARKING | PROPOSED BICYCLE FACILITY |
|---|---|---|---|---|---|---|---|---|
| MILL ST | I-215 | WATERMAN AV | 52 | 64 | | 17 | 17 | II |
| MILL ST | WATERMAN AV | TIPPECANOE AV | 52 | 64 | | 12 | 12 | II |
| MILL ST | MT VERNON AV | I-215 SB | 58 | 58 | | 13 | 13 | II |
| MOUNTAIN VIEW AV | SAN BERNARDINO AV | I-10 WB | | 100 | 12 | 15 | 15 | |
| MOUNTAIN VIEW AV | CENTRAL AV | SAN BERNARDINO AV | 64 | | | 13 | 13 | |
| MOUNTAIN VIEW AV | HUFF ST | ESPERANZA ST | | 52 | | 17 | * | |
| MT VERNON | MILL ST | GRANT AV | 58 | 82 | 15 | 16 | 16 | IV |
| MT VERNON AV | RIALTO AV | MILL ST | 58 | 100 | | 15 | 15 | IV |
| MT VERNON AV | BASELINE ST | 5TH | 58 | 76 | | 16 | 8 | IV |
| MT VERNON AV | HIGHLAND AV | BASELINE ST | 64 | 76 | | 15 | 7 | IV |
| MT VERNON AV | 21ST ST | HIGHLAND AV | | 76 | 15 | 17 | 9 | II |
| MT VERNON AVE | 5TH ST | 4TH ST | | 64 | 16 | 18 | 18 | II |
| NORMAN RD | LENA RD | CLEVENGER DR | | 70 | | 15 | * | |
| NORMAN RD | WATERMAN AV | LENA RD | 46 | 70 | 16 | 20 | 12 | |
| ORANGE SHOW RD | E ST | WATERMAN AV | 52 | 70 | | 20 | 12 | II |
| ORANGE SHOW RD | WATERMAN AV | TIPPECANOE AV | 58 | 70 | 20 | 20 | 20 | II |
| PALM AV | INDUSTRIAL PKWY | KENDALL DR | 46 | 100 | | 12 | 12 | II |

**Table 4-1 Truck Route Segment Characteristics**

| ROADWAY SEGMENT | FROM | TO | PAVEMENT QUALITY (PCI) - LOW VALUE | PAVEMENT QUALITY HIGH VALUE | CURB LANE WIDTH LOW VALUE | CURB LANE WIDTH HIGH VALUE | CURB LANE WIDTH MINUS PARKING | PROPOSED BICYCLE FACILITY |
|---|---|---|---|---|---|---|---|---|
| PALM AV | PALM AV RAMP | CAJON BL | | 100 | 14 | 15 | 15 | II |
| PEPPER AV | CITY LIMIT NORTH | RANDALL AV | 52 | 100 | 15 | 18 | 18 | II |
| PEPPER AV | 6TH ST | SPRUCE ST | | 52 | 12 | 15 | 15 | |
| PERRIS ST | HOME AV | BASELINE ST | 52 | 76 | | 14 | * | |
| RANCHO AV | 5TH ST | RIALTO AV | 64 | 76 | 13 | 34 | 34 | |
| RANCHO AV | RIALTO AV | MILL ST | 46 | 100 | 20 | 24 | 16 | |
| RANCHO AV | MILL ST | CITY LIMIT | | 100 | | 15 | 15 | |
| REDLANDS BL | HUNTS LN | EAST CITY LIMIT | 52 | 64 | | 21 | 21 | |
| REECE ST | PERRIS ST | END | | 46 | | 18 | 10 | |
| RIALTO AV | RANCHO AV | MT VERNON AV | 52 | 70 | 18 | 20 | 20 | II |
| RIALTO AV | I-215 NB | WATERMAN AV | 64 | 70 | 15 | 16 | 16 | IV |
| RIALTO AV | MT VERNON AV | I-215 SB | 52 | 70 | 17 | 18 | 10 | IV |
| RIALTO AV | LENA RD | 330 FT EAST OF LENA RD | | | | 12 | * | III |
| RIVERVIEW DR | SAN BERNARDINO AV | MOUNTAIN VIEW AV | | 64 | 20 | 21 | 13 | |
| SAN BERNARDINO AV | RICHARDSON ST | MOUNTAIN VIEW AV | | 52 | | 20 | 12 | |
| SAN BERNARDINO AV | TIPPECANOE AV | RICHARDSON ST | 52 | 70 | | 14 | 14 | |

**Table 4-1 Truck Route Segment Characteristics**

| ROADWAY SEGMENT | FROM | TO | PAVEMENT QUALITY (PCI) - LOW VALUE | PAVEMENT QUALITY HIGH VALUE | CURB LANE WIDTH LOW VALUE | CURB LANE WIDTH HIGH VALUE | CURB LANE WIDTH MINUS PARKING | PROPOSED BICYCLE FACILITY |
|---|---|---|---|---|---|---|---|---|
| STATE ST | SR-210 EB | I-215 EB | 52 | 100 | 11 | 12 | 12 | II |
| STATE ST | HIGHLAND AV | SR-210 EB | | 100 | 11 | 12 | 12 | |
| STEELE RD | INDUSTRIAL RD | COMMERCIAL RD | | | | 19 | 11 | |
| TIPPECANOE AV | CENTRAL AV | SAN BERNARDINO AV | 64 | 64 | 19 | 23 | 23 | II |
| TIPPECANOE AV | MILL ST | CENTRAL AV | 64 | | 13 | 15 | 15 | II |
| TIPPECANOE AV | ORANGE SHOW RD | I-10 WB | 52 | 64 | 12 | 13 | 13 | II |
| TIPPECANOE AV | 3RD ST | MILL ST | 70 | 76 | 14 | 21 | 21 | II |
| VICTORIA AV | TIPPECANOE AV | RICHARDSON ST | | 70 | | 21 | 21 | |
| VICTORIA AV | 3RD ST | SABO WY | | | 17 | 19 | 19 | |
| VICTORIA AV | SABO WY | U ST | | | 13 | 14 | 14 | |
| WATERMAN AV | ORANGE SHOW RD | I-10 WB | 64 | 100 | | 20 | 20 | II |
| WATERMAN AV | MILL ST | ORANGE SHOW RD | 64 | 82 | 20 | 22 | 22 | NS |
| WATERMAN AV | 5TH ST | MILL ST | 64 | 64 | | 15 | 15 | NS |
| WATERMAN AV | I-10 FWY | BARTON RD | 64 | 100 | | 12 | 12 | II |
| WATERMAN AV | BASELINE ST | 5TH ST | | 64 | 15 | 20 | 20 | NS |
| WATERMAN AV | HIGHLAND AV | BASELINE ST | 64 | 70 | | 18 | 10 | NS |
| WATERMAN AV | SR-210 | HIGHLAND AV | 52 | 64 | 12 | 18 | 10 | NS |
| WATERMAN AV | 40TH ST | SR-210 | | | | 14 | 14 | NS |

**Table 4-1 Truck Route Segment Characteristics**

| ROADWAY SEGMENT | FROM | TO | PAVEMENT QUALITY (PCI) - LOW VALUE | PAVEMENT QUALITY HIGH VALUE | CURB LANE WIDTH LOW VALUE | CURB LANE WIDTH HIGH VALUE | CURB LANE WIDTH MINUS PARKING | PROPOSED BICYCLE FACILITY |
|---|---|---|---|---|---|---|---|---|
| WATERMAN AV | NORTH CITY LIMIT | ARROWHEAD RD | | 100 | | 15 | 15 | |
| WATERMAN AV | SIERRA WY | 40TH ST | | | 15 | 16 | 16 | NS |
| WATERMAN FRONTAGE RD | INDUSTRIAL RD | COMMERCIAL RD | | 70 | | 16 | * | |

* Roadway is a local two-lane road with shared lane and parking space. This measurement does not apply.
Bikeway designations: II – Class II bicycle lane, III – Class III signed/sharrow route, IV – Class IV separate bikeway, NS – Neighborhood bikeway (sharrows, access restrictions)

# 4.2 TURNING RADIUS ANALYSIS

Selected intersections along the proposed truck routes were analyzed for potential truck turning issues. The analyzed locations are where four-lane roads meet two-lane roads, or where all approaching roadways are two-lane roads. The roadways were selected in this manner to identify potential restrictions in geometry at intersections on these smaller roadways, where trucks would be turning. The identified issues are potential curb overruns, where turning trucks may not have adequate space at corners to turn without going off the pavement or over curbs, based on the turning radius. These locations may have to be evaluated further and potentially improved as part of the implementation of the truck routes.

The truck turning radius analysis drawings are provided in Appendix E.

**Table 4-2 Truck Turning Radius Issues at Intersections**

| | | POTENTIAL CURB OVERRUN, BY CORNER LOCATION | | | |
|---|---|---|---|---|---|
| ROADWAY | CROSS STREET | NW | NE | SW | SE |
| Mountain View Ave | San Bernardino Ave * | X | | X | |
| Waterman Ave | Rialto Ave | X | | | X |
| Mt Vernon Ave | Mill St | X | X | | X |
| Rancho Ave | Rialto Ave | X | X | | X |
| Rancho Ave | Foothill Blvd | | | | X |
| Waterman Ave | 5th St | X | | X | X |
| Mt Vernon Ave | Highland Ave | | | X | X |
| Mt Vernon Ave | 21st St (next to Cajon Blvd) | | | | |
| Palm Ave | Cajon Blvd | | | | |
| W 4th St | W 5th St | | | | |
| State St | Highland Ave * | | | | |
| Alabama St | E 3rd St * | X | | X | X |
| Victoria Ave | 5th St * | X | | X | X |
| Redlands Blvd/E Steel Rd | S Hunts Ln * | | X | | X |
| N Del Rosa Dr | E Baseline St * | | X | X | X |

* On or near City boundary
Note: Cajon Boulevard is also "Historic Route 66"
NW = northwest, NE = northeast, SW = southwest, SE = southeast

# 4.3 MUNICIPAL CODE UPDATES

Existing City truck prohibitions are defined by Municipal Code Section 10.24.190, "Commercial Vehicles Prohibited on Certain Streets. It is recommended that this Code section be amended to include the following two paragraphs:

> *"The City Council finds that a city-wide truck route study has been completed in full compliance with the requirements of the California Vehicle Code and the recommendations in the study should be implemented. Based upon the review of the study and related information, the city council has identified by resolution those city roadways to become regulatory truck routes, and finds that all trucks within the city shall be operated only on the truck routes illustrated on the "Approved Truck Routes" map, attached hereto and made a part hereof, when appropriate route signs and end-of-route or no trucks signs (where necessary) are erected along the routes."*
>
> *"Pursuant to Vehicle Code §§ 21101 and 35700 et seq., the city council prohibits any commercial vehicle exceeding a manufacturer's gross vehicle weight rating of 10,000 pounds (five tons) from using any identified city highways or identified CSA roads within a residential area for any duration of the day or from using any identified city highways or identified CSA roads if the use of such highways or roads may adversely affect traffic circulation or safety within a residential area."*

Specific truck travel prohibition signs can continue to be used in areas that may require it, based on City enforcement of the regulatory truck routes and neighborhood needs. This need can be documented in the Code amendment. The City Engineer should be allowed discretion, after implementation of the truck routes, in installing a minimum amount of truck prohibition signs (R5-2) required to provide adequate notice to truck drivers to instruct them which routes are restricted for trucks use. These signs should continue to be used, or should be erected as new signs, only if the following applies:

1. If trucks are repeatedly using a particular roadway in violation of the truck route policy, by cutting through a residential neighborhood when an alternate route on a designated truck route is available.

2. If repeated travel by trucks on a roadway has resulted in trucks becoming stuck or causing roadway or property damage due to inadequate roadway widths, tight turning radii, a lower tree canopy, or an excessive street grade.

3. If truck travel is prominent on roadways determined by the City to be inappropriate for truck traffic, based on adjoining land uses and/or the local nature of the roadway.

4. If the level of truck traffic on a roadway is consistently and noticeably higher than what would be typical for a facility of that classification.

## 4.4 AGENCY COORDINATION AND ENVIRONMENTAL REVIEW

Letters can be provided by the City of San Bernardino to the neighboring city managers, public works directors, and city engineers to provide notice on the planned truck route network. A review period can be provided before final City Council approval of the study and recommended truck routes. The recommended truck route network, however, has been developed to match the truck routes of adjacent cities on the same roadways that cross between jurisdictions. Therefore, no recommended San Bernardino truck route would send traffic into a neighboring city without the presence of a continuing truck route past the City boundary.

California Environmental Quality Act Guidelines (CEQA) Section 15301(c), permits categorical exemptions from CEQA for actions such as the regulatory truck routes. Adoption of a citywide truck route ordinance to amend existing sections with specified streets is exempt, as the truck routes formalize existing patterns of trucking activity, matching the use of the existing roadways currently used by trucks. No new segments of roads have been identified for truck routes that are not currently used by trucks, or are not currently one of multiple alternate and primary routes to an industrial or commercial parcel. Therefore, the adoption of the proposed truck routes would not change the distribution of truck traffic compared to existing conditions.

In addition, in accordance with CEQA Guidelines 15301, the recommended Code amendments are categorically exempt from CEQA in that they relate to operation of public streets and expansion of use would not occur.

APPENDIX A:

LOCAL TRUCKING DESTINATIONS ON ROADWAYS
WITH LOW PAVEMENT RATINGS

**8142 – West 13th between N K St & Montgomery** – lots of trucks & trailers parked at the east end of 13th, unknown who owns or operates this truck yard


**20158 – N J St between West 2nd & West 3rd –** near large BNSF rail yard, satellite shows one truck parked along route

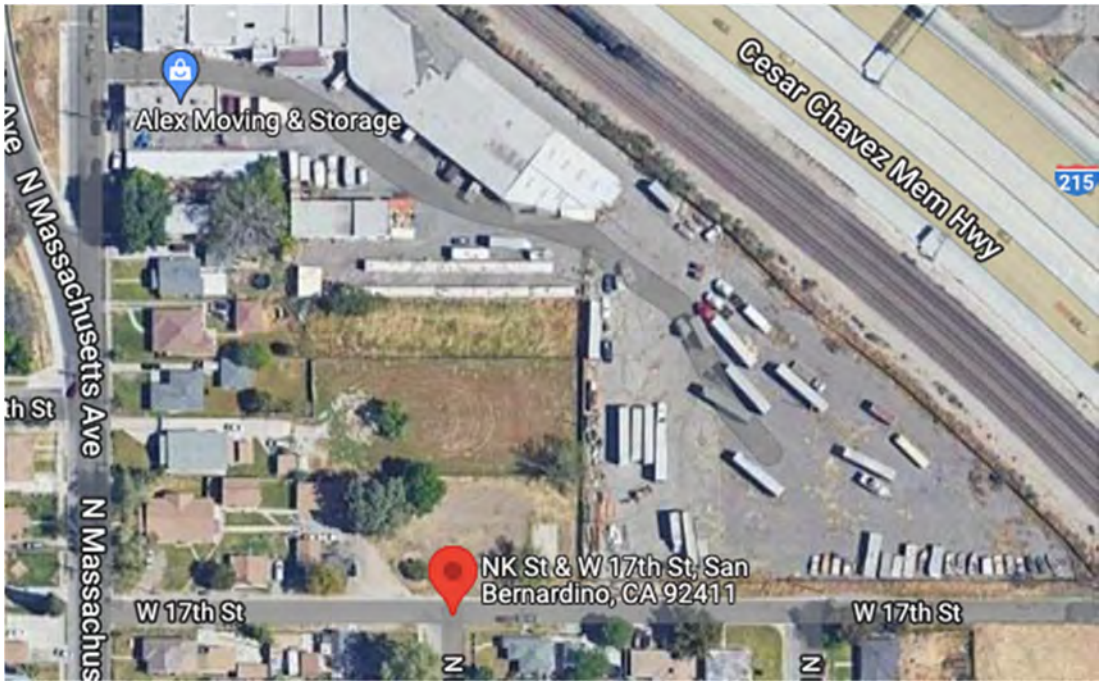

**26672 – N J St between 16th & 17th –** a residential street but is near a truck area likely operated by Alex Moving & Storage (a moving company which operates full-sized semi trucks & trailers)


**26446 – 7th St between N Sierra Way & N Waterman Ave –** near large auto yards & a truck parts store, so not inconceivable a truck could end up there

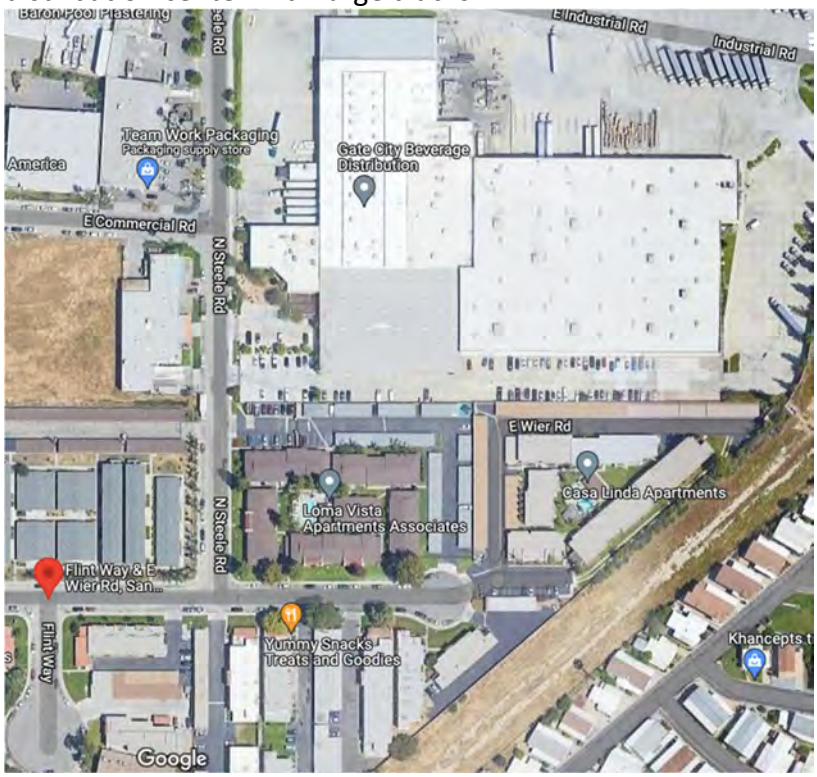
**26044 – E Olive St from Belvan Ave to end –** next to a truck/trailer yard which is also a First Transit yard that looks to be for school buses, but photos show many semi truck/trailers as well.


**26040 – S J St from W Congress St to end –** Access shuttle bus yard along this street, though looks like yard may possibly be used for some small box trucks as well

**25982 – W 17th St from N K St to N Massachusetts Ave –** near the Alex Moving & Storage yard, on the same route as N J St between 16th & 17th

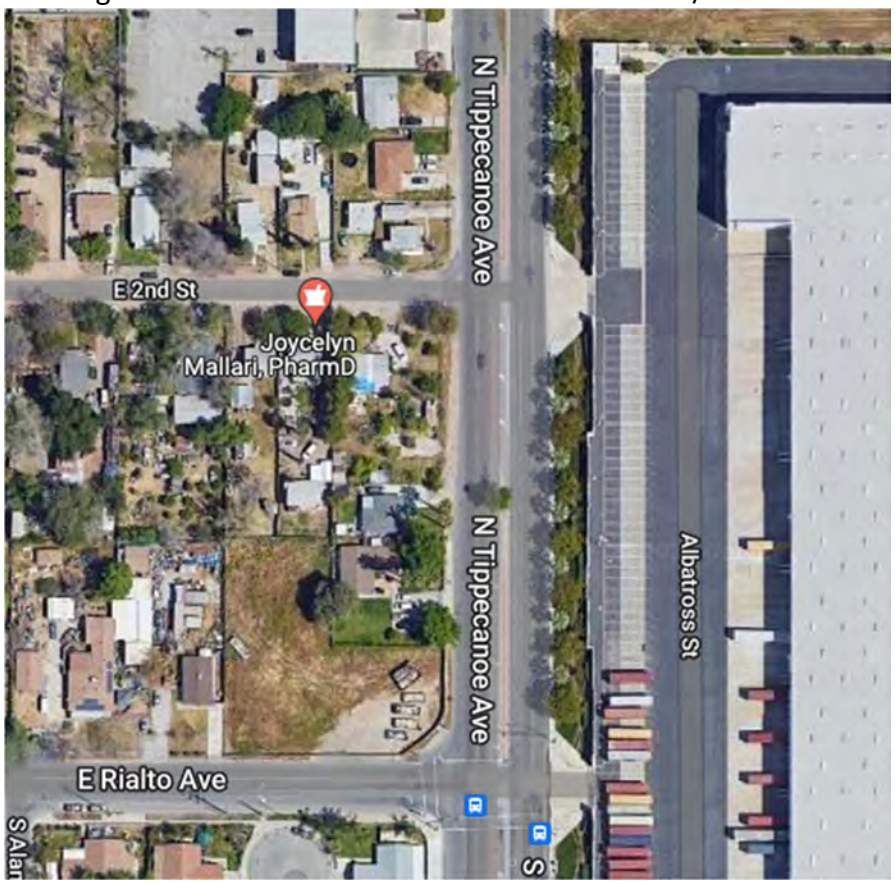



**25742 – Flint Way from E Weir Rd to end –** small side street near Gate City Beverage distribution center with large trucks



**25394 – Oak St from S Arrowhead Ave to S Mayfield Ave –** close to some small truck yards with large trailers, unknown who operates these


**25192 – East 2nd St from N Lena Rd to N Tippecanoe Ave –** residential street, directly adjacent to a large Mattel distribution center with a 2nd St exit/entrance



**21096 – Palm Ave from Industrial Pkwy to Kendall Dr –** road to a major JC Penny distribution center, lots of trucks & trailers parked nearby

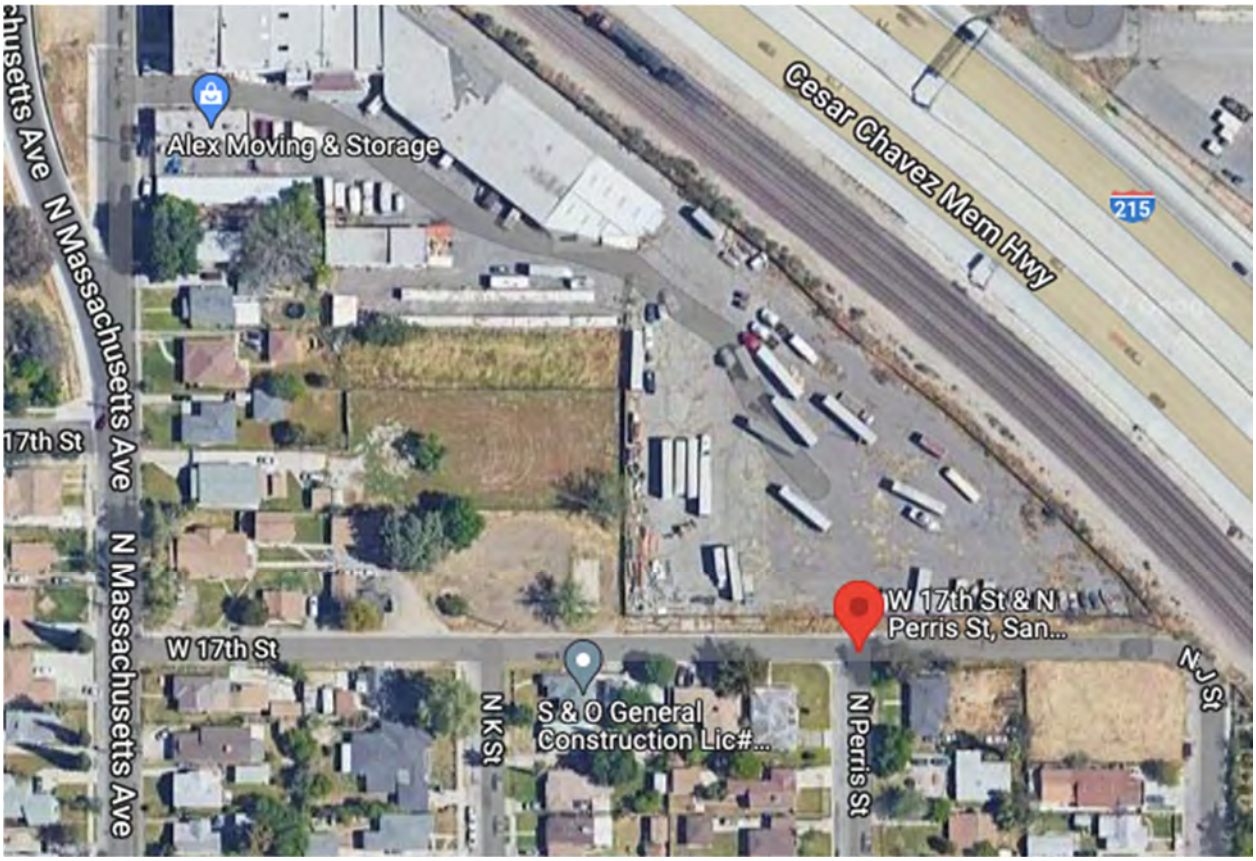

**16339 – W Naranga St from N Rancho Ave to gate –** small side road along a truck route, near a large BNSF yard

**16231 – E Tennis Ct Ln from S Lena Rd to end –** near major distribution centers for Kohl's, Burlington Coat Factory, Trader Joe's, and others; clearly a route for trucks, with trailers parked at the end

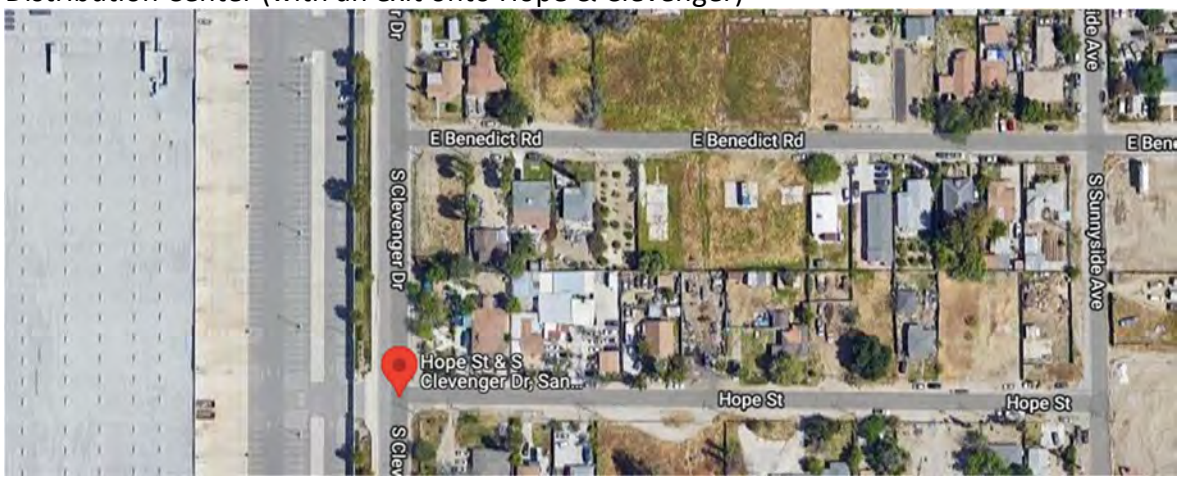

**15694 – Bobbett Dr from E 11th St to Baseline St –** residential street near previously mentioned First Transit yard

**14715 – Greenwood St from Terrace St to Macy St –** out of the way residential street, but adjacent to the BNSF yard and lots of parked trucks/trailers


**14462 – W 17th St from N Perris St to N K St –** same block as 17th from N K St to N Massachusetts Ave, near Alex Moving & Storage yard



**14164 – Hope St from S Clevenger Dr to S Sunnyside Ave –** directly next to large Kohl's Distribution Center (with an exit onto Hope & Clevenger)

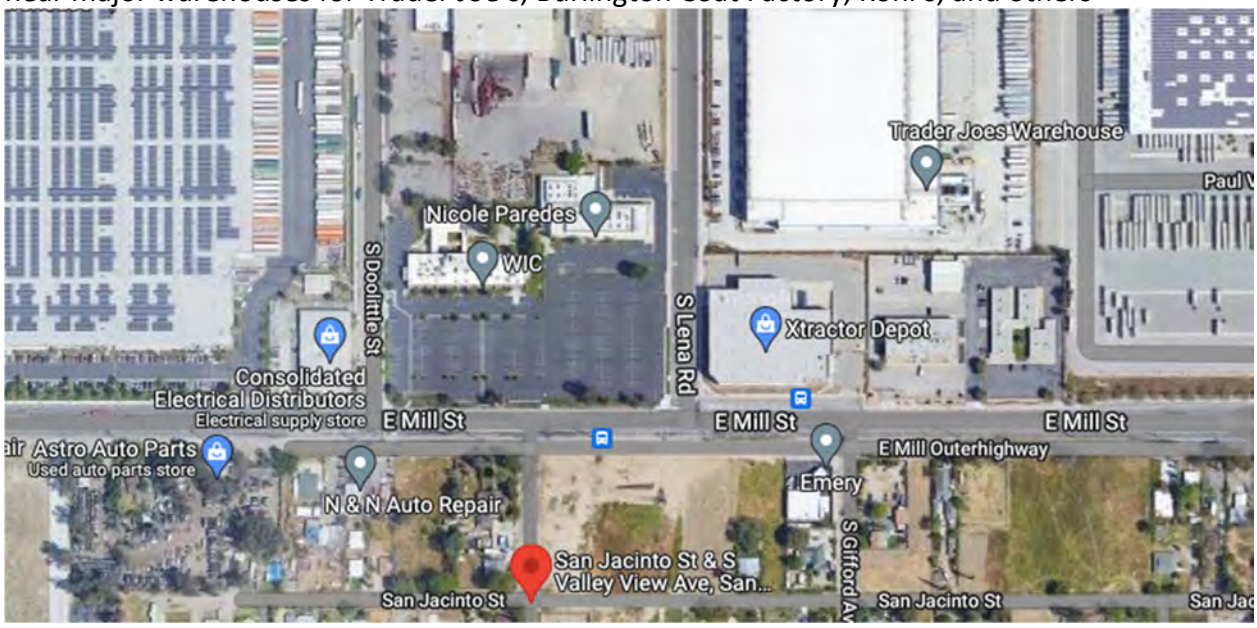



**13730 – Reece St from Montgomery St to N Perris St –** direct route to a lot with some small parked truck trailers, mostly looks to be a RV park though


**12407 – E Norman Rd from S Waterman Ave to S Foisy St –** definite truck route, near a Lean Supply Solutions warehouse with lots of trucks/trailers nearby

**10957 – W Congress St from S I St to S J St –** near a Golden Eagle Trucking yard (& also the Access shuttle bus yard)


**9950 – San Jacinto St from S Valley View Ave to S Gifford Ave –** out of the way side street, but near major warehouses for Trader Joe's, Burlington Coat Factory, Kohl's, and others



**7578 – Huff St W from S Mountain View Ave to S Arrowhead Ave –** includes entrance to lot with trailers/containers, located next to a large Kohler DC


**7072 – N Martin Rd from Baseline St to Meridian Ave –** Service road next to a large JB Hunt yard

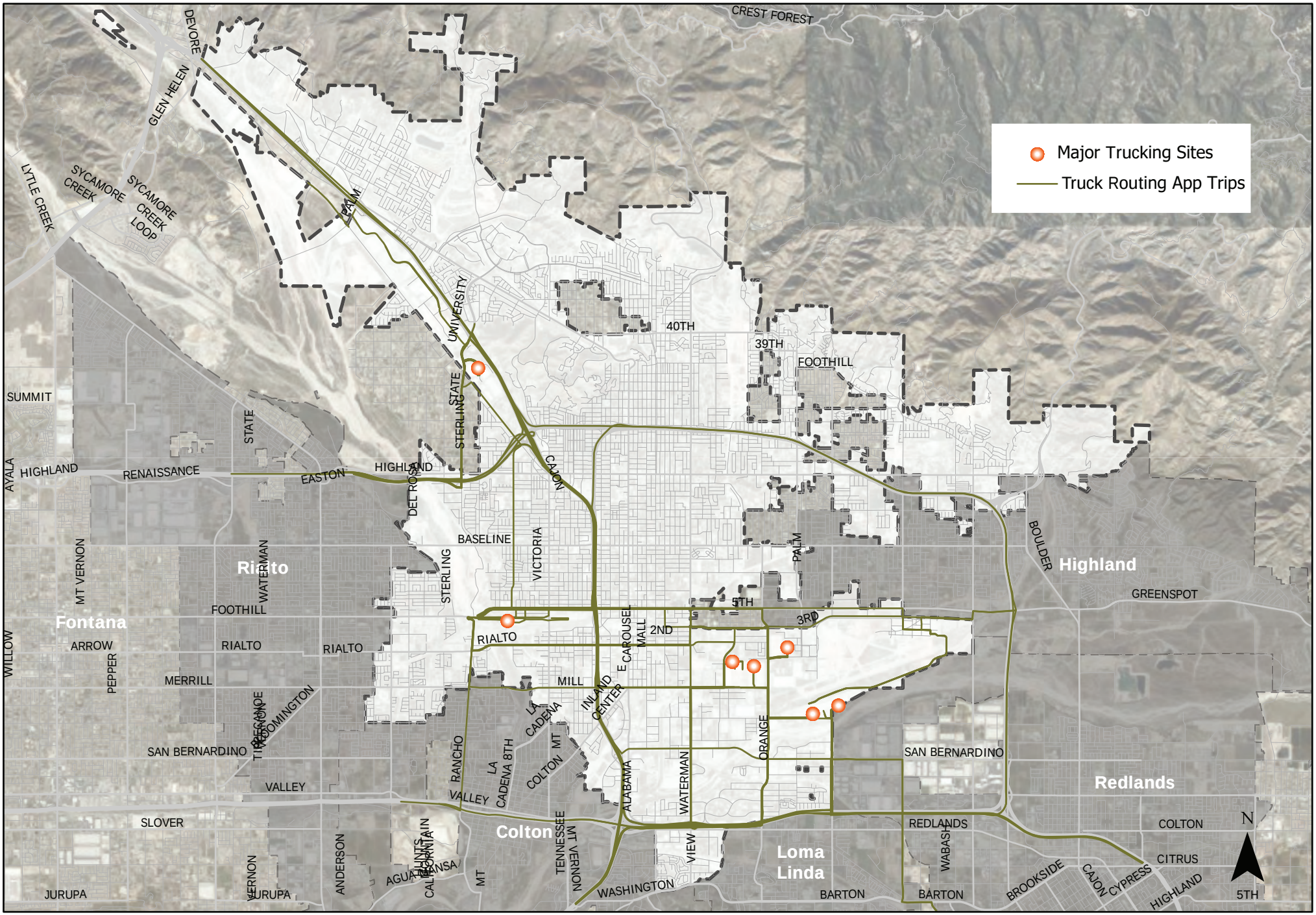
**4926 – W Kingman St from N Mt Vernon Ave to Cabrera Ave –** Residential street directly next to BNSF yard and a truck exit


**1540 – N I St from Home Ave W to W 14th St –** adjacent to rail tracks & some parked trucks, trailers, and containers nearby, unknown who owns or operates this yard

**360 – Bobbett Dr from 9th St to E Olive St –** next to the First Transit yard, also close to a large Royal Appliance warehouse

APPENDIX B:

TRUCKING MOBILE APPS ANALYSIS RESULTS MAP


Major Trucking Sites
Truck Routing App Trips
CREST FOREST
DEVORE
GLEN HELEN
LYTLE CREEK
SYCAMORE CREEK
SYCAMORE CREEK LOOP
PALM
UNIVERSITY
40TH
39TH
FOOTHILL
SUMMIT
STATE
STERLING
AYALA
HIGHLAND
RENAISSANCE
EASTON
HIGHLAND
DELROSO
CACTUS
BASELINE
VICTORIA
MT VERNON
WATERMAN
Rialto
STERLING
PALM
BOULDER
Highland
GREENSPOT
5TH
3RD
2ND
FOOTHILL
Fontana
ARROW
RIALTO
RIALTO
RIALTO
E CAROUSEL MALL
WILLOW
PEPPER
MERRILL
MILL
INLAND CENTER
LA CADENA
TIPPECANOE
BLOOMINGTON
CEDAR
SAN BERNARDINO
RANCHO
LA CADENA 8TH
COLTON MT
ALABAMA
WATERMAN
ORANGE
SAN BERNARDINO
VALLEY
VALLEY
Redlands
SLOVER
Colton
TENNESSEE
MT VERNON
VIEW
REDLANDS
COLTON
N
Loma Linda
WABASH
CITRUS
VERNON
ANDERSON
AGUA MANSA
CALIFORNIA
MT
WASHINGTON
BARTON
BARTON
BROOKSIDE
CAJON
CYPRESS
HIGHLAND
5TH
JURUPA
JURUPA
0
2
4
8 Miles

APPENDIX C:

ANALYSIS OF TRUCK ROUTING MOBILE APPS

# Truck Routing Apps Review

## Background

Navigation, parking, and other apps designed specifically for truckers have become increasingly common in recent years, although they are still far from universally used.

Most auto drivers are familiar with Google Maps, Apple Maps, or the directions offered by various GPS systems and services. Drivers use these apps or systems to obtain directions to unfamiliar locations, find the quickest route during peak periods, and estimate driving and arrival times.

Not surprisingly, a number of routing apps are available to truck drivers, and are used in the same ways. Drivers serving repeat customers or those on delivery routes would seldom need an app for directions, but might use an app to choose between routes or avoid slow-downs due to accidents or work zones. Long-haul drivers unfamiliar with the area or with specific customer locations would be much more dependent on these apps.

Many of these apps are also designed to help truckers find parking, as truck parking has been a significant issue for some time. According to a 2019 ATRI study, 57% of truck drivers reported using a parking app in the past year. The percentage was higher among younger drivers, with 67% of those under 45 reporting using one within the past year (notably, these statistics dealt specifically with truck parking apps, though many apps serve multiple functions). The disparity between older and younger drivers may not simply be due to younger drivers being more up with current technology. Older drivers may already have knowledge of parking and routing from their experience and not need apps, according to the study. More up-to-date statistics are not available, but usage will likely increase as new, younger drivers enter the industry and the apps themselves improve. One can speculate that these percentages have only increased since then.

Accordingly, the consultant team investigated these apps and tested them on sample routes in San Bernardino to determine:

- Whether the apps could successfully navigate the highways and streets serving San Bernardino's commercial and industrial areas.
- Whether the apps suggested sensible routes consistent with the team's route recommendations.
- How the City might eventually inform app sponsors of designated truck routes.

## Major Truck Routing Apps

With this many truckers using apps and with their use becoming more prevalent among the next generation of truckers for multiple reasons, ensuring that data regarding truck routes, parking locations, restrictions, and other necessary information is correct and up-to-date is essential. Fortunately, drivers themselves may help. All of these apps are subject to reviews and rating from drivers and trucking companies that use them. These reviews are available on the app store sites (Apple and Android are, of course, the two main app stores). Analyzing the reviews can help weed out apps that give incorrect or unreliable information, as truckers are less likely to use them if they see negative reviews. For example, the National Association of Truck Stop Owners launched an app called *Park My Truck* in 2016 designed to help truckers find parking. The app claimed reliable data on parking at truck stops reported by truck stop operators themselves. However, a quick search of the app on Apple's store reveals that, of the very few truckers who actually used this app (only two reviews show up), it was poorly reviewed. One driver's negative review states that the reliability of data was compromised as truck stop owners over reported parking availability to lure truckers to their businesses. The app now seems to be essentially defunct, as new data for the truck stops listed seems to have not been reported in years.

What reviews of apps strongly suggest is that drivers mostly trust other drivers for information; many reviews suggest that they do not trust "official" sources. Drivers also logically prefer apps that serve multiple functions all-in-one. They do not want to have to switch back and forth from different apps, so an app that relies on data from other truckers and provides information on routing, parking, weight stations, and other things truckers must know about would theoretically be the most successful.

*TruckerPath*, which brands itself as "built for truckers, by truckers," is a possible candidate for an all-in-one app. and is by far the most popular trucking app, claiming over a million regular users. *TruckerPath* gets exceptional reviews, with a 4.7/5 average rating on the app store and over 81,000 reviews. Although the app requires a paid subscription to access full truck routes (including restrictions due to length, height, weight, etc. – routes for trucks, not cars, in other words), it provides much of the information truckers would need all in one stop, including parking, truck stops, weight stations, routing, and amenities along the road.

Other trucking apps exist and are fairly widely used, though. Another popular and well-reviewed app is *TruckMap*, which includes much of the same information that *TruckerPath* provides. *TruckMap* app also finds loads for drivers along their routes. If a driver searches a route between two points, the app will automatically suggest loads that trucker could pick up along the route. This app does not require a paid subscription to use, and claims to have full data on routes for trucks, not cars (though it does not say in the app store where it gets this data from, unlike *TruckerPath*, which specifies that it gets it from users).

There are also some less-used competitors to these main apps available. The website *truckersreport.com*, which finds trucking jobs and provides other resources for truckers, has used data that they presumably obtained from truckers to start an app called *Hammer*, which is

also free to use. This is a very new app launched in 2021, but it has gained quite positive reviews on the app store from a healthy 9,400 ratings as of this writing.

The app *Trucker Tools* is designed to be another all-in-one stop for truckers (and operators). It allows them to book loads, and then find routes for these loads, with relevant information (including truck stops, weight stations, etc. provided along the way. This app was one of the first in its field when it was launched in 2010). However now it only has 1,300 app store ratings and was the worst reviewed of the ones examined here.

## Testing Truck Routing Apps in San Bernardino

These section analyzes routes that commonly used apps for getting to and between a selection of major trucking destinations in San Bernardino. The apps used were *Trucker Path, Hammer, TruckMap, and Trucker Tools,* which were compared to *Google Maps* results for cars.

In general, and as shown in the figures that follow, the apps provided reasonable routing suggestions using major thoroughfares that could become components of San Bernardino's truck route system. For most trips to San Bernardino DCs from outside locations, the apps suggested using freeways to the nearest exit and then a short trip over arterial streets. Outbound trips suggestions tended to be the reverse: choosing a short route to the nearest freeways entrance. Only cross-town trips tended to have greater use of surface streets, as expected. In this respect, the team's findings suggest that the highest priority for truck routes would be preferred paths to and from freeways ramps.

In practical tests in San Bernardino, *Trucker Path*, which is by far the most commonly used and well-reviewed app specifically for truckers, was the simplest to use (aside from *Google Maps*). It includes truck routes, but these are only accessible to paid subscribers (*Trucker Path* only uses car directions for free users, making it similar to *Google Maps*). This could be problematic, as truckers who want to save some money could conceivably end up using a version that does not include truck restrictions and ending up on restricted routes (although they do have *TruckMap* and *Hammer* as free options).

*Hammer* claims to be the only truly free app for truckers, with no paid subscription requirement. However, the sign-up process does go to great lengths to verify that the user signing up is, in fact, a trucker, and one must register with an account and consent to receiving marketing emails. The service also stated upon signing up that a representative may reach out to verify that the user is, in fact, a trucker, although no representative reached out to the consultant team upon signing up for the purpose of conducting this study. Regardless, the app seems intent on making sure than non-truckers do not use it, for reasons that are unclear and unexplained.

The trucking-specific apps allow the user to change the truck settings (height, weight, length, etc.) so as to get the most relevant route restrictions, and they also allow the user to set preferences for things such as avoiding tight turns, choosing the most direct route vs. the

fastest one, etc.  For the purposes of this study, the default settings for each app were used in order to control variables. These were generally for a loaded, 53’ semi-truck and trailer that would typically be used for long-haul trucking or transporting domestic containers (ocean-going containers are 20’-45’.

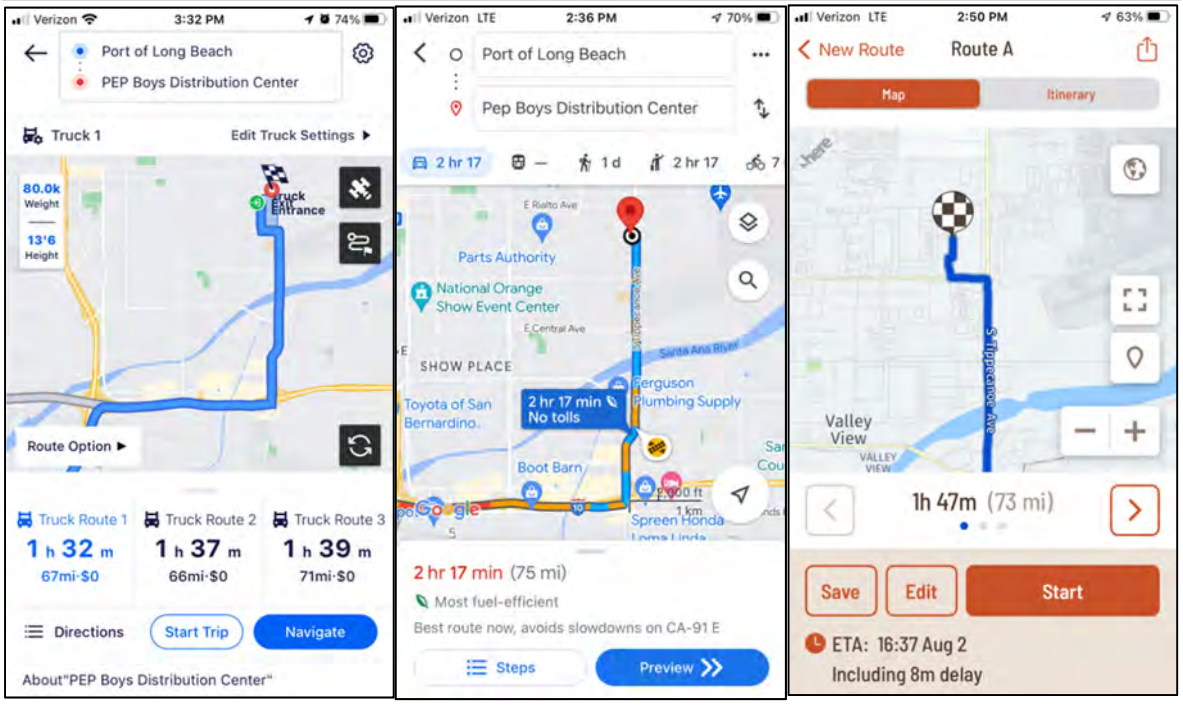
Screenshots of what each app suggested for various routes are included below. Although some of these searches were also done again at different times of day to account for different traffic conditions, these searches did not turn up different results.  Also, *Trucker Tools* would not allow the user to change the origin location for directions, demanding that the user’s current location be used. As such, all routes for *Trucker Tools* originate from Highland Park, Los Angeles, rather than the sample origin described.

## Long Beach to Pep Boys DC

As shown in Figure 1, the apps suggest using Tippecanoe north from I-10.

*Figure 1: Port of Long Beach to PEP Boys DC*

| TruckerPath | Google Maps | Hammer |
|---|---|---|

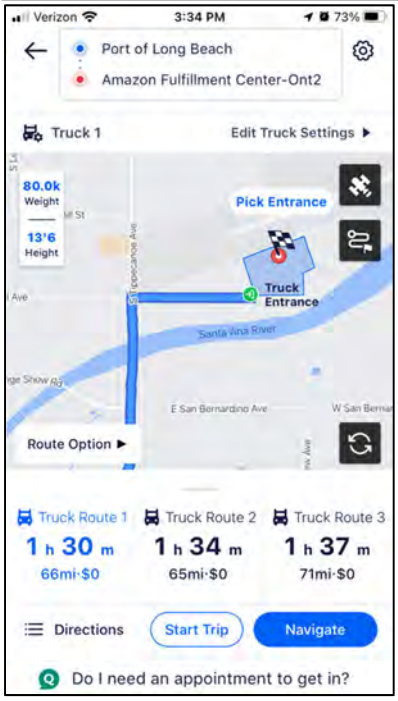
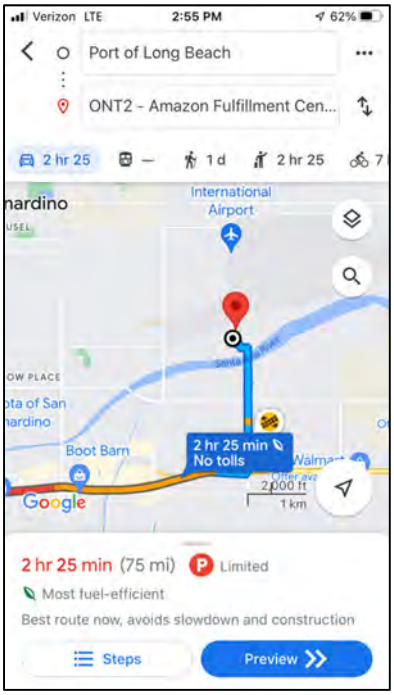
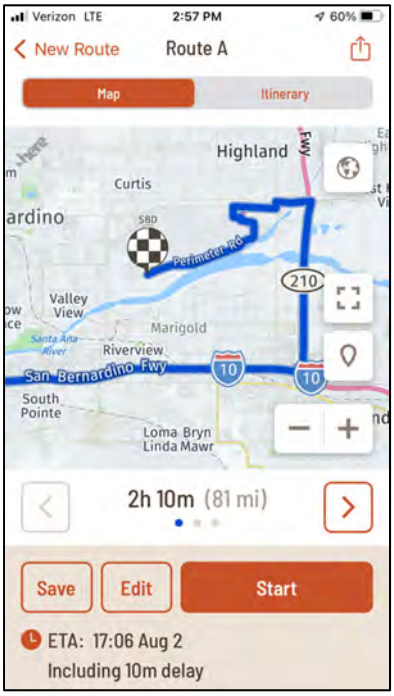



No results for the DC turned up in a search on *TruckMap* or *Trucker Tools*, so they are not included here as presumably the apps could not find this location.  Notably, *Hammer* and *TruckerPath* both automatically found a truck entrance to the DC, whereas *Google Maps* did not (as it is not designed to).

## Port of Long Beach to Amazon ONT2

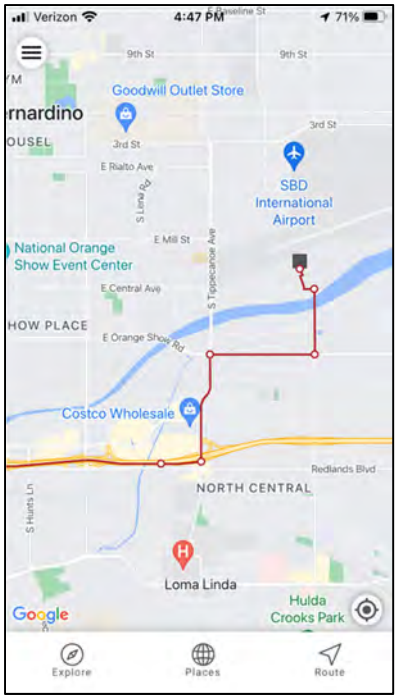
The apps again generally used Tippecanoe north from I-10 (Figure 2), with the differences largely due to the DC entrance assumed. This may be a critical point, as truck entrances are often different from the “official” street address.

*Figure 2: Port of Long Beach to Amazon ONT2*

| TruckerPath | Google Maps | Hammer |
|---|---|---|
|  |  |  |



Trucker Tools:



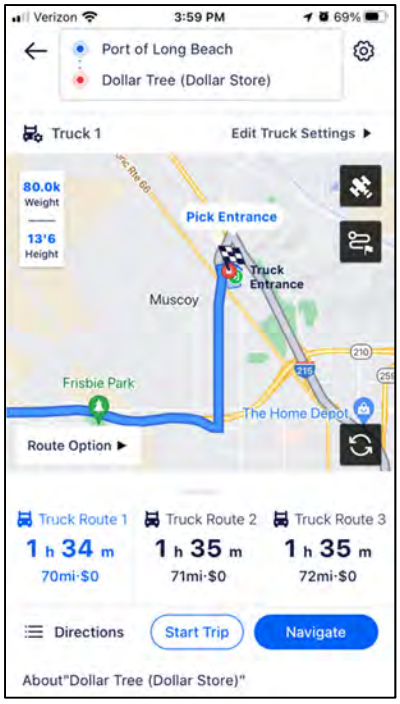

*TruckMap* once again did not turn up any results in a search for ONT2. *Google Maps* again did not automatically find a truck entrance, and *Hammer* suggested an out-of-the-way route that takes the driver to a part of the airport just above ONT2 rather than the truck entrance. A trucker would have to search a more specific address to get correct directions. Note that each of the apps found a different route.

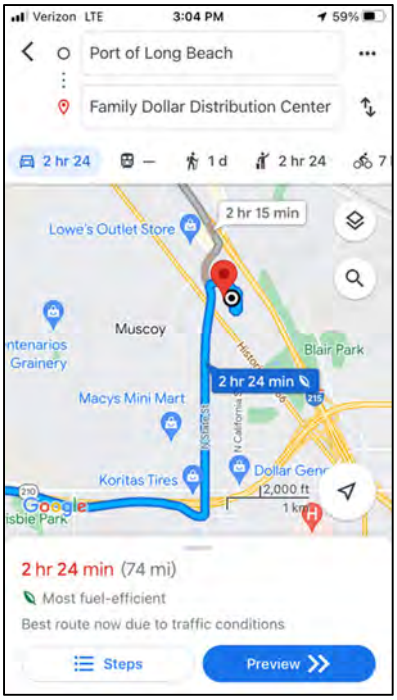
### Port of Long Beach to Family Dollar Distribution Center

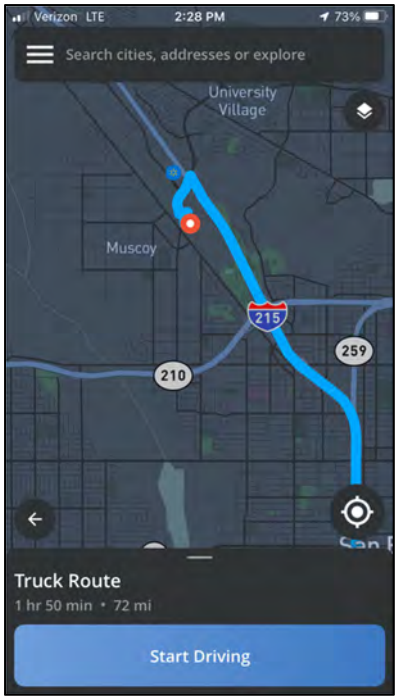
Most apps used N State St north from SR 210 (Figure 3). Note that Trucker Path is the only trucking-specific app to offer multiple route choices here (and that these choices are different from Google Maps), but that it seems to consider this DC to be a Dollar Tree location (it found it with a simple search though).

*Figure 3: Port of Long Beach to Family Dollar Distribution Center*

| TruckerPath: | Google Maps: | TruckMap: |
|---|---|---|

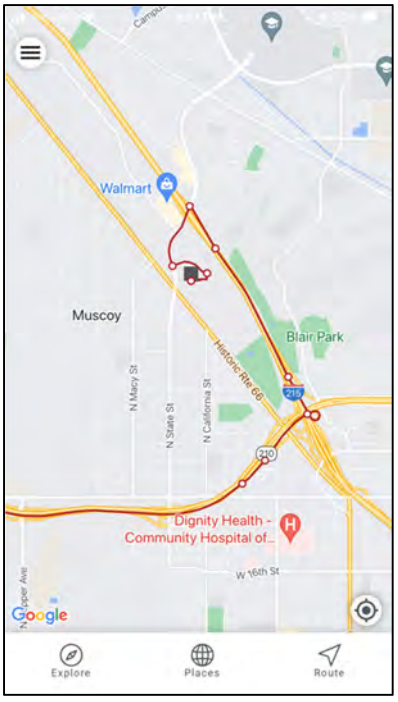



Hammer:


Trucker Tools:

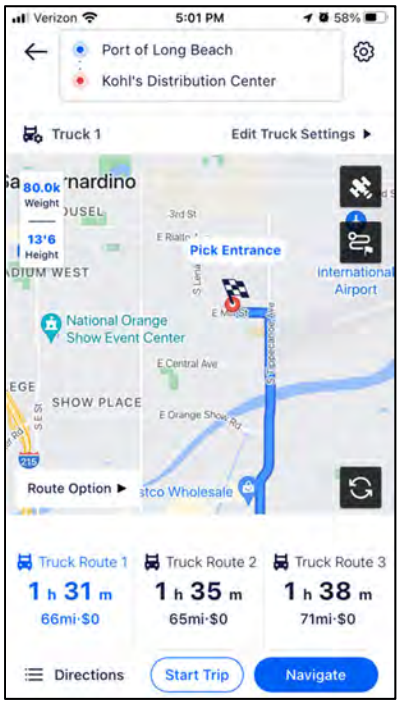


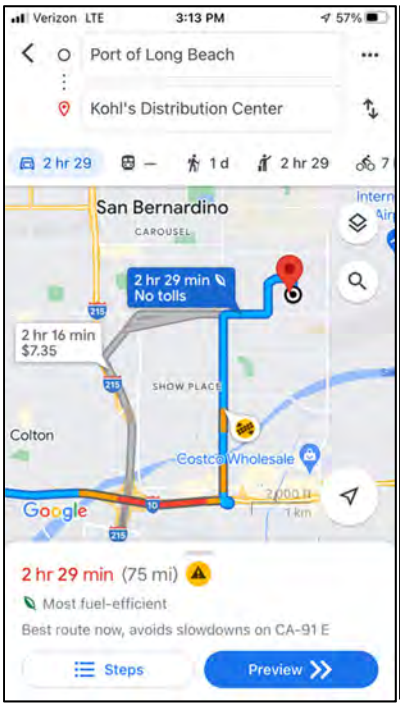

Port of Long Beach to Kohl's Distribution Center

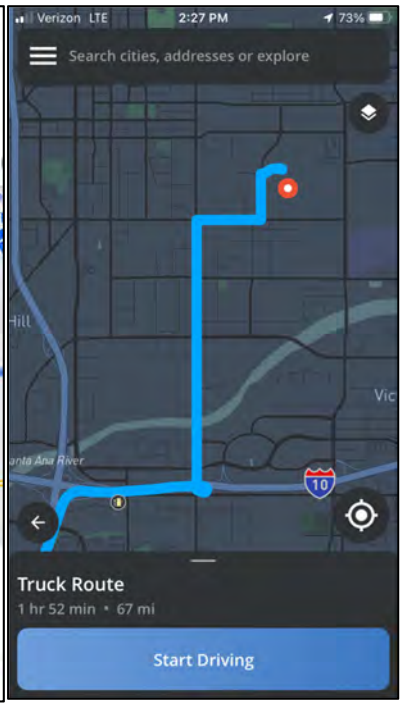
All found a route, though different apps suggested different truck entrances (Figure 4). Google Maps, TruckMap, and Trucker Tools all automatically found the correct entrance here.

*Figure 4: Port of Long Beach to Kohl's Distribution Center*

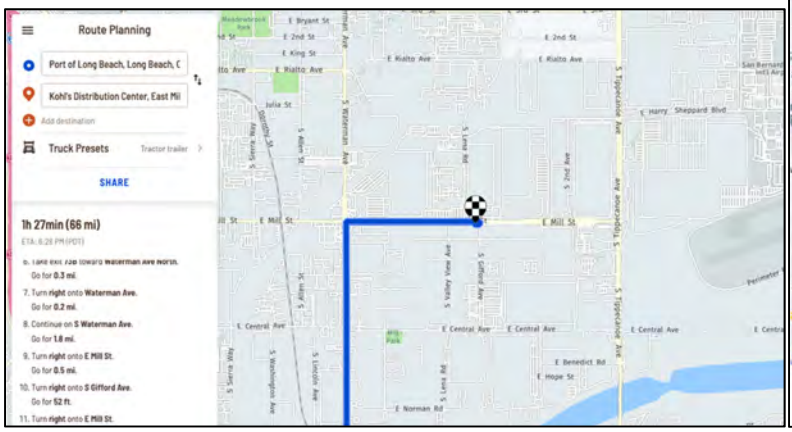
| TruckerPath: | Google Maps: | TruckMap: |
|---|---|---|



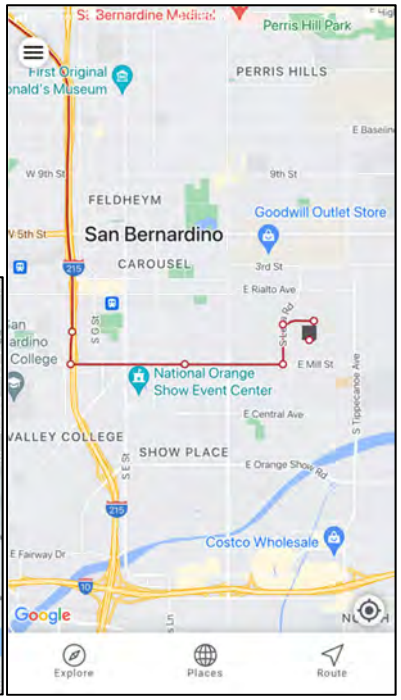




Hammer:



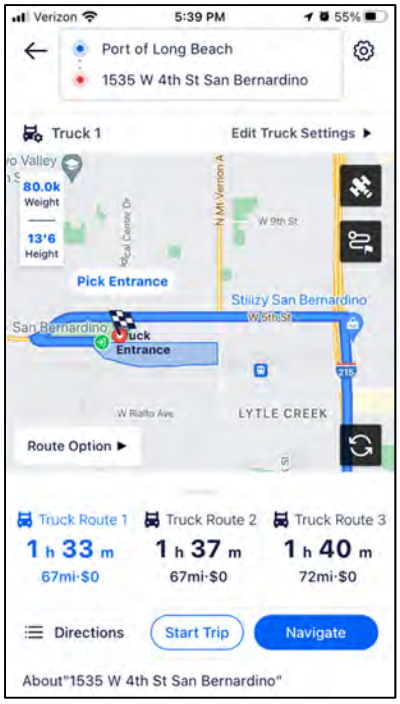
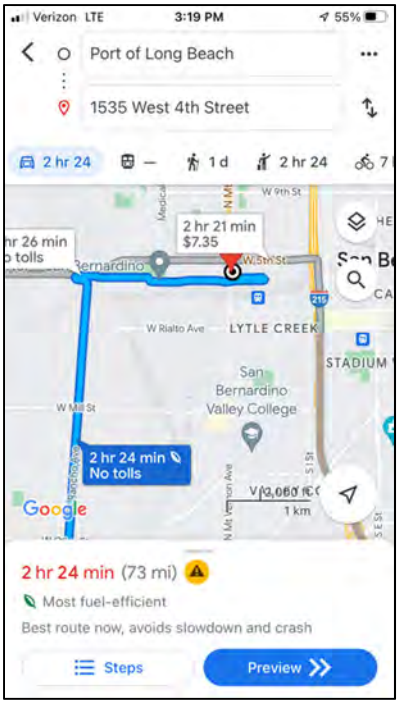
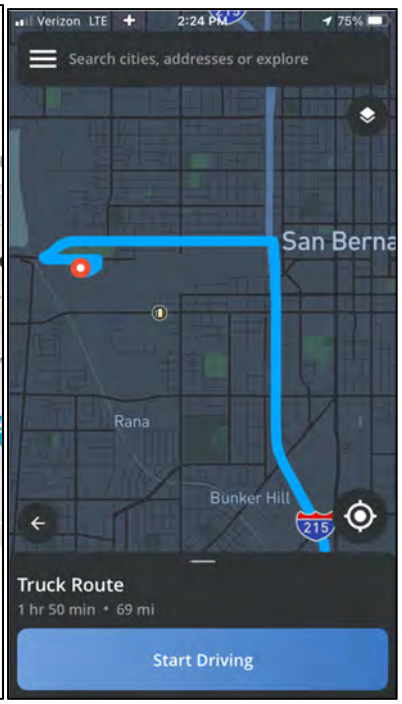

Trucker Tools:

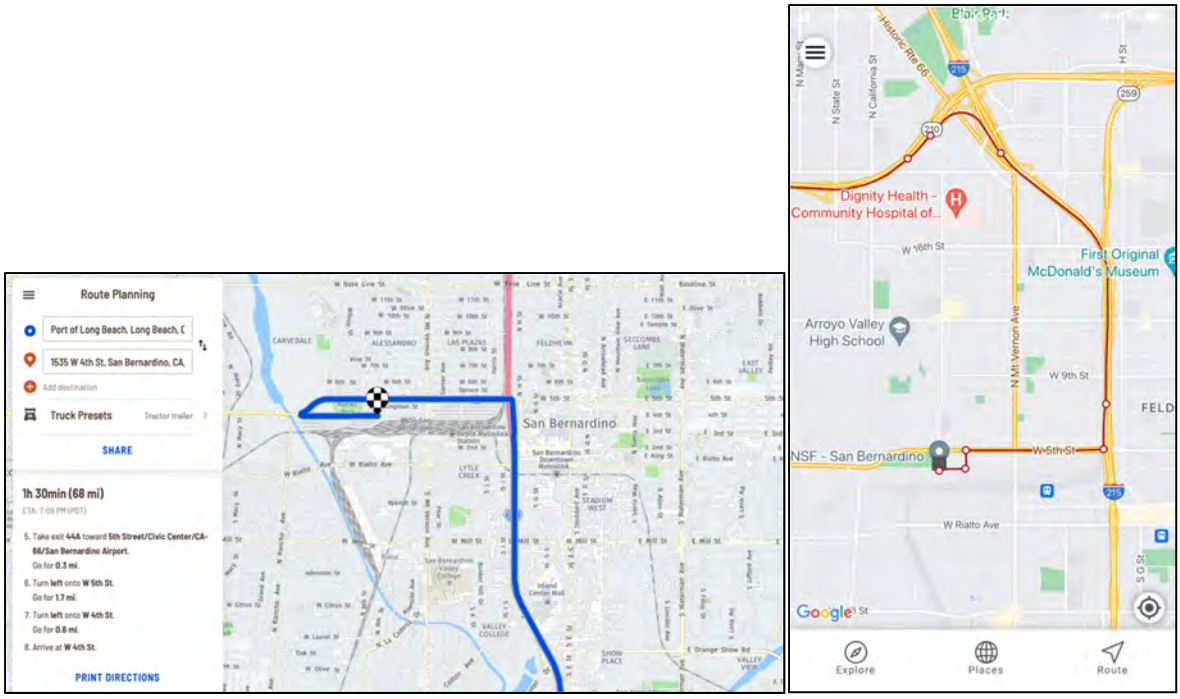


## Port of Long Beach to BNSF Yard

All trucking specific apps show the same route for this trip (although Trucker Tools shows a different freeway into town due to coming from Highland Park), but Google Maps shows a route up Rancho Ave, which could be concerning if that road is restricted (Figure 5). Trucker Path, TruckMap, and Hammer all found an accurate, viable entrance to the facility, whereas Trucker Tools suggests a route down a narrow residential street (though it ultimately leads to the correct entrance, this is not logical or what is used by trucks seen in field work).

*Figure 5: Port of Long Beach to BNSF Yard*

| TruckerPath: | Google Maps: | TruckMap |
|---|---|---|
|  |  |  |
| Hammer: | | Trucker Tools: |

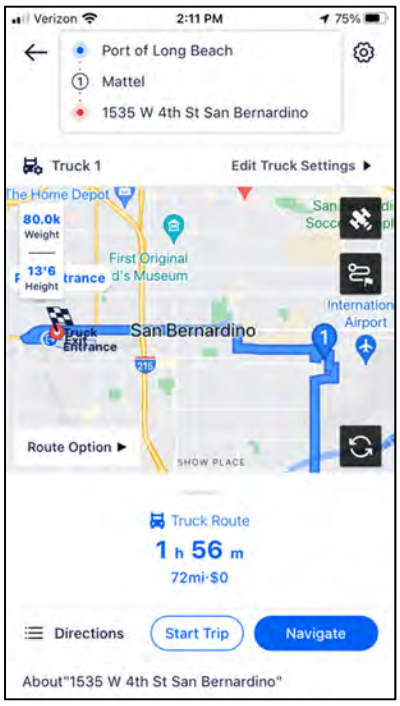


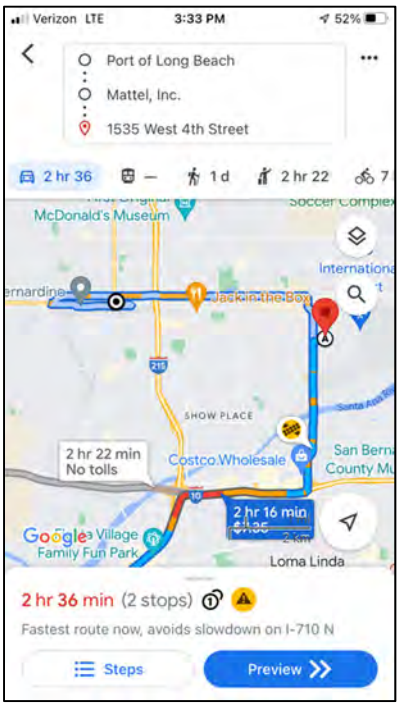

## Port of Long Beach to Mattel DC to BNSF Yard

As Figure 6 indicates, TruckerPath and Google Maps use Tippecanoe for the freeway connection, while the cross-town segment between Mattel and BNSF uses surface streets.

*Figure 6: Port of Long Beach to Mattel DC to BNSF Yard*

| TruckerPath: | Google Maps: |
|---|---|



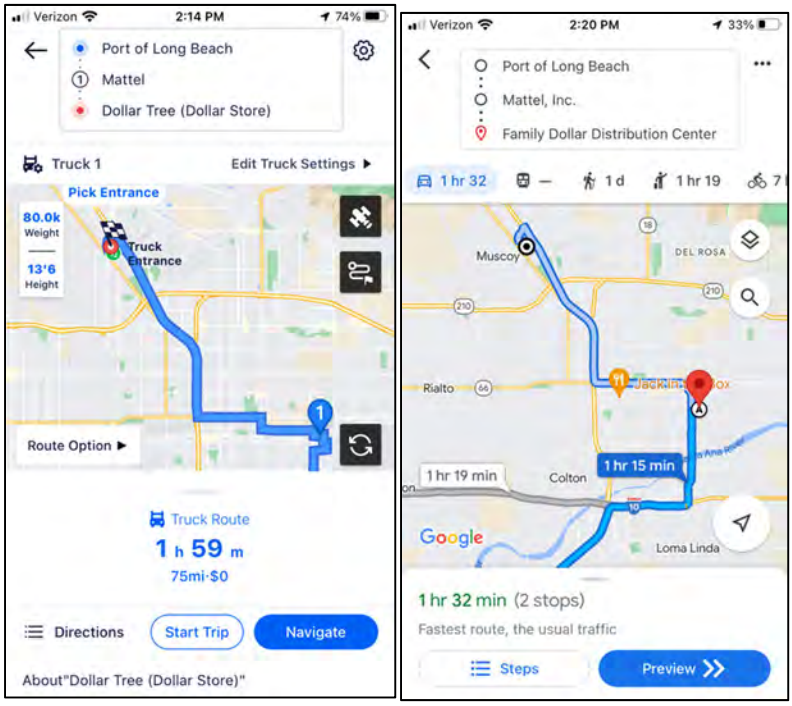
TruckMap, Hammer, and Trucker Tools all failed to find the Mattel DC in a search (Trucker Tools also does not allow for multi-destination route planning). TruckerPath suggested a slightly different route than Google Maps, though both routes did appear to have a high number of trucks during fieldwork.

### Port of Long Beach to Mattel DC to Family Dollar DC

In this example, TruckerPath and Google Maps suggest similar routes (Figure 7), taking the driver across town on surface streets.

*Figure 7: Port of Long Beach to Mattel DC to Family Dollar DC*

| TruckerPath: | Google Maps: |
|---|---|

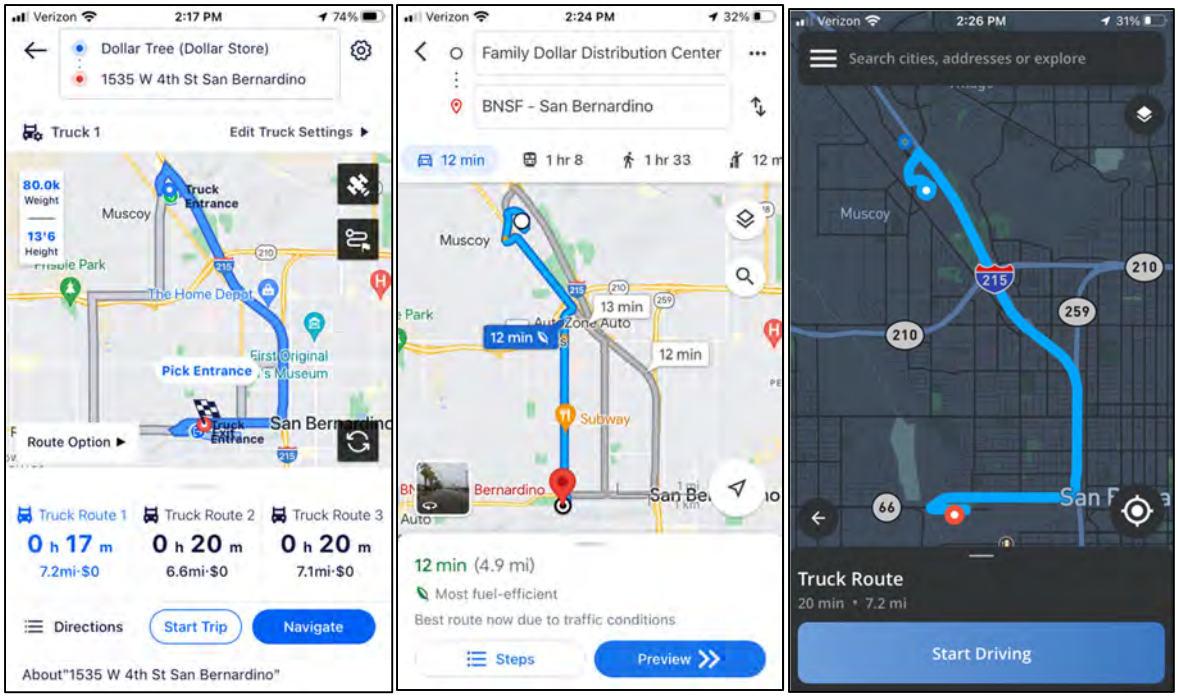



### Family Dollar DC to BNSF Yard

This example is notable in that the truck-specific apps directed the driver to the freeway while Google Maps suggested surface streets (Figure 8).

*Figure 8: Family Dollar DC to BNSF Yard*

| TruckerPath: | Google Maps: | TruckMap: |
|---|---|---|



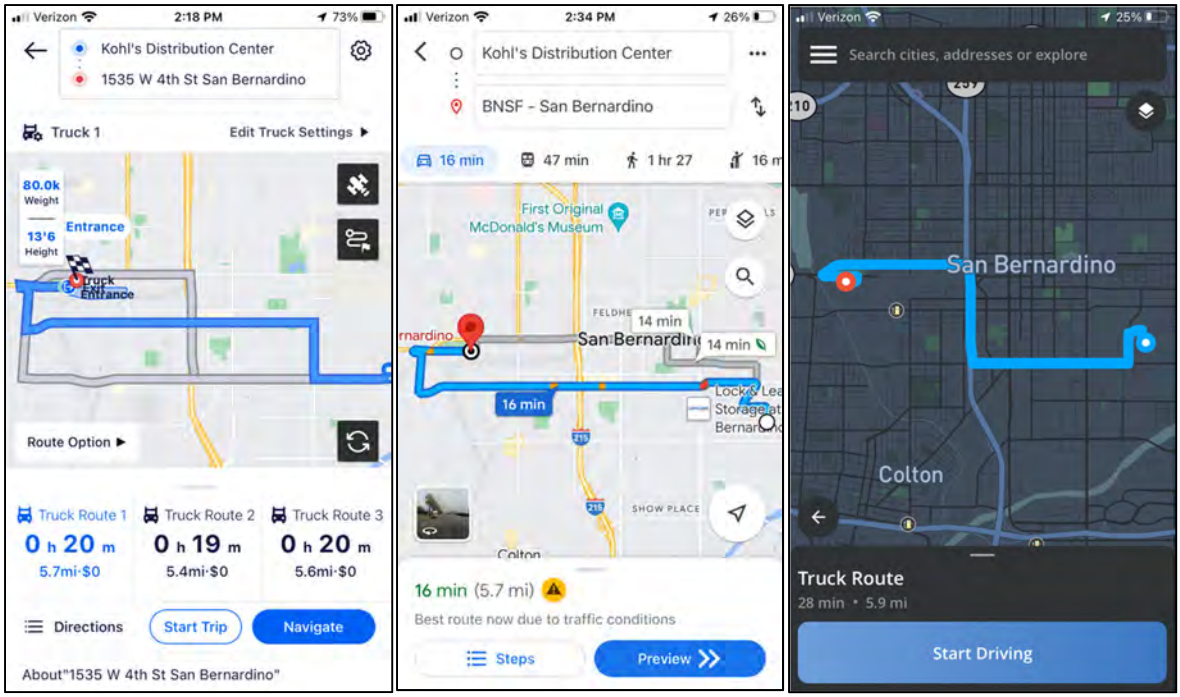

Though the desktop version of Hammer could find the Family Dollar DC in an earlier search, when it came time for this search the iPhone app could not find it. TruckerPath once again suggests multiple route options. Trucker Tools does not allow for this search. All apps found the proper truck entrance.

## Kohl's DC to BNSF Yard

In this case as well, the truck apps suggested using a short section of freeway while Google Maps used surface streets (Figure 9).

*Figure 9: Kohl's DC to BNSF Yard*

| TruckerPath: | Google Maps: | TruckMap: |
|---|---|---|



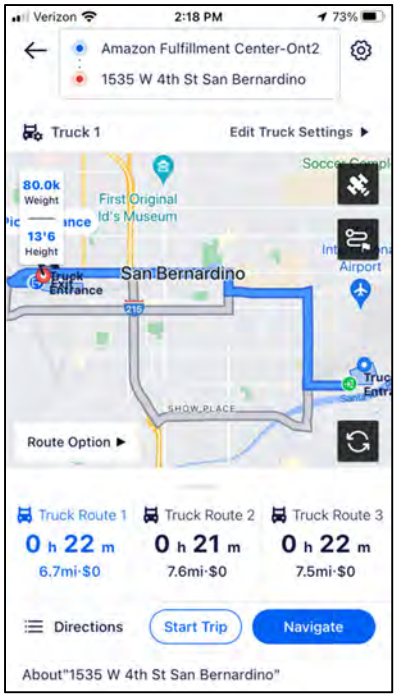

Once again, the Hammer phone app could not find the Kohl's DC (inconsistent with the desktop version once again). All three other apps found different routes (TruckerPath once again had multiple options). Trucker Tools does not allow for this search.

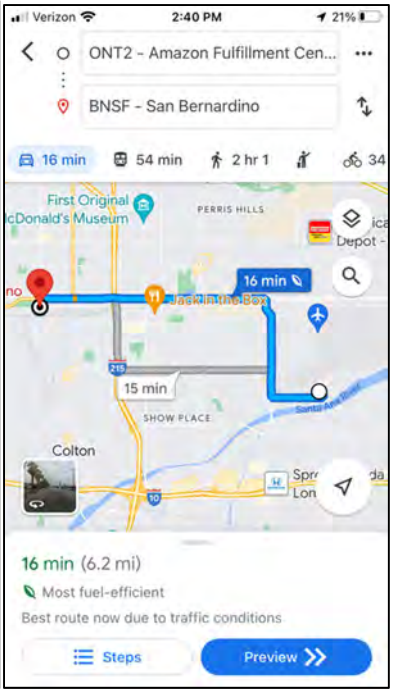
## Amazon ONT2 to BNSF Yard

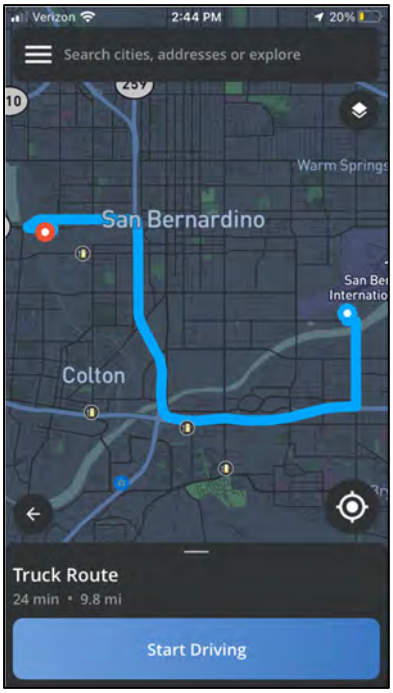
From the Amazon Fulfillment Center to the BNSF yard Trucker Path offered options, Google Maps used surface streets, and TruckMap suggested a short stretch of freeway (Figure 10).

*Figure 10: Amazon ONT2 to BNSF Yard*

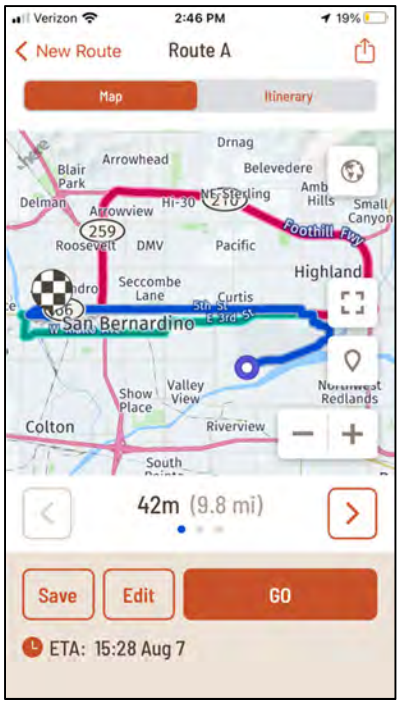
| TruckerPath: | Google Maps: | TruckMap: |
|---|---|---|




Hammer:



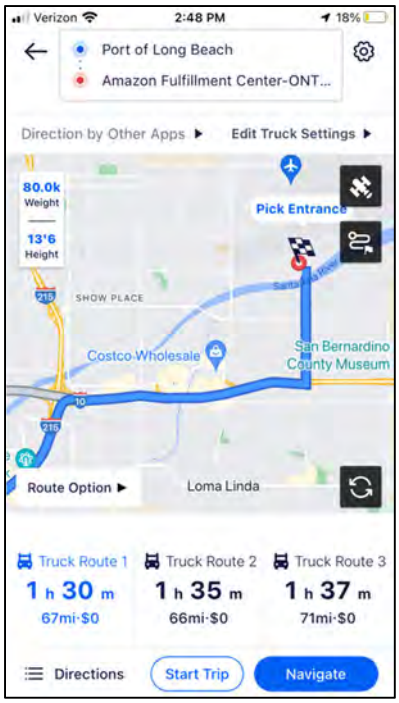

TruckerPath suggested multiple options again, while TruckMap only had one longer option and Hammer suggested a strangely out-of-the-way route, once again failing to find the actual accurate location of ONT2.

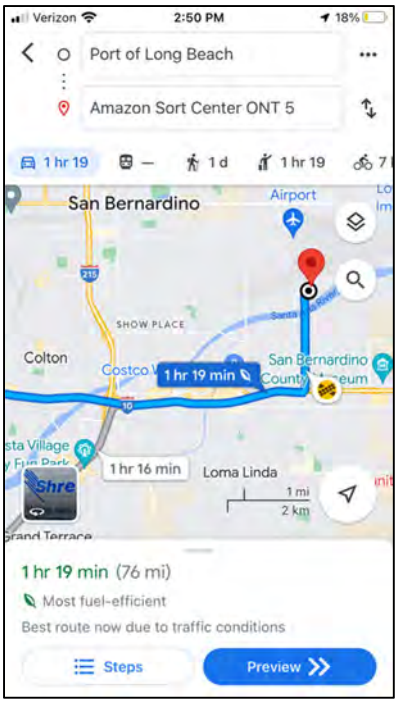
## Port of Long Beach to Amazon Fulfillment Center ONT5

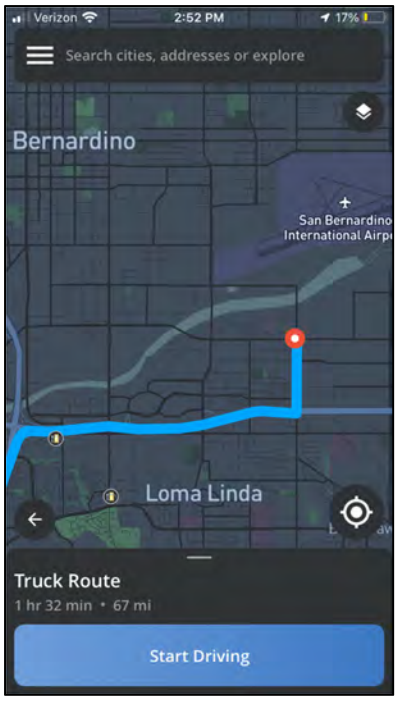
The last example shows the same suggested routes from the three major apps (Figure 11), but very different results from the others. Trucker Path and Trucker Tools found routes without a problem (though slightly different ones), while TruckMap came up with a wrong location for ONT5, just down the road from where it is actually located.  Hammer placed ONT5 around the summit of Mt. Baldy for reasons unclear.

*Figure 11: Port of Long Beach to Amazon Fulfillment Center ONT5*

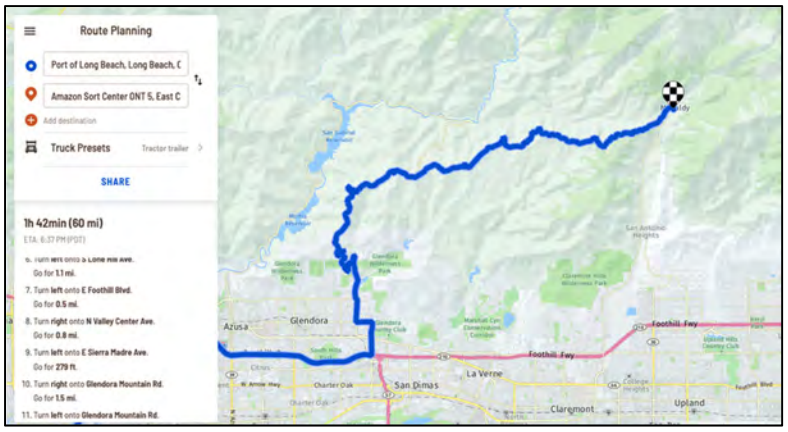
| TruckerPath: | Google Maps: | TruckMap: |
|---|---|---|



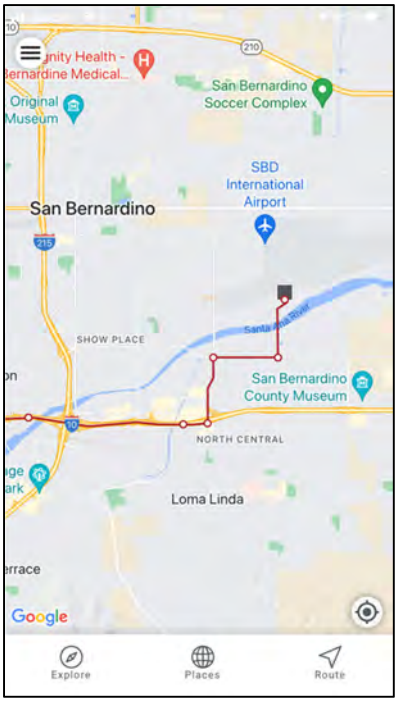




Hammer:




Trucker Tools:




These examples seem to demonstrate why truckers seem to generally prefer *TruckerPath* and rate it highly: it was the most consistent trucking-specific app in terms of delivering results for

all of these locations. *TruckerPath* also had the best functionality of any app designed specifically for truckers, and automatically found truck entrances for many of these locations (although a few were inaccurate). *TruckerPath* describes itself as "for truckers by trucker" which suggests that the data is crowd-sourced from truckers themselves, though it is unclear if this applies to routing and mapping data or just to information on parking and truck stops. Nonetheless, widespread use of *TruckerPath* suggests that truckers value getting their information from other truckers and trust this above other information sources, at least in principle.

*TruckMap* was second to *Trucker Path* in terms of overall use and ratings on the app store, but as shown here, it was not as reliable as *TruckerPath in navigating San Bernardino*. *TruckMap* also had worse functionality and was sometimes difficult to use. It requires drivers to find truck entrances on the map themselves, although this is probably preferable to automatically directing truckers to wrong entrances.

*Trucker Tool*s also was fairly reliable in terms of finding routes, but had probably the worst functionality of any of the trucker-specific apps for the purposes of these. It does allow for multi-destination planning, but was very restrictive in allowing for searches from different locations at different times (although truckers using it for simple directions from their current location would likely find it sufficient).

*Hammer* is not as well-used as the others. In the tests conducted it frequently came up with incorrect routing and often failed to find locations (or found wrong locations), making it probably the least reliable in these tests. Notably though, it is a very new app, and reviews seem to have improved slightly since the teams first tests were conducted. Some of the routes it suggested could be very misleading to a driver, especially an inexperienced driver unfamiliar with the area, which is concerning.

However, it is important to note that of all these apps, *Google Maps* had the best functionality and was the easiest to use, finding all these locations instantly and accurately after a very simple search. Although it did not find truck entrances as Trucker Path did, it often still found the location despite misspelling or only partially typing in the name, and it gave multiple route options, rail crossing information, and the most up-to-date traffic information. Unlike *Trucker Path*, it is also free to use. As such, it could be understandable that a frustrated trucker would simply choose *Google Maps* and risk ending up on a restricted road (though there does not seem to be data that suggests whether a significant number of truckers do this or not, and truckers overwhelmingly do not recommend Google Maps for truck directions in online trucking forums, so it seems unlikely that many truckers are actually doing this). Some of these alternate route options it suggests could be restricted for trucks, and it does not allow the user to change as many settings as Trucker Path (or the other truck specific apps).

Most drivers should be able to avoid the worst of the bad directions these apps have provided, figuring out that Hammer's route to ONT 2 does not make sense, for example. Issues could arise, however, from unfamiliarity or bad decision making under time pressure. A driver

unfamiliar with the area or inexperienced could also be mislead down a bad route, but wind up in an undesirable area or one that is difficult to exit before they realize their mistake (or the app's mistake). As such, making sure these apps have accurate data remains important.

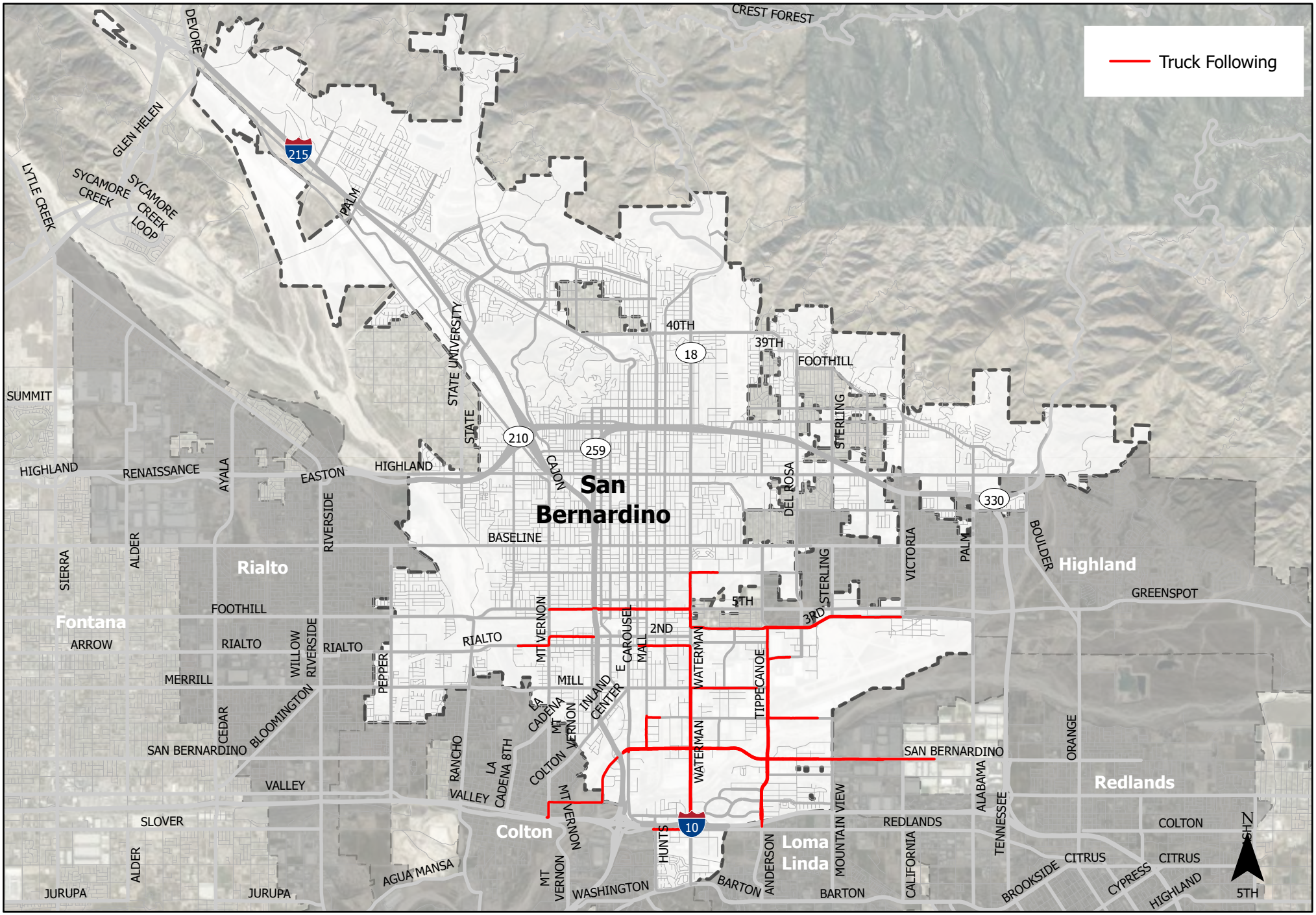
## App Data Sources

Given the current and growing popularity of these truck route apps, it would be to the advantage of both the City and the trucking industry to have these developments reflected in routing apps. Accordingly, the consultant team began investigating where and how routing apps obtain data.

Where these apps get up-to-date data on truck routes and restrictions has not yet been established. An attempt to reach out to the apps listed above and ask where they obtain their data resulted in only one response to date, from *Hammer*. This response stated, however, that the app gets its data from Here Technologies, a large company that specializes in creating online maps for a wide variety of customers, including providing location services for Amazon, large automotive manufacturers, and many others. Here Technologies gets mapping data from a large network of camera vehicles, in other words, sending vehicles out onto roads to film street signs, restrictions, etc. and then using what they document to provide updated mapping.

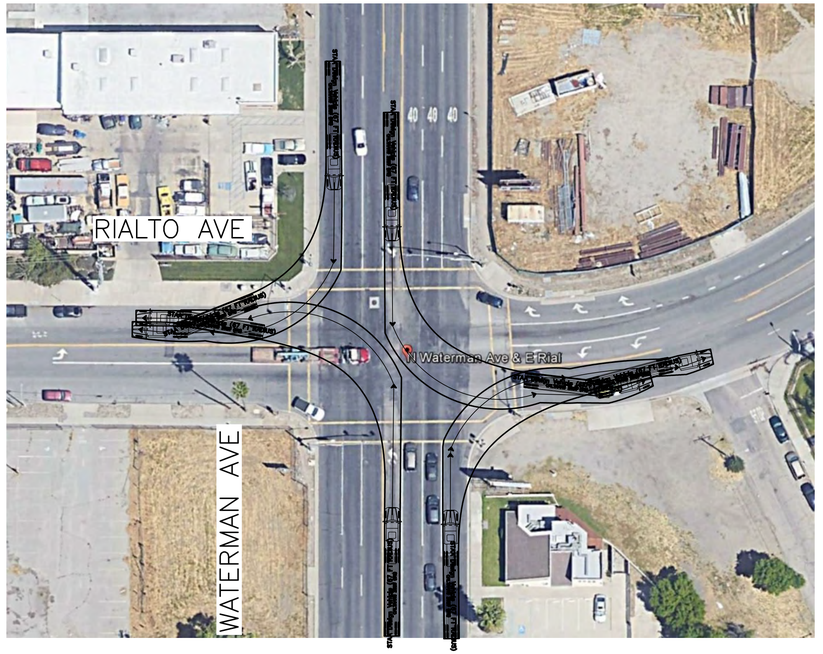
APPENDIX D:

TRUCK FOLLOWING RESULTS MAP

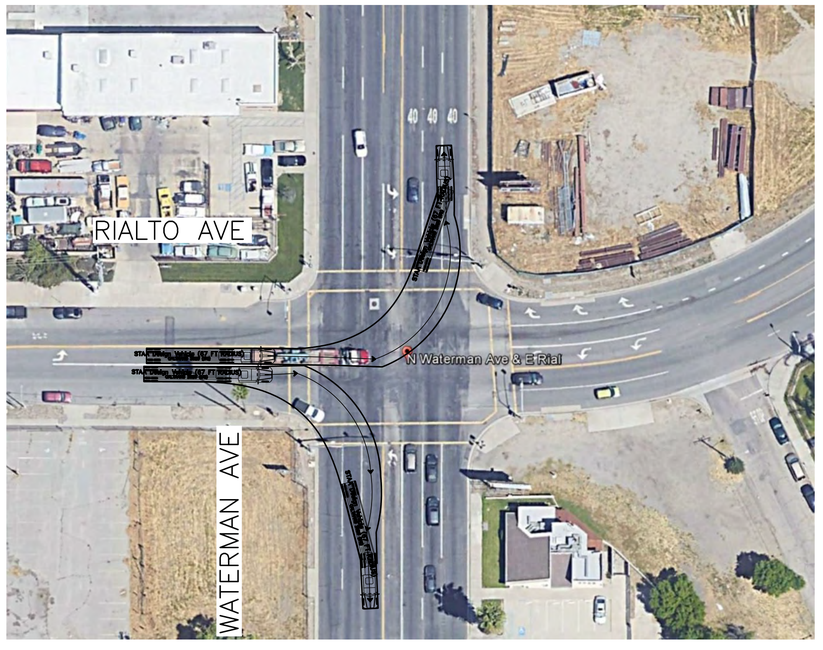

Truck Following
CREST FOREST
DEVORE
GLEN HELEN
LYTLE CREEK
SYCAMORE CREEK
SYCAMORE CREEK LOOP
215
PALM
STATE UNIVERSITY
40TH
39TH
18
FOOTHILL
STERLING
SUMMIT
STATE
210
259
CAJON
DEL ROSA
330
HIGHLAND
RENAISSANCE
AYALA
EASTON
HIGHLAND
San Bernardino
BASELINE
RIVERSIDE
SIERRA
ALDER
Rialto
VICTORIA
PALM
BOULDER
Highland
GREENSPOT
5TH
3RD
2ND
FOOTHILL
Fontana
ARROW
RIALTO
WILLOW
RIVERSIDE
RIALTO
MT VERNON
CAROUSEL MALL
E
WATERMAN
TIPPECANOE
MERRILL
PEPPER
MILL
INLAND CENTER
LA CADENA
MT VERNON
CEDAR
BLOOMINGTON
SAN BERNARDINO
RANCHO
LA CADENA 8TH
COLTON
WATERMAN
SAN BERNARDINO
ORANGE
VALLEY
VALLEY
Redlands
SLOVER
Colton
10
HUNTS
MT VERNON
MOUNTAIN VIEW
REDLANDS
ALABAMA
TENNESSEE
COLTON
N
ALDER
AGUA MANSA
MT VERNON
WASHINGTON
BARTON
ANDERSON
Loma Linda
BARTON
CALIFORNIA
CITRUS
BROOKSIDE
CYPRESS
CITRUS
HIGHLAND
5TH
JURUPA
JURUPA
0
2
4
8 Miles

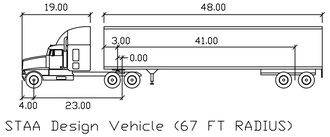
APPENDIX E:

STAA/TERMINAL TRUCK TURNING RADII ANALYSIS



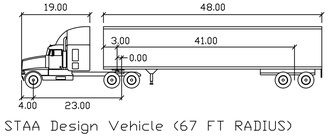



STAA Design Vehicle (67 FT RADIUS)

feet

| | | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |

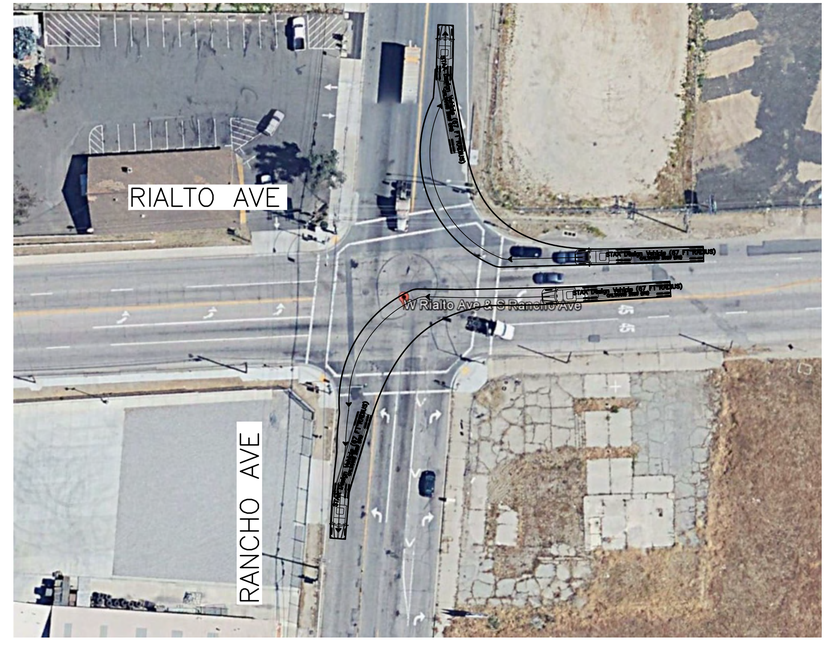


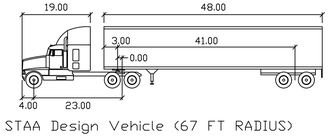

STAA Design Vehicle (67 FT RADIUS)

feet

| | | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |

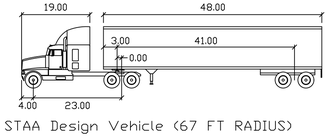


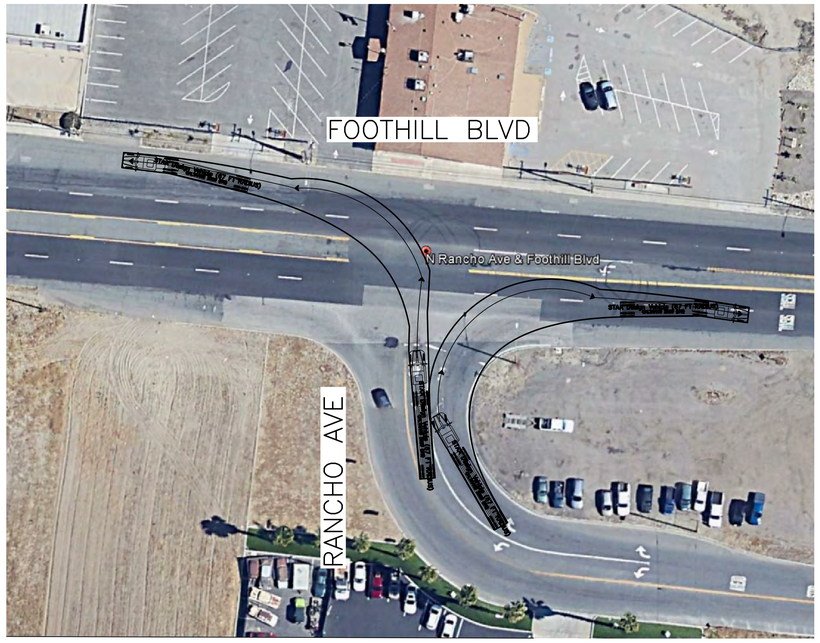

STAA Design Vehicle (67 FT RADIUS)

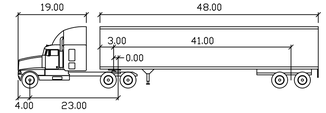
| | feet | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |




STAA Design Vehicle (67 FT RADIUS)

| | feet | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |

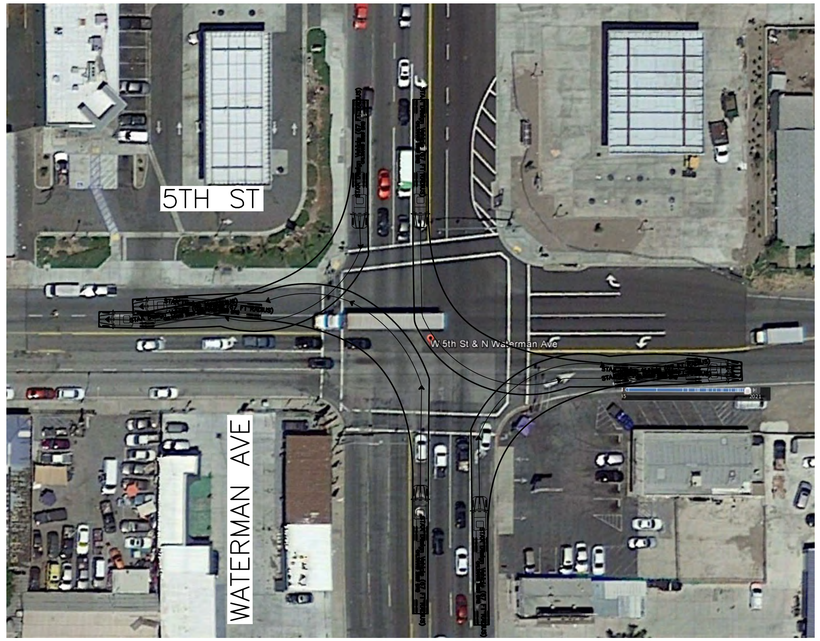



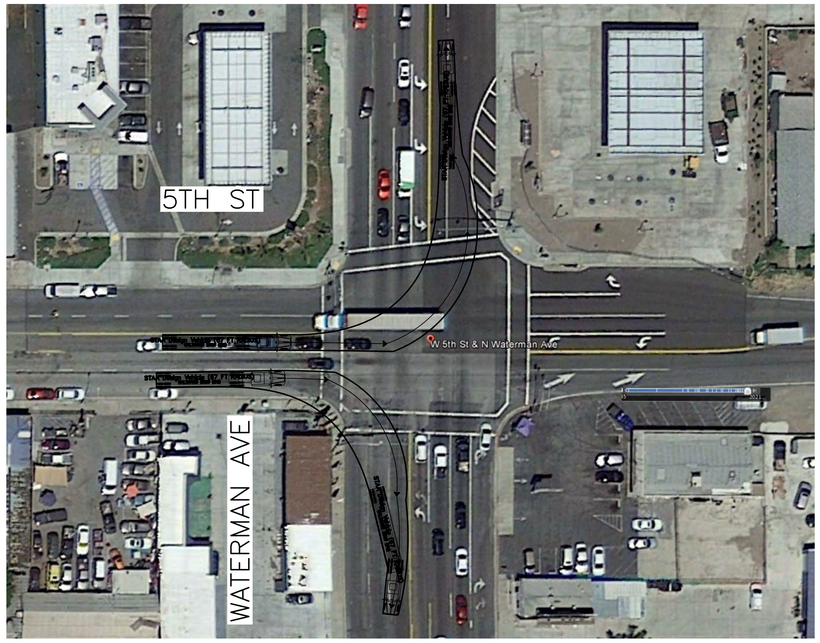



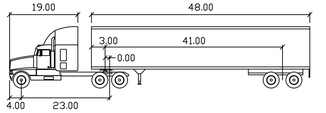

STAA Design Vehicle (67 FT RADIUS)

feet

| | | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |




STAA Design Vehicle (67 FT RADIUS)

feet

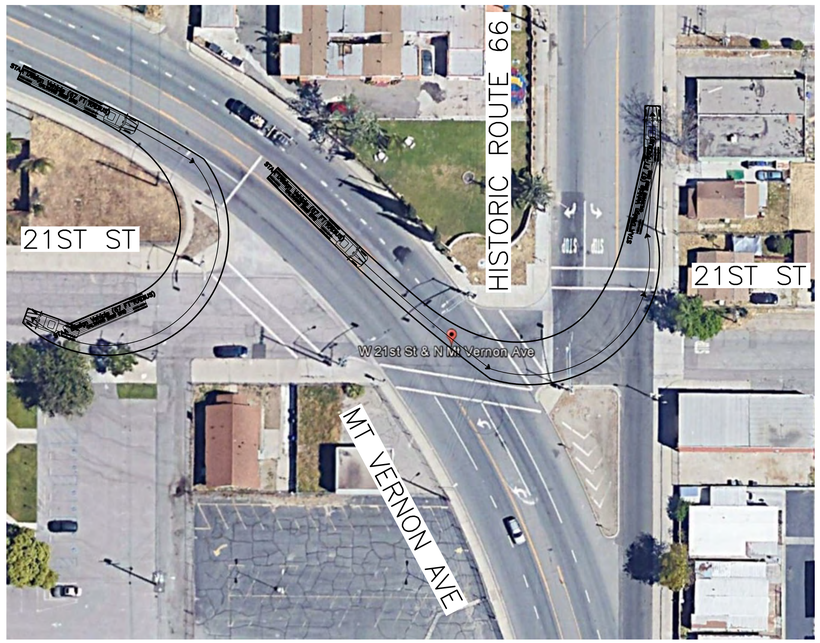
| | | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |






STAA Design Vehicle (67 FT RADIUS)

| | feet | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |

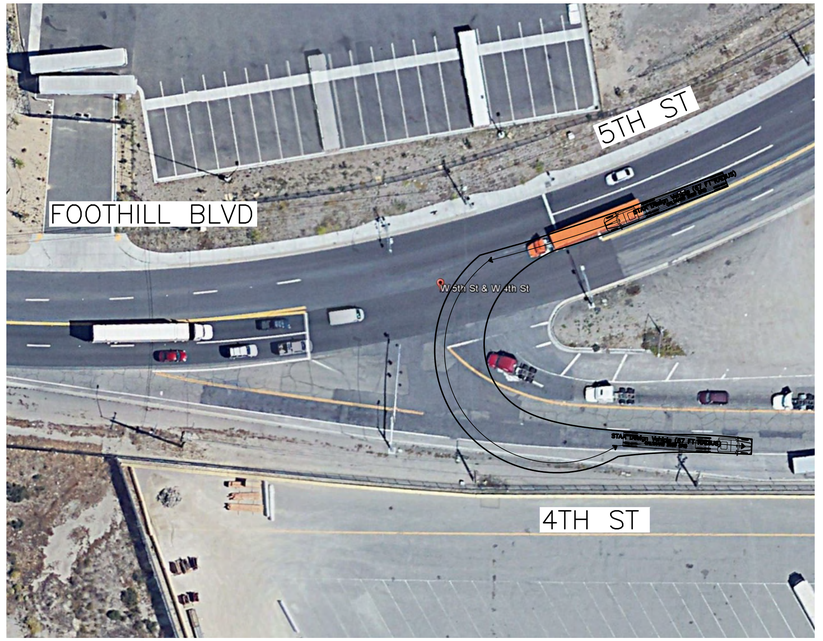





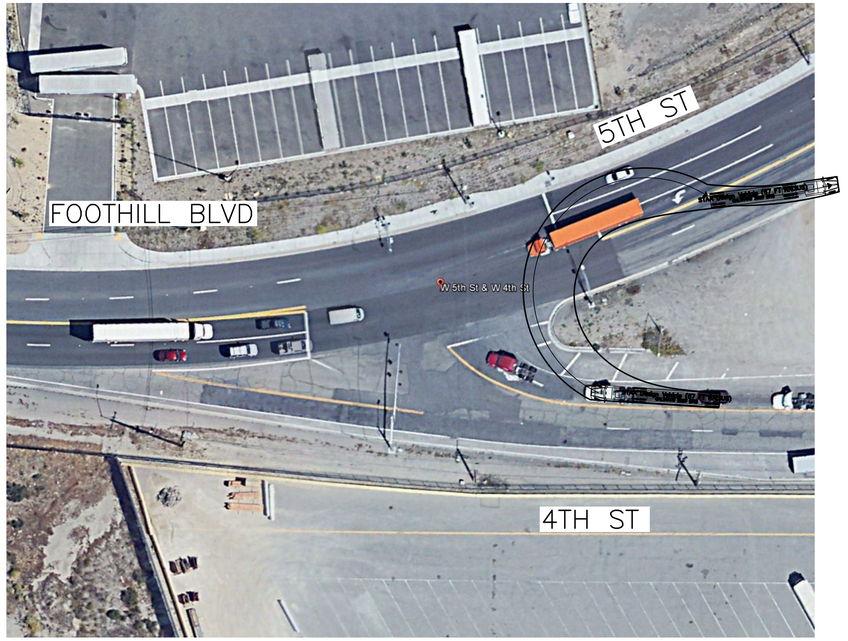


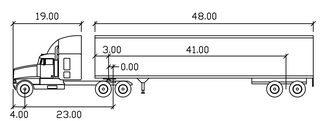
STAA Design Vehicle (67 FT RADIUS)

| | feet | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |



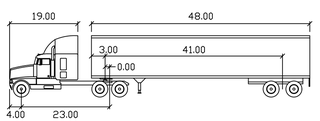



STAA Design Vehicle (67 FT RADIUS)

feet

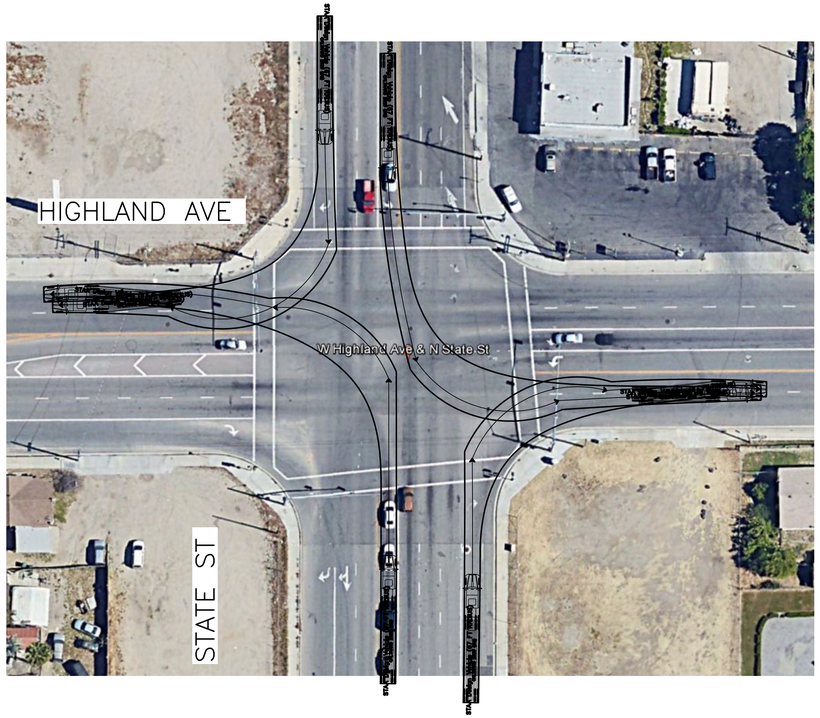
| | | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |

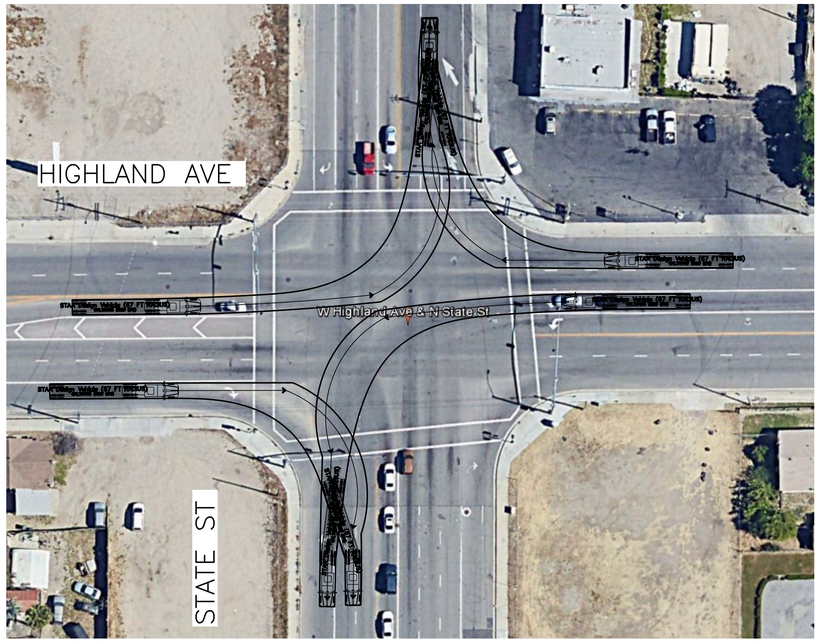


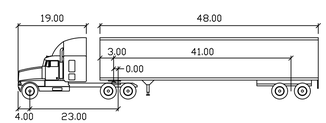

STAA Design Vehicle (67 FT RADIUS)

feet

| | | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |




STAA Design Vehicle (67 FT RADIUS)

feet

| | | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
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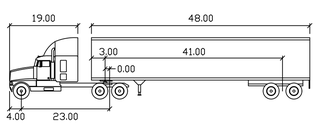
| Trailer Track | : 8.50 | | |






STAA Design Vehicle (67 FT RADIUS)

feet

| | | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
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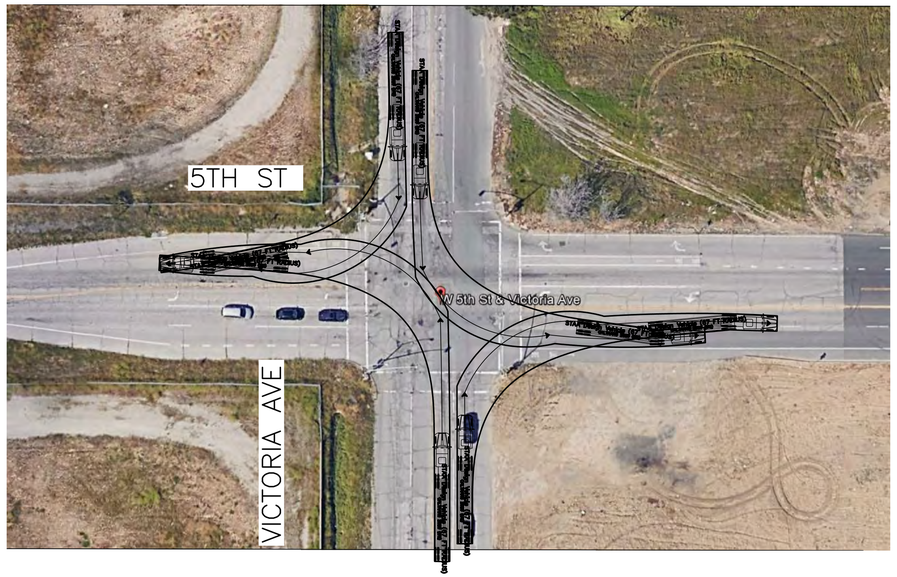
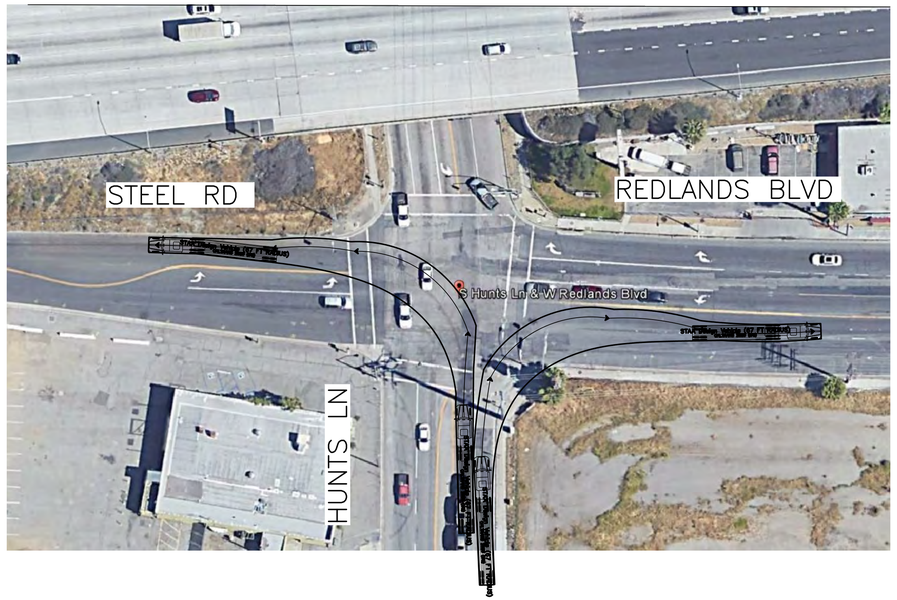
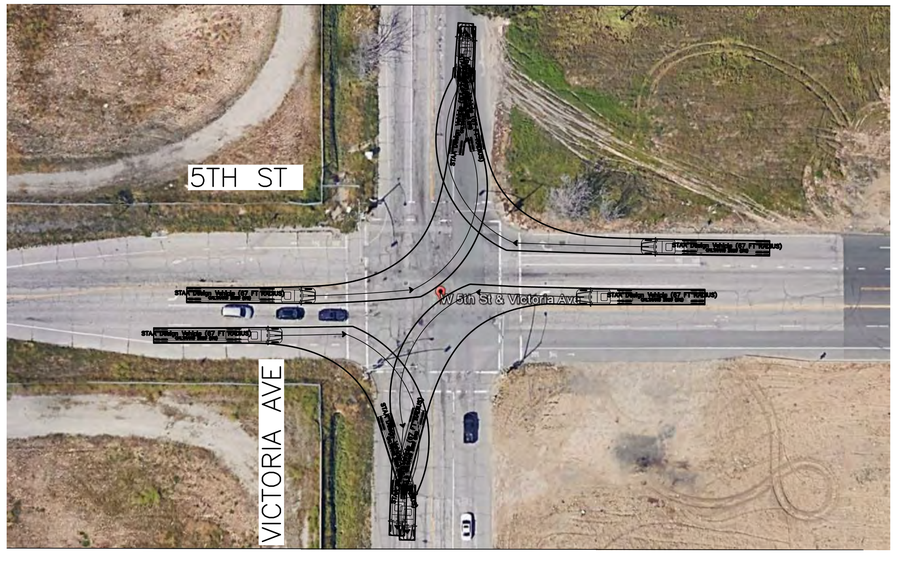
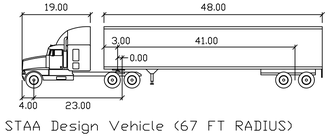


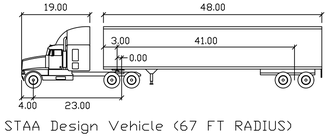







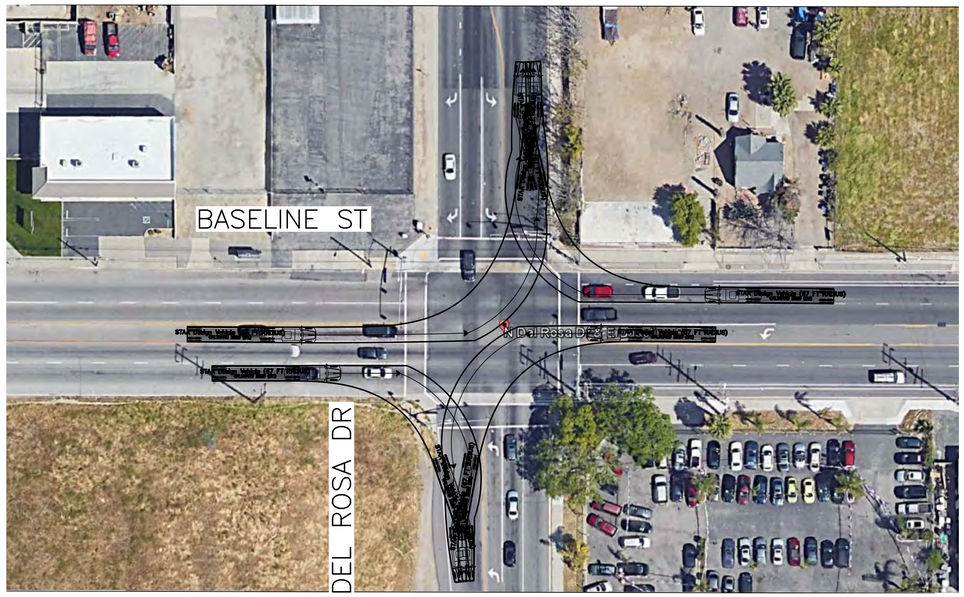

STAA Design Vehicle (67 FT RADIUS)

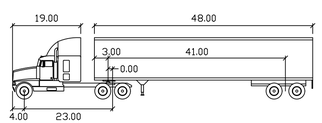
| | feet | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |




STAA Design Vehicle (67 FT RADIUS)

| | feet | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |


STAA Design Vehicle (67 FT RADIUS)

| | feet | | |
|---|---|---|---|
| Tractor Width | : 8.50 | Lock to Lock Time | : 6.0 |
| Trailer Width | : 8.50 | Steering Angle | : 21.4 |
| Tractor Track | : 8.50 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 | | |