

SR 0001, Section RC3

Purpose and Need Statement

1.0 Introduction

The Pennsylvania Department of Transportation (PennDOT), Engineering District 6-0, in cooperation with the Federal Highway Administration (FHWA), is advancing the transportation improvements that were identified during the SR 0001 Group 03S transportation corridor studies.

This document evaluates the identified transportation needs and associated data to support the purpose and need for the SR 0001, Section RC3 Improvement Project National Environmental Policy Act (NEPA) investigations. The purpose and need statements have been developed in accordance with Title 23 Code of Federal Regulations (CFR) Part 771 as well as the PennDOT Needs Study Handbook (PUB-319, May 2020) and PennDOT Design Manual 1, Transportation Program Development and Project Delivery Process (PUB-10, May 2020).

1.1 Background

The initial purpose of the SR 0001 Section RC3 project was to improve safety on the SR 0001 mainline, while maintaining adequate access and limiting impacts to the adjacent local roadways and communities. The original alternatives analysis study for the project, the *US Route 1 Frontage Road Corridor Study*, was completed in March 2011 and identified limited safety improvements for the project corridor. The proposed safety improvements included the addition of full width outside shoulders for the SR 0001 mainline and replacement of the raised concrete islands separating the mainline from the service (frontage) roads with a concrete median barrier. The existing slip ramps were also identified as a safety concern because their acceleration and deceleration lanes do not meet current design standards; however, providing adequate acceleration and deceleration lane lengths in addition to full width mainline shoulders would have substantial right-of-way impacts. As a result, several of the intermediate slip ramps between the SR 0001 mainline and service roads were proposed to be closed.

A Design Field View for the proposed improvements was submitted in June 2013 and a Design Field View Meeting was held in August 2013. During the spring and fall of 2014, public meetings were held for the project. A number of concerns with the proposed design were raised during that public outreach effort:

- Closure of intermediate slip ramps on the service roads would require traffic to travel the entirety of the service roads and potentially result in speeding.
- Emergency responders had concerns regarding replacement of the concrete separator islands with concrete barrier which would limit access and potentially impact response time.
- Closure of the intermediate slip ramps on the service roads would lead to traffic using the adjacent local road network as bypass / cut-through routes during incidents on SR 0001.

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- Concern that traffic noise mitigation was not included in the project improvements.

Based on public concerns, an *Interchange Alternatives Analysis Study* was advanced in 2015 to assess additional access improvement alternatives along the corridor including, but not limited to:

- A full access direct connect interchange with SR 0413 (Pine Street).
- A southern interchange in the vicinity of SR 2008 (Highland Avenue) (should the decision be made to remove the service road system completely from SR 0001).

Traffic counts were conducted in 2015 and summarized in an *Existing Conditions Report* (2016). The project was then put on hold. The project was restarted in 2018, and traffic counts were updated in September 2018. The draft *Interchange Alternatives Analysis Study* was completed in April 2019. The updated traffic information was used by the Delaware Valley Regional Planning Commission (DVRPC) to update its regional model in 2019 and provided updated traffic volume forecasts for various roadways in the project area. The traffic analyses for the alternatives were also updated. PennDOT District 6-0 conducted a study to evaluate an additional interchange alternative for SR 0413 (Pine Street). An operational analysis for a diverging diamond interchange (DDI) was compared to the partial cloverleaf (ParClo) interchange, which had been identified as the preferred interchange option for both SR 0413 (Pine Street) and a southern interchange in the vicinity of the SR 2008 (Highland Avenue) underpass.

In May 2021, a virtual Public Officials Update was conducted to convey the initial findings of the analysis with local agency representatives. Bucks County, Middletown Township, and Langhorne Manor Borough, as well as local politicians, were present at the meeting. Materials provided at the meeting included an overview of the project and information on both the ParClo and DDI alternatives; the ParClo was chosen as the preferred alternative. The *Interchange Alternatives Analysis Report* was then finalized in August 2021 recommending the ParClo interchange as the Preferred Alternative for SR 0413 (Pine Street) as well as the interchange in the vicinity of SR 2008 (Highland Avenue).

The previous traffic analysis completed as part of the 2021 *Interchange Alternatives Analysis Report* was reevaluated and updated in February 2025 utilizing 2024 traffic data. The traffic analysis compared the No Build Alternative and the Preferred Alternative to assess the traffic and safety impacts.

1.2 Project Location and Relationship to Other SR 0001 Projects

The SR 0001 Section RC3 project is located in Middletown Township, Langhorne Manor Borough, and Langhorne Borough in Bucks County, PA and includes the area of SR 0001 from north of the SR 2037 (Business Route 1) / Penndel Interchange to north of the Corn Crib Lane (SR 2197) overpass. SR 0001 Section RC3 is part of the larger PennDOT SR 0001 Group 03S project which consists of four separate projects: Section LHB, Section RC1, Section RC2 and Section RC3. Section LHB included reconstruction of the SR 0001 and SR 0213 Interchange and was completed in 2014. Sections RC1 and RC2 are located south of the RC3 service Road section; Section RC1 construction was

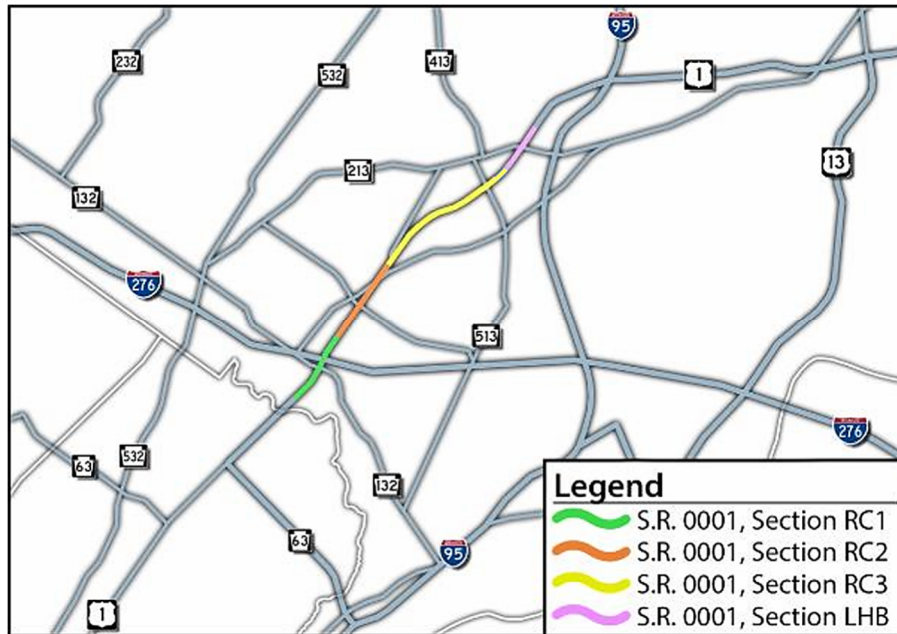
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completed in November 2022 and Section RC2 construction is anticipated to be completed in 2025. **Figure 1** depicts these project locations.

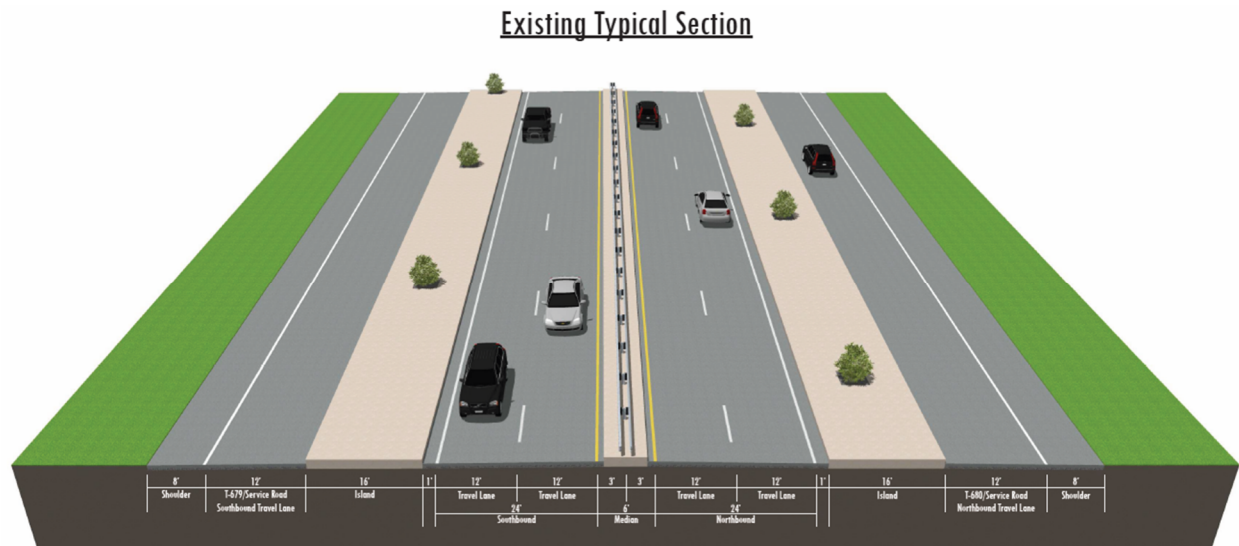
Figure 1. SR 0001, Group 03S Project Locations



1.3 Transportation Network and Conditions

In the existing condition, the SR 0001 mainline roadway, where the adjacent service roads are present, is a curbed section with two 13-foot travel lanes in each direction separated by a center median barrier with very limited, if any, inside shoulders and outside shoulders. See **Figure 2** for an existing typical section of the SR 0001, Section RC3 corridor. SR 0001 carries both local and regional traffic and a mix of all vehicle types (automobiles, medium trucks, and heavy trucks). The Average Annual Daily Traffic (AADT) volume according to PennDOT's Traffic Information Repository (TIRe) database for the existing condition is approximately 75,000 vehicles (2024, grown from 2016 data) with 8% truck traffic northbound and 10% truck traffic southbound. SR 0001 within the project area is characterized as an "Other Principal Arterial" meaning that it is designed to have higher mobility and lower degrees of access. SR 0001 is accessible via an interchange with SR 0213 (Maple Avenue) to the north of the service road limits and via an interchange with SR 2037 Business Route 1 (Old Lincoln Highway) to the south. The referenced service roads run one-way northbound and southbound parallel to the SR 0001 mainline and are separated from the SR 0001 mainline by raised concrete islands. There are several slip ramps that provide access between the service roads and SR 0001 mainline; however, the acceleration and deceleration lanes of these slip ramps do not meet current design criteria.

Figure 2. Existing Typical Section for SR 0001, Section RC3



2.0 Safety

2.1 Crash Analysis

Data was collected from PennDOT's Crash Information Tool (PCIT) database for crashes that occurred between January 1, 2019 and December 31, 2023. According to Pennsylvania's Consolidated Statutes, Section 3746(a), a crash is reportable if it involves damage to any vehicle that cannot be driven under its own power without further damage or hazard to the vehicle, other traffic elements, or the roadway, requiring towing. PennDOT identifies seven types of crashes: non-collision, head-on, rear-end, sideswipe, angle, hit fixed object, and hit pedestrian. Crashes were reviewed to determine if there were any fatalities within the project area and to complete the predicted crash frequency calculations based on Highway Safety Manual (HSM) methodologies.

Crash data was collected within the following roadway lengths:

- Mainline SR 0001
 - From approximately 700ft north of the SR 0001 bridge over Bus. Rte. 1 and the railroad tracks at the Penndel Interchange north to approximately 2000ft north of the SR 0001 bridge over SR 0213 at the Maple Avenue Interchange, which correlates to:
 - Northbound SR 0001 Segment 0070 Offset 0000 to Segment 0134 Offset 0000, and
 - Southbound SR 0001 Segment 0071 Offset 0000 to Segment 0135 Offset 0000

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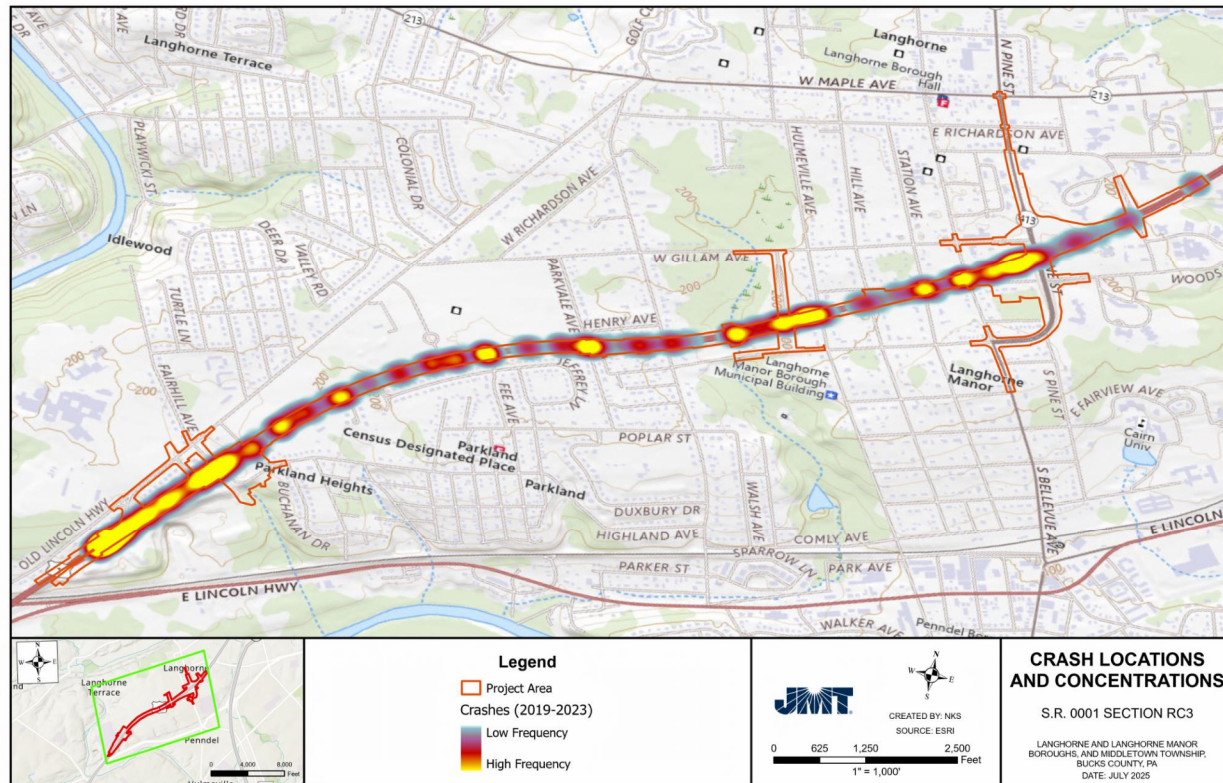
- SR 0413 (Pine Street)
 - From the SR 0413 (Pine Street) intersection with SR 2049 (Bellevue Avenue) and West Highland Avenue north to approximately 400ft north of the SR 0413 (Pine Street) intersection with Gillam Avenue, which correlates to:
 - Northbound SR 0413 (Pine Street) Segment 0210 Offset 0000 to Segment 0220 Offset 0000
 - Southbound SR 0413 (Pine Street) Segment 0211 Offset 0000 to Segment 0221 Offset 0000

Along SR 0001, there were 164 crashes in the five-year span. Four crash types accounted for all but 11 of the 164 crashes: 21 angle (13%), 63 hit fixed object (38%), 55 rear-end (34%), and 14 same direction sideswipe (9%). The crash severities consisted of one fatal (<1%), 65 injury (40%) and 98 property damage only (60%).

Along SR 0413 (Pine Street), there were a total of 19 crashes in the five-year span. Angle crashes were the predominant crash type occurring approximately every 3 or 4 crashes (15 crashes; 79%). No fatalities were reported; however, 2 out of every 3 crashes on SR 0413 (Pine Street) resulted in injuries (12 crashes; 67%).

Figure 3 provides an overview of the general crash locations along SR 0001, as well as a “heat map” illustrating the concentration of crashes. Review of this figure reveals that crashes were scattered along the corridor with a concentration near the SR 2008 (Highland Avenue) underpass, the SR 2199 (West Interchange Road) overpass, and the SR 0413 (Pine Street) overpass, which are also in the vicinity of the various access points between the service roads and the SR 0001 mainline.

Figure 3. Crash Locations and Concentrations



2.2 Highway Safety Analysis

The Interchange Safety Analysis Tool (ISATe) was utilized to complete an analysis for the existing conditions (per the latest five-year historic crash data utilizing the PCIT and local police crash reports) to evaluate the safety performance of SR 0001 and the service roads within the project area. The ISATe was also used to complete the same analysis for the design year. The ISATe can be used as an analytical tool for quantifying potential effects of crashes for decision-making during the planning, design, operations, and maintenance processes. It also assists in evaluating how design elements could impact safety. The following methodologies were used to calculate the following within the project area:

- **Predicted Average Crash Frequency (Baseline)** – estimate of long-term average crash frequency based on the geometric design, traffic control features, and traffic volume of the site. This measure does not account for any observed site-specific crash history.
- **Observed Crash Frequency** – the historical crash data observed/reported at the site during the period of analysis.
- **Expected Average Crash Frequency (Normalized)** – estimate of long-term average crash frequency, calculated based on the observed crash frequency.
- **Potential for Safety Improvement (PSI)** – estimates of how much long-term crash frequency can be reduced at a site and is represented as the Expected Average Crash

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Frequency minus the Predicted Average Crash Frequency. A positive PSI identifies areas along a roadway where potential design improvements could improve safety.

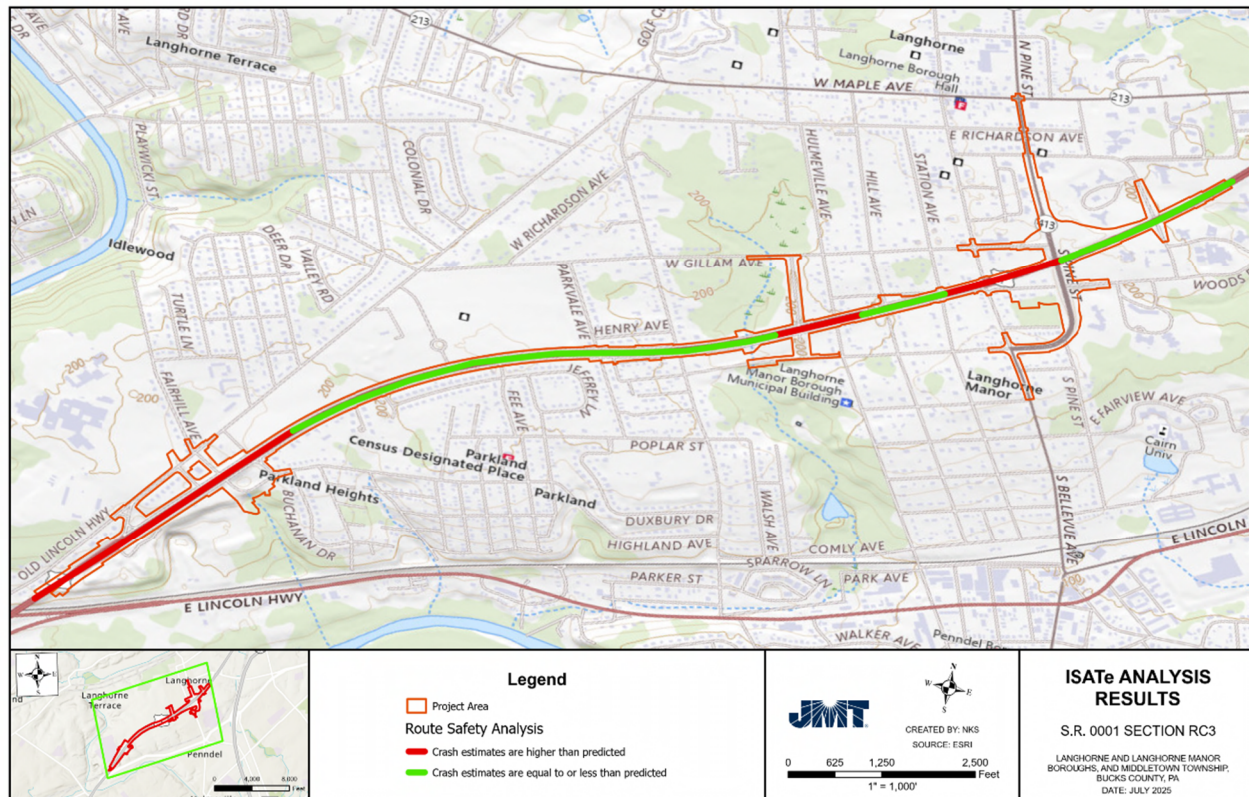
The ISATe analysis conducted for SR 0001 indicates that when evaluating the roadway by segments, five of the 11 segments had an Expected number of crashes greater than the ‘Predicted’ number of crashes (i.e., showing a safety need). These segments are shown in **Table 1**. Numbers shown in “red” indicate the roadway segment is seeing more crashes than “predicted” for a similar roadway in a similar setting. Numbers shown in “green” indicate the roadway segment is experiencing less crashes than “predicted” for a similar roadway in a similar setting. Additional correlation between the ‘Expected’ number of crashes and actual number of crashes can be seen in **Figure 4**.

For the entire corridor, there are 3.1 more ‘Expected’ crashes versus ‘Predicted’ crashes, showing a positive PSI for the corridor. This indicates that there are 6% more crashes occurring within the entire corridor than would be expected. These excess crashes indicate potential safety issues within the corridor.

Table 1. Expected vs. Predicted Crashes in the SR 0001, Section RC3 Corridor

Segment	Expected Crashes	Predicted Crashes	Potential for Safety Improvement (PSI)	Description
1	7.167	2.856	4.311	Freeway with one exit ramp and one entrance ramp
2	10.749	7.706	3.043	Freeway
3	3.528	4.049	-0.521	Freeway with one exit ramp
4	3.855	4.650	-0.795	Freeway with one entrance ramp
5	7.597	8.457	-0.860	Freeway
6	3.822	4.516	-0.694	Freeway with one exit ramp and one entrance ramp
7	3.955	3.010	0.945	Freeway
8	2.886	3.937	-1.051	Freeway with one exit ramp and one entrance ramp
9	2.854	2.532	0.322	Freeway
10	3.920	2.738	1.182	Freeway with one exit ramp and one entrance ramp
11	5.308	8.072	-2.764	Freeway
Total	55.64	52.52	3.118	

Figure 4. ISATe Analysis Results



3.0 Project Purpose and Need

The Project's purpose and needs document the transportation issues and challenges within the SR 0001, Section RC3 corridor. They also provide a foundation to help identify the range of alternatives that should be considered as part of the NEPA process. Specifically, the transportation needs will provide the foundation for the evaluation of how well the proposed project alternatives address the identified transportation issues and challenges.

3.1 Project Area Needs

The needs include safety and system continuity as summarized below:

- **Existing roadway configurations and traffic conditions contribute to safety concerns in the project area.**
 - Acceleration lanes do not meet current design criteria for length or gap acceptance (room to safely merge into traffic).
 - Curbed traffic island along a high-speed facility (SR 0001), combined with a lack of inside and outside shoulders along SR 0001, limits vehicle recovery or refuge.
 - Low profile traffic island does not prevent errant vehicles from leaving the roadway.

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- SR 2199 (West Interchange Road) overpass pier columns are unprotected in separator traffic island and located within the clear zone (bridge pier not protected by barrier or guide rail).
 - Crashes were identified throughout the project corridor with crash clusters located at multiple locations along SR 0001, including near the SR 2008 (Highland Avenue) underpass, SR 2199 (West Interchange Road) overpass, and SR 0413 (Pine Street) overpass, which are also in the vicinity of the multiple merge / diverge points (slip ramps) between the service roads and the SR 0001 mainline.
 - The ISATe analysis and crash data analysis indicated that nearly half of the segments within the SR 0001, Section RC3 corridor have an 'Expected' number of crashes that exceeds the 'Predicted' number of crashes, with 3.1 more expected than predicted crashes overall. This correlates to a positive potential for safety improvements (PSI), indicating there is potential for safety improvements within the SR 0001, Section RC3 corridor.
- **SR 0001 does not meet current design standards.**
 - The following areas along the SR 0001, Section RC3 project corridor do not meet current design standards:

Existing Condition	Design Criteria Requirement
SR 2199 (West Interchange Road) bridge over SR 0001 has a vertical clearance of 14'-5 ¾" (posted 14'-2").	The required minimum clearance is 16'-6".
SR 0413 (Pine Street) bridge over SR 0001 has a vertical clearance of 14'-2 ¼" (posted 13'-11").	The required minimum clearance is 16'-6".
SR 0001 mainline travel lanes within the service road corridor have 1'-0" outside shoulders.	The required outside shoulder width is 10'-0" minimum, with 12'-0" preferred.
SR 0001 mainline travel lanes north of the service road corridor have outside shoulders that range from 7.5' to 8' in the northbound direction and 6.3' to 8' in the southbound direction.	The required outside shoulder width is 10'-0" minimum, with 12'-0" preferred.
SR 0001 median width is 4'-0".	The minimum required median width is 10'-0".
SR 0001 existing left (median) shoulder width is 1'-0".	The minimum required left (median) shoulder width is 4'-0".
SR 0001 has vertical curbs within the service road corridor as part of the median.	Design standards dictate that "...vertical curbs should not be used along freeways or other high-speed roadways".

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Existing Condition	Design Criteria Requirement
Service road ramp acceleration lanes onto SR 0001 do not provide minimum design lengths to allow vehicles to reach merging travel speeds.	The minimum required acceleration lane length is 550'.
Portions of northbound (925') and southbound (910') SR 0001 have a vertical grade of 0.45%.	The minimum required vertical grade is 0.5%.
SR 0001 sight distance just south of the SR 2199 (West Interchange Road) overpass is 404'.	The minimum required sight distance is 570'.
SR 0001 horizontal curves from just north of Park Avenue to just south of the SR 2199 (West Interchange Road) overpass have as flat as 1.75% roadway bank.	The required roadway bank is 2.70%.
The SR 2199 (West Interchange Road) bridge pier columns, located in the SR 0001 raised concrete island, are unprotected from vehicular traffic within the mainline and service road clear zones.	Design standards dictate that bridge piers require barrier protection when located within 30' of the adjacent travel lane.

- **The roadway network and configuration in the project area lack continuity and do not meet driver expectations.**
 - The SR 0001 roadway sections north and south of SR 0001 Section RC3 are more typical of a limited access freeway (i.e., interstate) open section with full width outside paved shoulders, four to twelve-foot inside (median shoulders) and full interchanges. Whereas the SR 0001 Section RC3 service road section lacks full width paved shoulders and introduces curb height concrete traffic islands offset one foot from the mainline travel lanes with cut-through acceleration and deceleration lanes for intermediate (slip ramp) access. The service road section is not typical of a limited access freeway; therefore, driver expectations are not met when traveling through SR 0001 Section RC3.

3.2 Project Purpose

The primary purpose of this project is to facilitate safe and efficient travel along SR 0001 within and through the project area to meet current and future transportation needs while providing a functional and modern roadway that meets current design criteria and driver expectations. In addition, a goal of the project is to consider bicycle and pedestrian mobility within the SR 0001 Section RC3 corridor.