

# US-191 MOAB Concept Study

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Utah Department of Transportation

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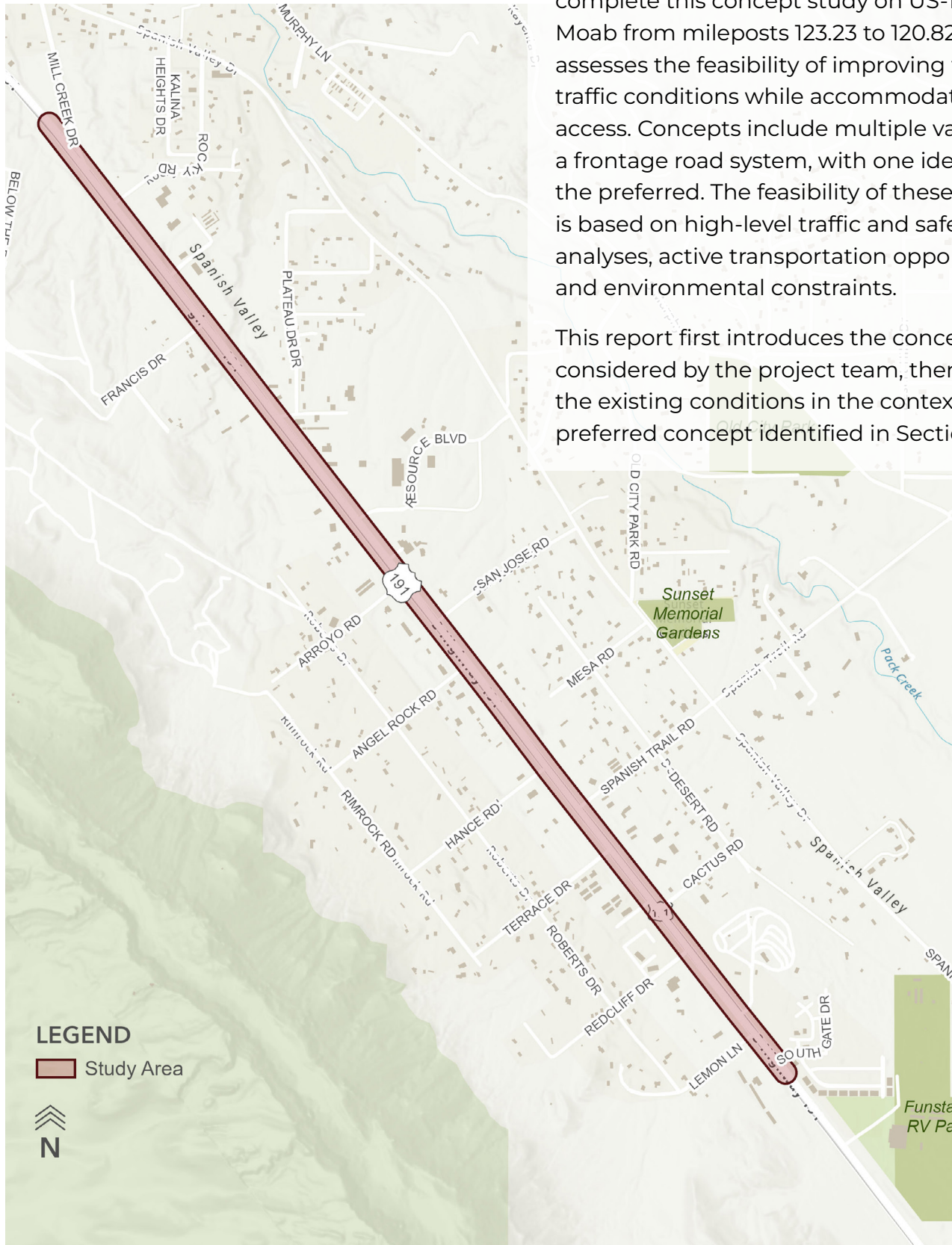
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## Project Summary

Avenue Consultants provided planning, engineering, and environmental services to complete this concept study on US-191 south of Moab from mileposts 123.23 to 120.82. This study assesses the feasibility of improving through traffic conditions while accommodating local access. Concepts include multiple variations of a frontage road system, with one identified as the preferred. The feasibility of these concepts is based on high-level traffic and safety analyses, active transportation opportunities, and environmental constraints.

This report first introduces the concepts considered by the project team, then describes the existing conditions in the context of the preferred concept identified in Section 2.10.

Figure 1. US-191 Study Area



## 1.0 US-191 Study Area

The study area begins just south of South Gate Drive and extends approximately 2.5 miles north to slightly beyond Mill Creek Drive/Aggie Boulevard and is wide enough to include the existing right-of-way and adjoining parcels (see Figure 1). US-191 is the primary route connecting Spanish Valley to Moab. Most of the surrounding area has been developed into various residential, commercial, and recreational uses that have direct access to US-191.

## 2.0 Concepts

Potential concepts considered by the project team include access management and frontage roads to address capacity (present and future) and safety issues along the corridor. All concepts include opportunities for trails to enhance the active transportation network.

These concepts are classified into three broad categories: 1) access management improvements, 2) one-way frontage roads, and 3) two-way frontage roads. All concepts assume future signals at Millcreek Drive/Aggie Boulevard and Spanish Trail Road intersections. Sub-options include  $\frac{3}{4}$  access at six other intersections or one additional full signalized access at Resource Boulevard with a  $\frac{3}{4}$  access at the southernmost Lemon Lane. The frontage road concepts also provide an option for slip ramps between the frontage roads and US-191 to improve local access.

## 2.1 Option 1a – Access Management with Raised Medians and ¾ Access

Figure 2 illustrates a concept that manages access by adding raised medians. This option has full access at the Millcreek Drive and Spanish Trail Road intersections. Six other intersections would allow for left-in turn movements creating ¾ access at these locations. Left-turns from cross-streets are limited to the signalized intersections only. Drivers wanting to turn left onto US-191 would have to utilize a signalized intersection or make a U-turn at the nearest signalized intersection. Right-in/right-out turn movements are allowed at all other public roads and private driveways creating the potential for weaving as drivers make lanes changes to enter the left-turn lanes to make U-turns. Additionally, the access management options limit opportunities for wildlife fencing on the corridor by maintaining access to driveways and side streets.

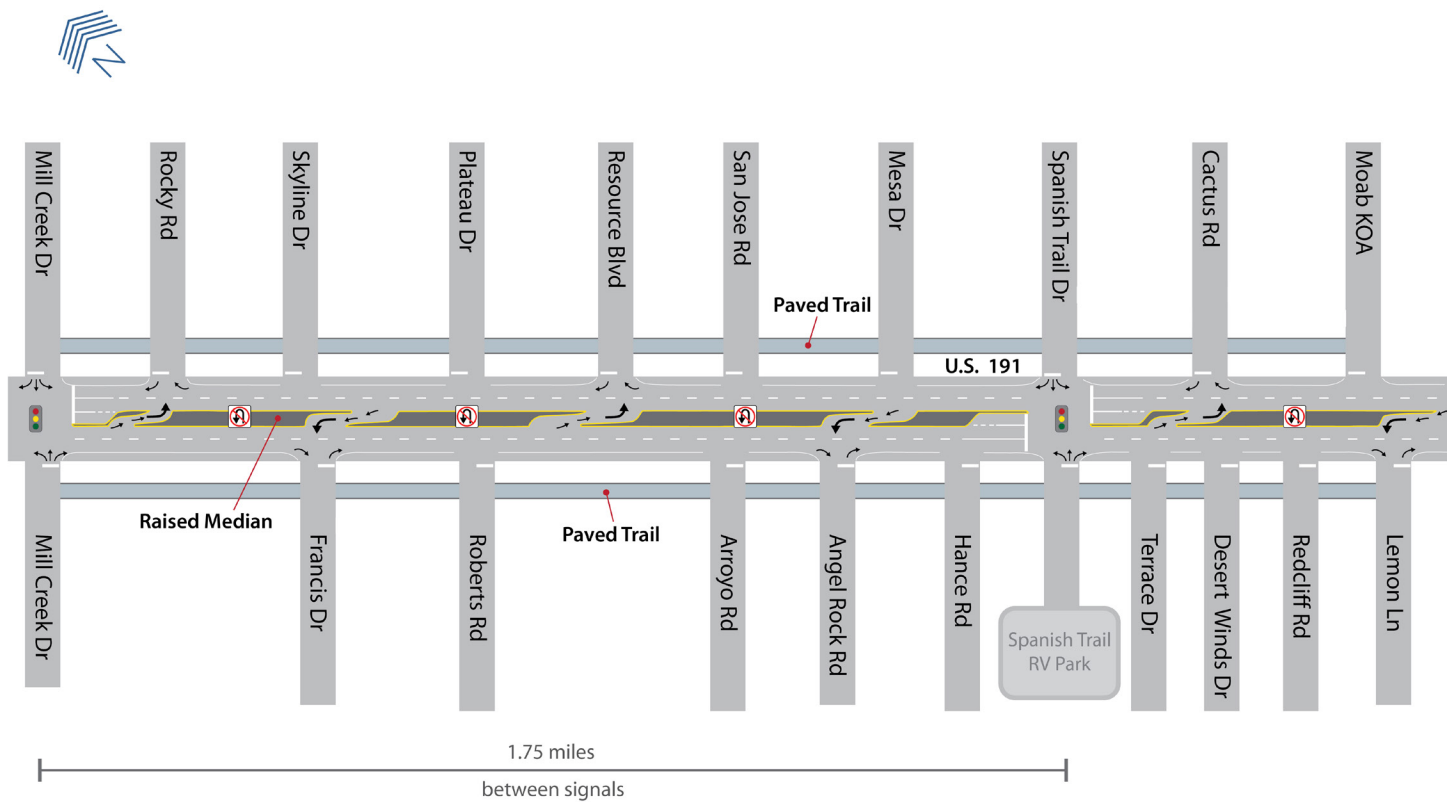


Figure 2. Option 1a – Access Management with Raised Medians and ¾ Access

## 2.2 Option 1b—Access Management with Raised Medians and Signalized Access

This option replaces the  $\frac{3}{4}$  access at Resource Boulevard with a full signalized intersection as shown in Figure 3. Signal spacing is reduced with this option but there is still approximately one mile between the Millcreek Drive and Resource Boulevard intersections with 0.75-miles between the Resource Boulevard and Spanish Trail Road intersections. However, with the additional signalized intersection, all other public streets and driveways are limited to right-in/right-out access only except for Lemon Lane which allows for  $\frac{3}{4}$  access. To make a left-hand turn onto US-191 drivers will have to use the closest signalized intersections or make a U-turn.

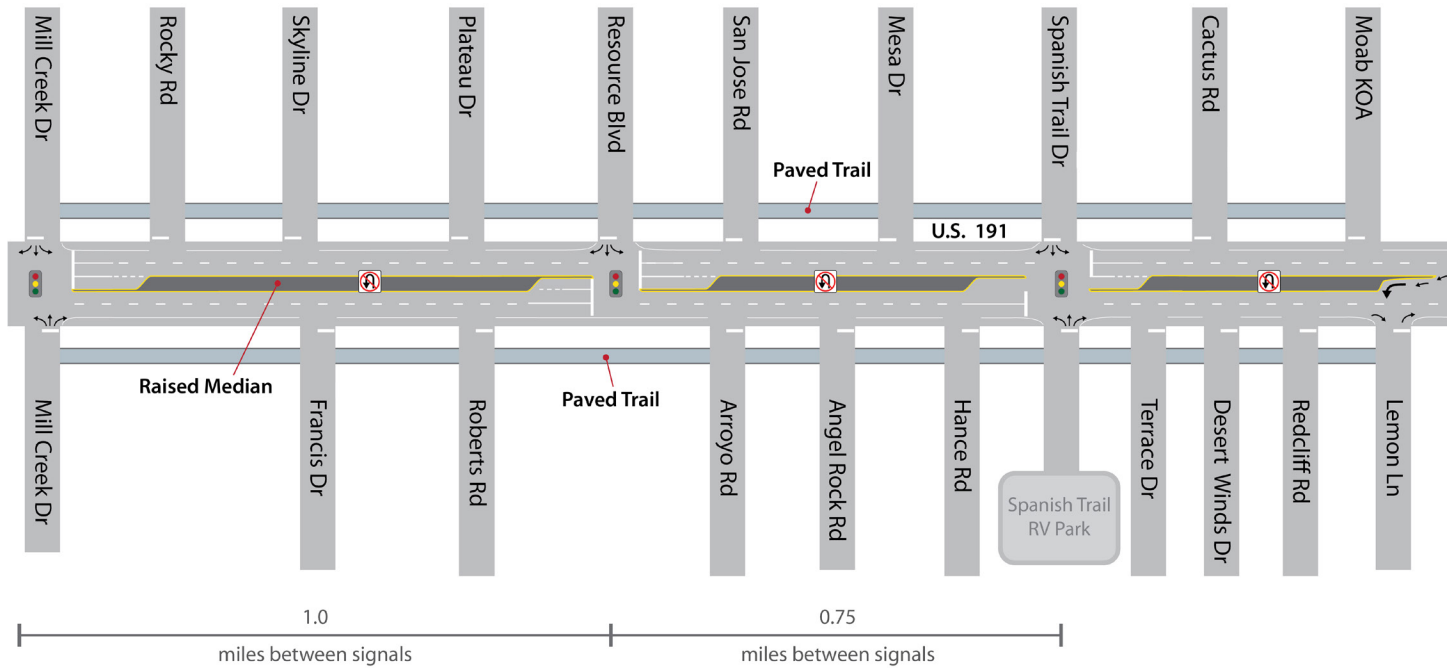


Figure 3. Option 1b—Access Management with Raised Medians and Signalized Access

### 2.3 Option 2a—One-Way Frontage Road with $\frac{3}{4}$ Access

This option adds one-way frontage roads on both the east and west sides of US-191 with the two signalized intersections at Millcreek Drive and Spanish Trail Road as depicted in Figure 4. There are also six  $\frac{3}{4}$  access intersections to provide additional access to the one-way frontage roads. Access to and from all other public streets and driveways to US-191 would be removed and access would be via the one-way frontage road system. This option could require more out-of-direction travel for drivers to make a left-hand turn onto US-191. Depending on the location, these drivers may have to use the one-way frontage road to access one of the full signalized intersections to make a left turn onto US-191 or weave across US-191 to make a U-turn at one of the intersections. The frontage road system would also provide some opportunities for wildlife fencing between the frontage road and US-191 to potentially reduce animal-related crashes which are a concern on the study corridor (see Section 5.2 for more information).

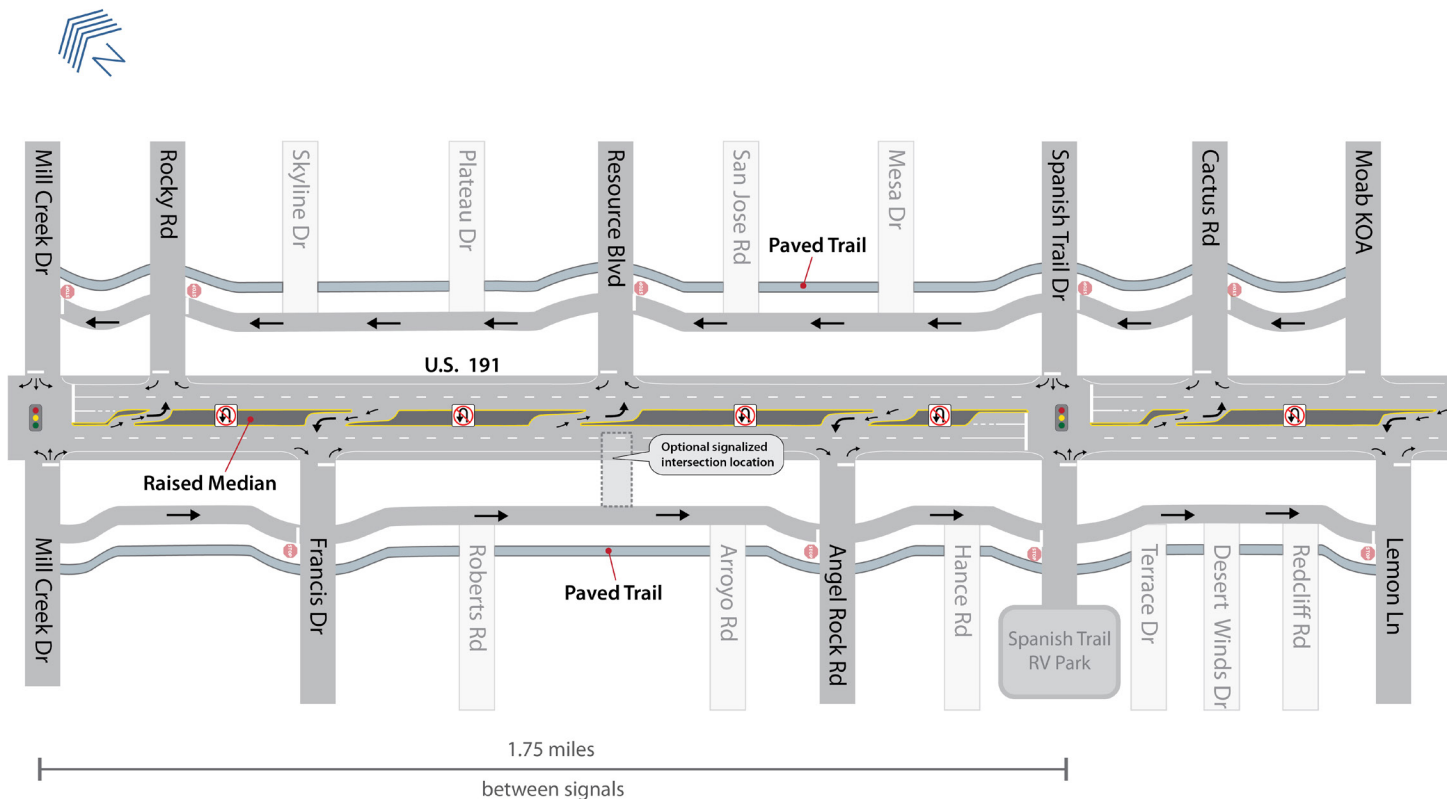
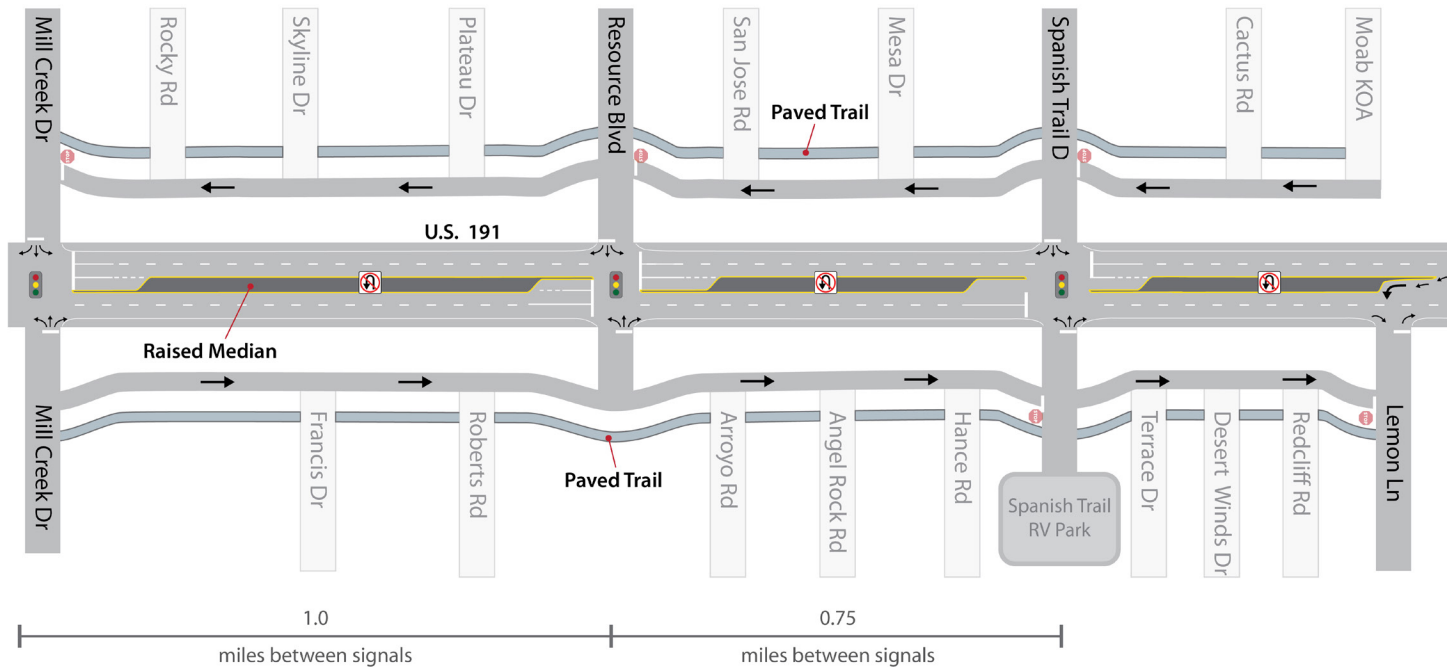


Figure 4. Option 2a—One-Way Frontage Road with  $\frac{3}{4}$  Access

### 2.4 Option 2b—One-Way Frontage Road with Signalized Access

This option modifies the one-way frontage roads by adding another full signalized intersection at Resource Boulevard. Figure 5 shows that this new intersection replaces the intersections with  $\frac{3}{4}$  access except for the Lemon Lane intersection at the southern end of the study area. This new signal will reduce the out-of-direction travel for drivers wanting to make a left turn onto US-191 compared to Option 2a. It will also reduce potential weaving by removing the unsignalized  $\frac{3}{4}$  accesses. Additionally, the reduced number of access points provides a greater opportunity for wildlife fencing between the frontage road and US-191.



## 2.5 Option 2c—One-Way Frontage Road with Slip Ramps

Slip ramps are added to the one-way frontage system in this option as shown in Figure 6. The slip ramps replace the  $\frac{3}{4}$  access intersections except at Lemon Lane. These slip ramps allow for higher speed ingress and egress to US-191 compared to the  $\frac{3}{4}$  intersection option. This option would also have significant out-of-direction travel for drivers to make left turns onto US-191. Drivers would have to use the frontage road to the closest signal to make a left turn or use a slip ramp and then make a U-turn at the closest intersection. These slip ramp to U-turn movements could potentially increase weaving on US-191 as drivers merge then make lane changes to complete the U-turn. The slip ramps would also reduce the opportunity for wildlife fencing compared to signalized access option.

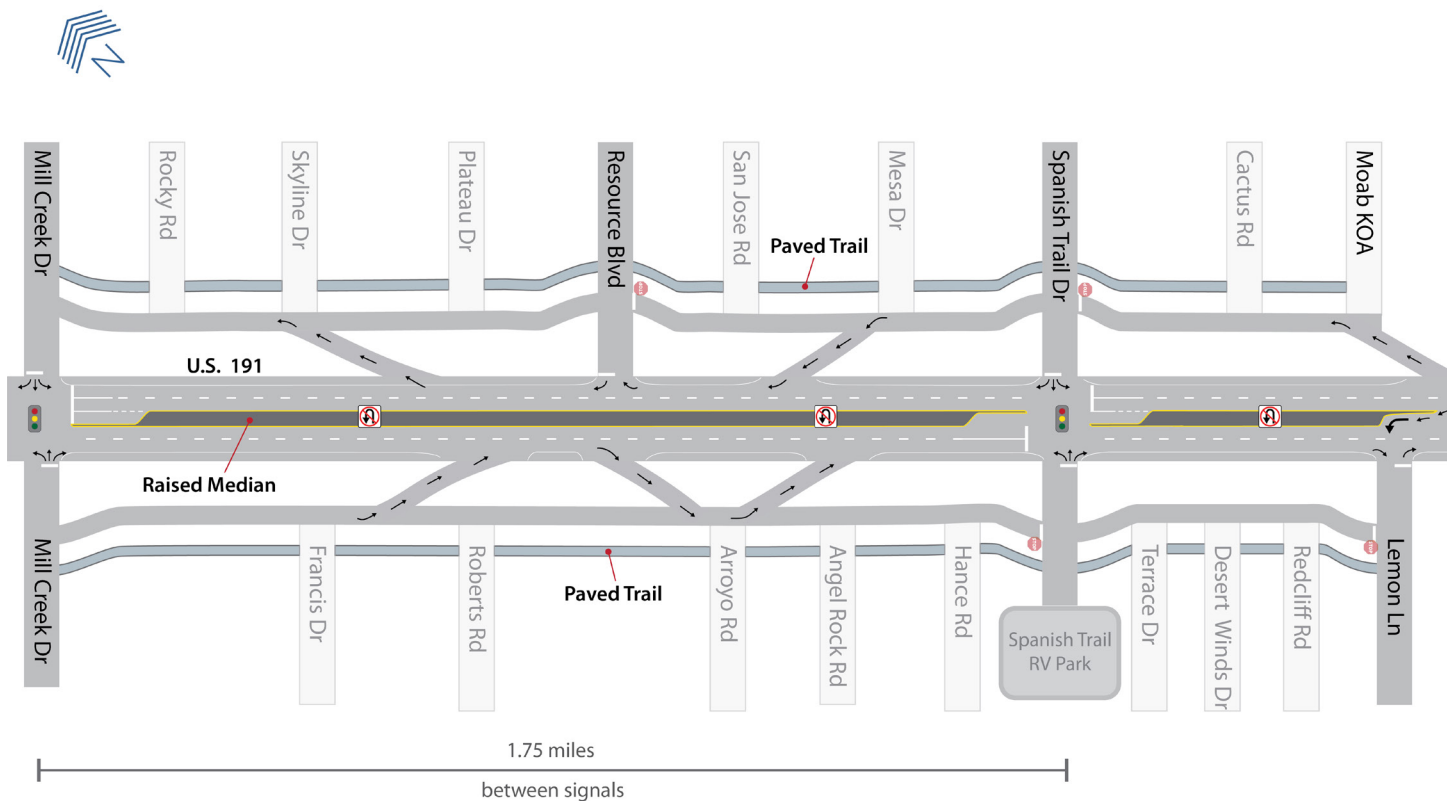


Figure 6. Option 2c—One-Way Frontage Road with Slip Ramps

### 2.6 Option 3a—Two-Way Frontage Road with ¾ Access

This option modifies the frontage road system by adding two-way frontage roads on both the east and west sides of US-191, as illustrated in Figure 7. The signalized intersections and ¾ intersections are proposed at the same intersections as in Option 1a and 2a. The benefit of the two-way frontage roads is that they reduce the potential for out-of-direction travel compared to the one-way frontage system by allowing drivers to access the closest signalized intersection to turn left onto US-191. Potential weaving on US-191 and opportunities for wildlife fencing are similar with the two-way frontage road as they are with the one-way frontage road options.

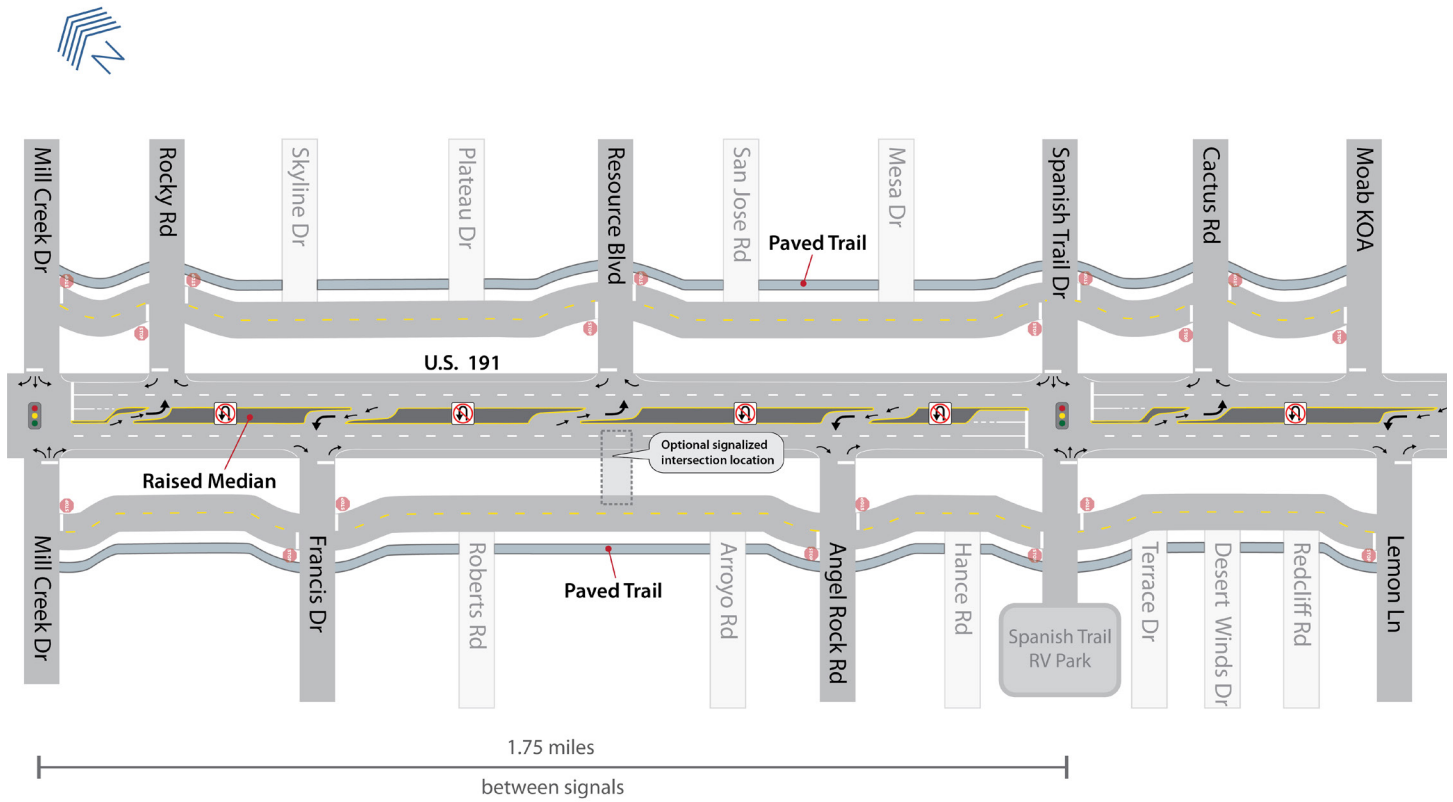


Figure 7. Option 3a—Two-Way Frontage Road with ¾ Access

### 2.7 Option 3b—Two-Way Frontage Road with Signalized Access

Figure 8 shows the two-way frontage road system with signalized intersections at Millcreek Drive, Resource Boulevard, and Spanish Trail Road with a ¾ intersection at Lemon Lane. All other accesses to public streets and private driveways would be on the frontage road system. This option has the same potential for reduced out-of-direction travel as Option 3a but less than the one-way frontage road options.

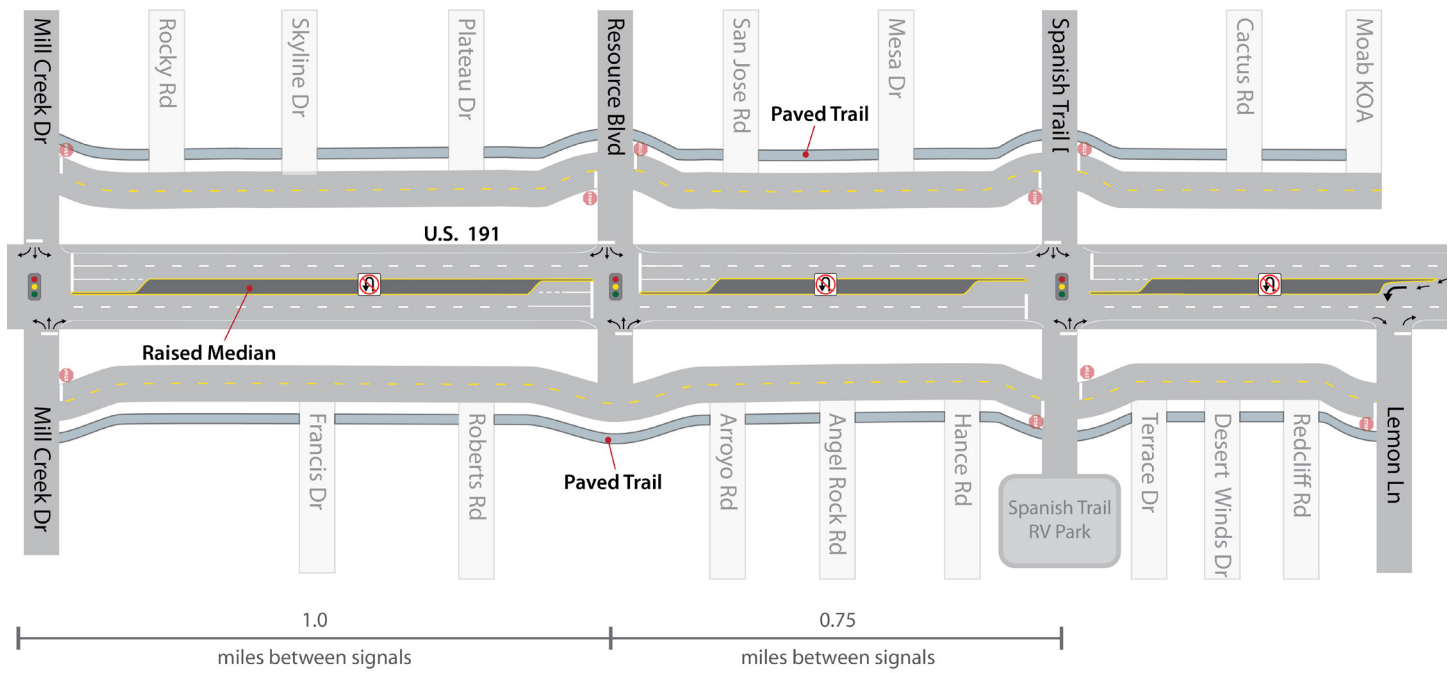


Figure 8. Option 3b—Two-Way Frontage Road with Signalized Access

### 2.8 Option 3c—Two-Way Frontage Road with Slip Ramps

This option would include slip ramps to provide access between mainline US-191 and the frontage roads instead of the ¾ intersections shown in Figure 9. This option would be like the other two-way frontage road options in terms of out-of-direction travel. However, as with Option 2c, the slip ramps could increase weaving as drivers merge and then make lane changes to turn left at the signalized intersections.

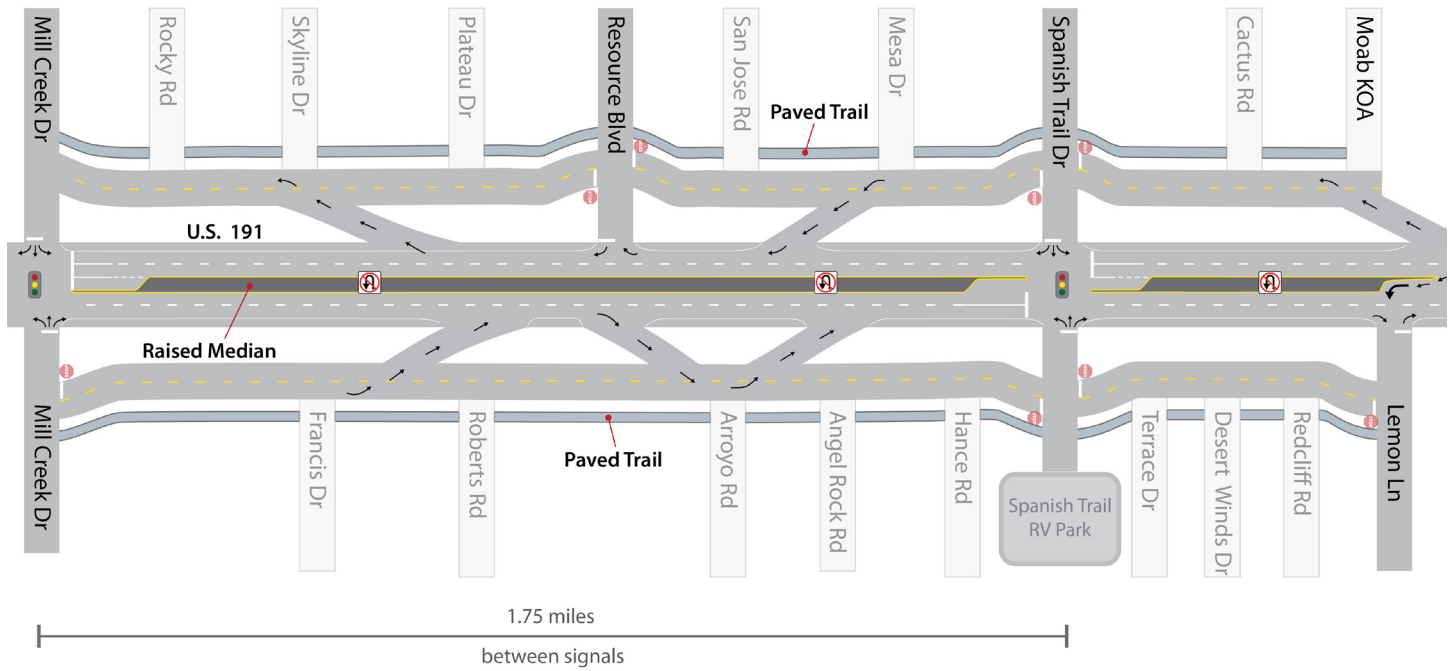


Figure 9. Option 3c—Two-Way Frontage Road with Slip Ramps

## 2.9 Trail Location with Frontage Roads

With the frontage road systems, two options were considered for the location of the multi-use trails. The trails can be located outside of the frontage roads as shown in Figure 10 or between US-191 and the frontage road as illustrated in Figure 11. The multi-use trail outside of the frontage road is easier for cyclists and pedestrians to access but has significantly more conflicts with public street and private driveway crossings. It also negatively affects the interaction between the frontage road and the signalized intersections by reducing the distance from where the frontage road flares out to maximize its distance from the signalized access (more distance is better). Locating the trails between the frontage road and mainline US-191 makes it slightly harder for users to access but there are fewer street crossings. Additionally, with the signalized access options all these trail crossings will have pedestrian signals potentially reducing conflicts with vehicles.

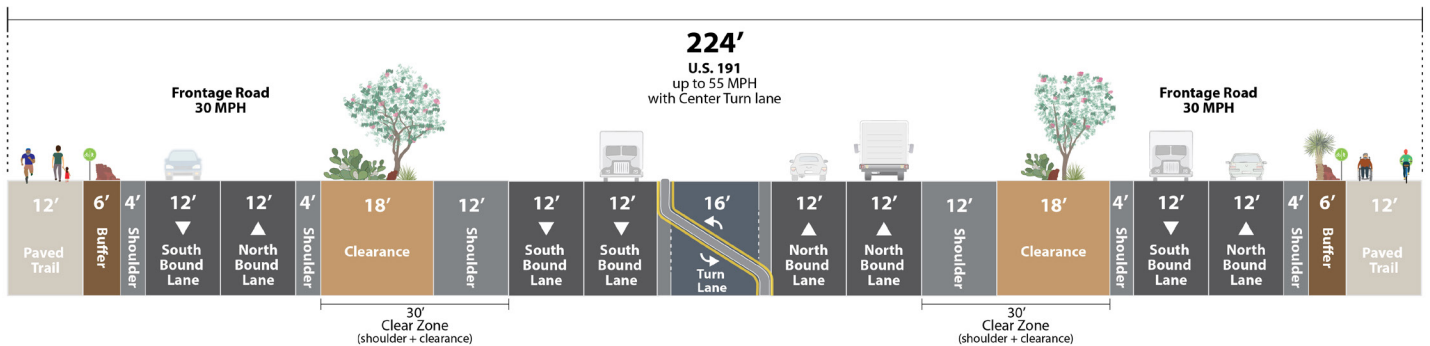


Figure 10. Trail on outside of Frontage Road – Two-way frontage road options.

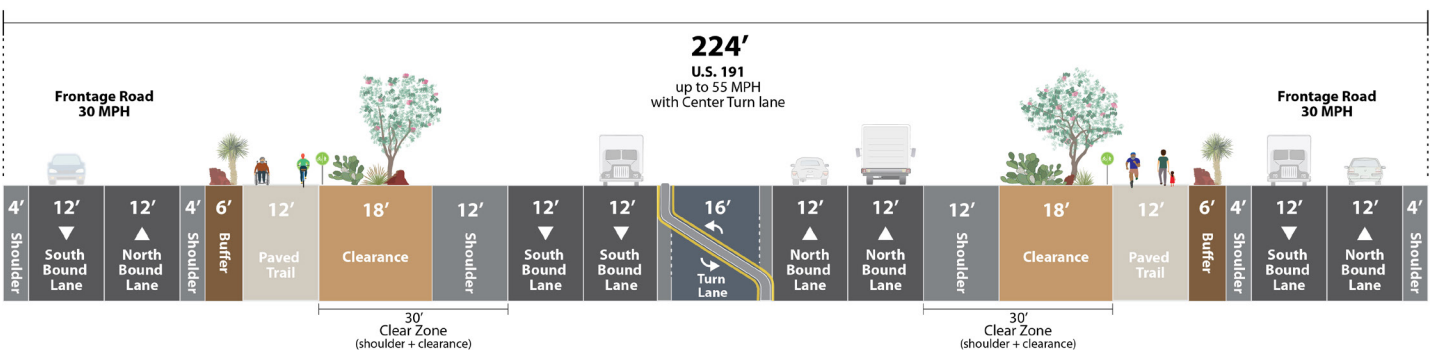


Figure 11. Trail between US-191 & Frontage Road – Two-way frontage road options.

## 2.10 Concept Screening

The project team screened these options based upon potential right-of-way, safety, and mobility impacts. The results of the screening are shown in Figure 12. Based on this high-level screening, Option 3b (highlighted in green) is the preferred concept to carry forward and layout. Although it has the highest right-of-way impact, the other benefits from improved access management, reduced weaving potential, and limited out-of-direction travel outweighed the slightly larger width, especially with the available right-of-way along the corridor. Additionally, for the concept layout, the multi-use trail is between US-191 and the frontage roads.

# Options Summary

Concept				ROW	Safety			Mobility			Driver Expectancy
				Approximate Cross Section Width (feet)	No. of Driveways / Access on US-191	Weaving to / from US-191	Opportunity for Wildlife Fencing	Out-of-Direction Travel	Access to / from US-191	Signalized Access to US-191	
Option 1	Access Management (Raised Medians)	a	3/4 Access	148	66					2	
		b	Signalized Access	148	66					3	
Option 2	One-Way Frontage Road	a	3/4 Access	200	7					2	
		b	Signalized Access	200	1					3	
		c	Slip Ramps	200	8					2	
Options 3 & 4	Two-Way Frontage Road	a	3/4 Access	224	7					2	
		b	Signalized Access	224	1					3	
		c	Slip Ramps	224	8					2	

Moab US-191 Concept Study

Figure 12. Concept Comparison

## 3.0 Traffic Counts

### 3.1 US-191 Mainline Traffic Volumes

Mainline tube counts were collected at two locations in the study area—just north of Rocky Road and south of South Gate Drive—from Thursday, June 17, to Sunday, June 20, 2021, to better understand the current traffic volumes, vehicle mix, and travel patterns on US-191, and more accurately forecast future traffic conditions.

The weekday peak volume north of Rocky Road (the north end of the study area) occurred at 3:45 pm on Friday with an hourly flow rate of 1,510 vehicles. Peak traffic was generally seen between 3:30 pm and 6:00 pm on Thursday and Friday. Weekend peak volumes occurred between 3:30 pm and 6:00 pm with an hourly flow rate of (see Figure 13).

**Similar to Rocky Road, weekday peak volumes** near South Gate Drive (near the south end of the study area) **occurred** at 4:30 pm on Thursday with an hourly flow rate of 938 vehicles. Friday's peak, however, was at 9:30 am with an hourly flow rate of 904 vehicles. Saturday and Sunday had peak volumes from approximately 8:00 am to 10:00 am (see Figure 13).

In summary, weekday peak volumes at both locations occurred during the same time of the day. Traffic volumes are comparatively less at the south end of the study area, indicating most traffic is to and from Moab. Saturday peak volumes at both locations are generally lower than weekday peaks but start sooner and last longer. Sunday peak volumes are the lowest and occur between 2:00 pm and 6:00 pm near Rocky Road and between 8:00 am and 10:00 am near South Gate Drive.

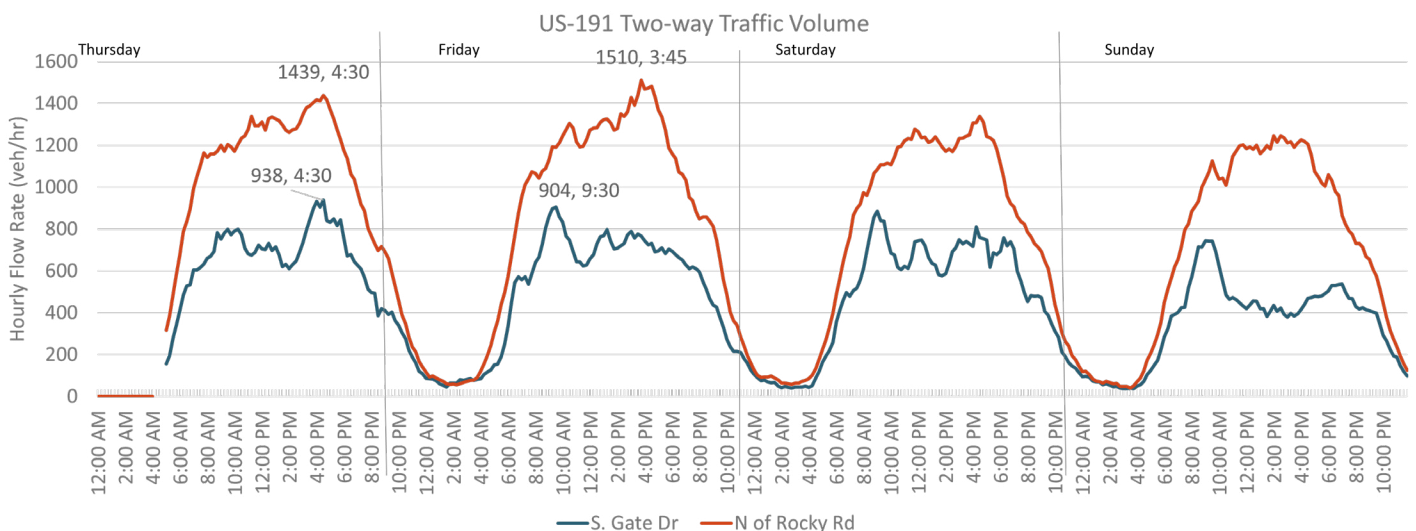


Figure 13. Traffic Tube Counts

### 3.2 Intersection Traffic Volumes

Traffic turn counts were collected on Thursday, June 18, and Friday, June 19, 2021 (See Figure 14). Similar to the mainline tube counts, there were more vehicles counted at the north end of the study area near Mill Creek Drive than the south end near Spanish Trail Road.

Based on the traffic turn counts, the estimated average daily traffic (ADT) for the north end of the study area is 18,500 vehicles per day. At the south end of the study area, the ADT is 42 percent lower, at 10,700 vehicles per day. As the mainline tube counts indicated, traffic volumes generally decrease the farther south an intersection is from Moab, suggesting that most of the traffic originating in the study area heads towards Moab (see Figure 14).

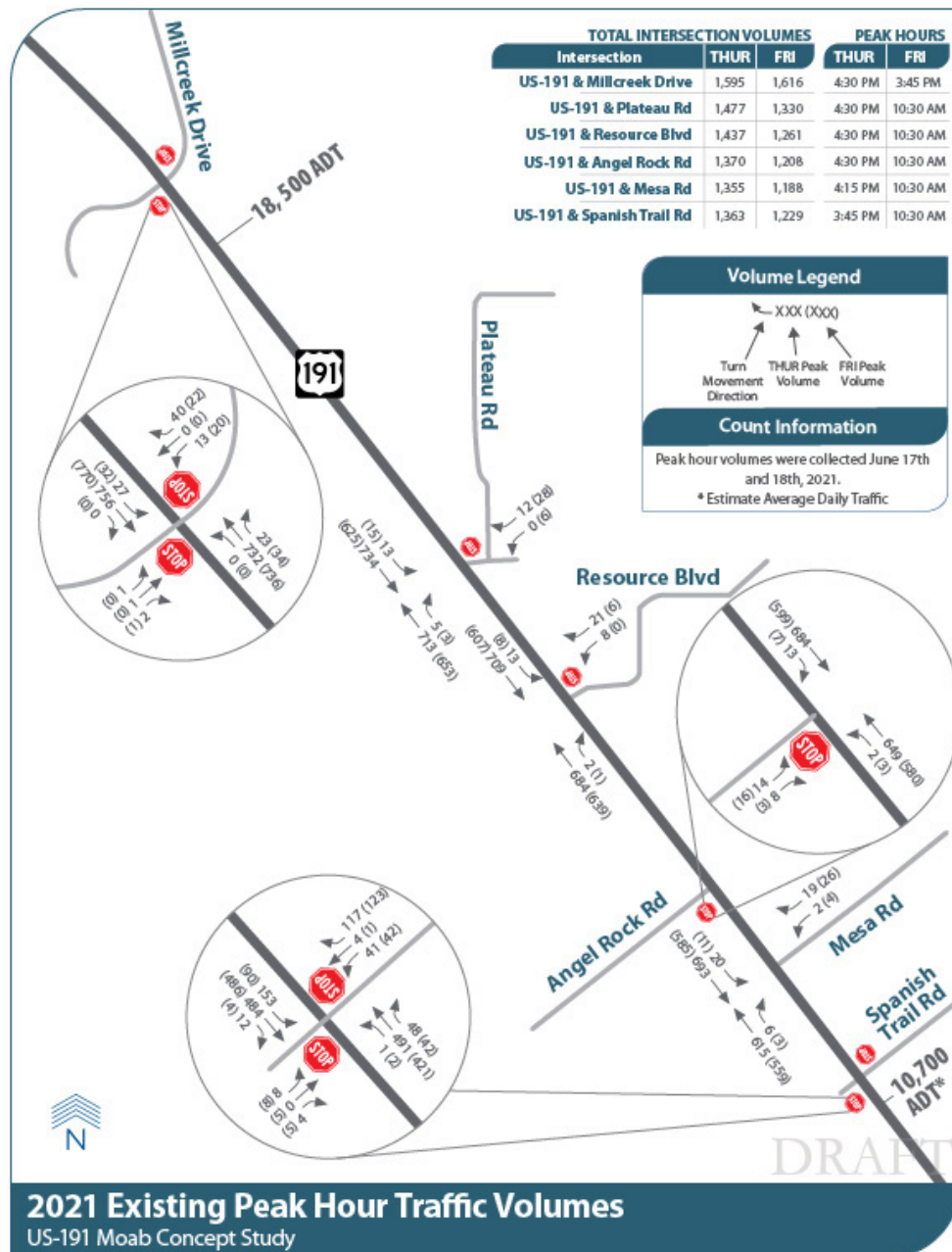


Figure 14. Existing Peak Hour Traffic Volumes

### 3.3 Truck Volume and Percentage

The tube count north Rocky Road also collected vehicle classification data for the 13 FHWA vehicle categories. For simplicity, truck traffic includes vehicles with three or more axles and captures single and combo trucks. Truck traffic heading southbound increased after 5:30 am, reaching its peak at 11:00 am, with an average hourly flow rate between 60 and 65 trucks. Northbound traffic peaked between 1:00 pm and 5:30 pm with an average hourly vehicle flow rate that ranged between the high 60s and low 70s (see Figure 15).

Although the total number of trucks on the road was at its lowest during the nighttime hours (see Figure 3), the ratio of trucks to other vehicles was at its highest during this time. Between 3:00 am and 5:00 am truck traffic increased to over 35% of total vehicle traffic at the tube count locations (see Figure 16).

Overall, during the four day count period 11% of vehicles were single or combo units trucks. This is significantly lower the annual average published in UDOT’s Truck Traffic on Utah Highways for 2019 and 2020. On this segment of U.S. 191 the 2019 annual average for single unit trucks is 11.3% and 26.6% for combo unit trucks while it was 11.9% and 27% in year 2020, respectively. This discrepancy is mostly due to the higher traffic volumes during summer weekends when the count was conducted. The annual average daily traffic (AADT) on this segment was 7,772 vehicles/day in 2019 and 7,414 vehicles/day in 2020 compared to ADT count volume of 18,500 vehicles/day. Most of the additional traffic during the high summer weekends is likely cars, vans, and pickup trucks of people recreating and staying near Moab. This additional traffic will result in lower truck proportions due to the higher total vehicle volume.

Additionally, truck traffic has weekly and season patterns that is not reflected in the annual average.

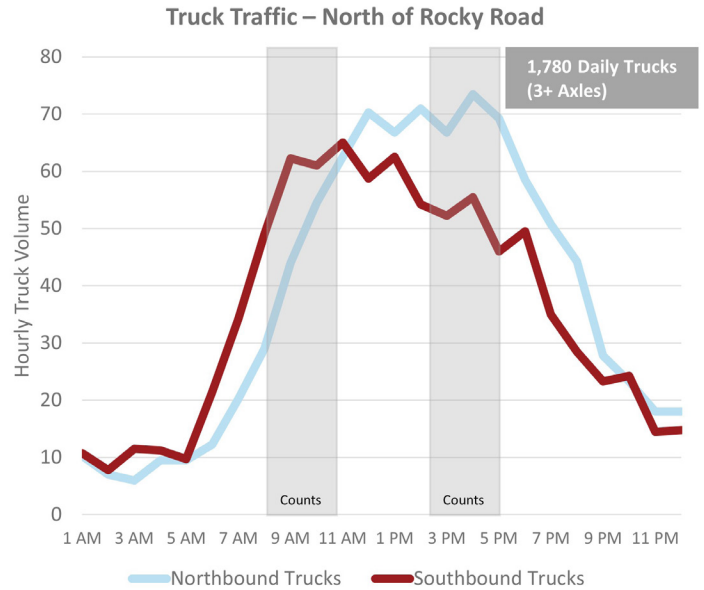


Figure 15. Truck Volume

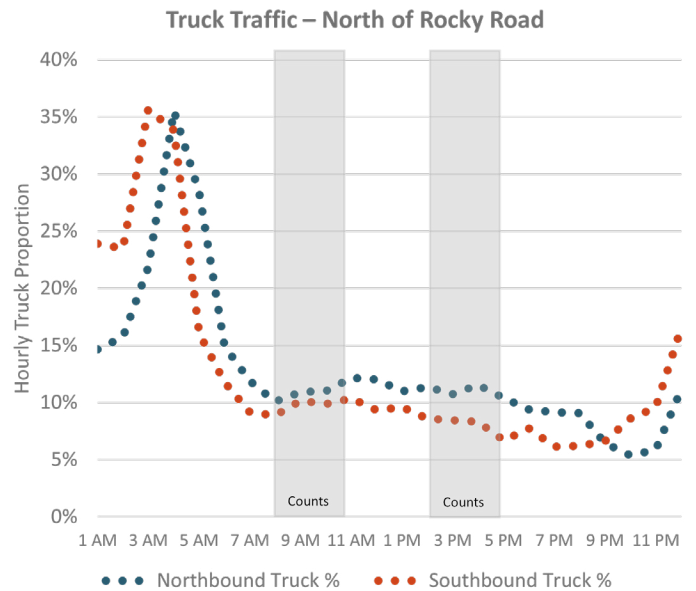


Figure 16. Truck Traffic by Percentage

## 4.0 Travel Demand Model Results

### 4.1 Existing Corridor Traffic

The existing traffic data collected on the corridor is incorporated into a high-level planning analysis of the existing capacity of the US-191. This analysis utilizes the daily traffic volumes and daily service volumes to determine the existing Level of Service (LOS) along the corridor.

#### Level of Service D Capacity

LOS is typically displayed by the relationship between the traffic volume and the roadway daily service volume (generally reflecting the number of lanes and traffic characteristics), or a volume over capacity ratio. This ratio is represented as a letter grade ranging from A to F, much like letter grades assigned in school. LOS A through C are generally considered free-flowing traffic operations, and while some congestion occurs at LOS D, the transportation system is assumed to be adequate (not failing).

LOS D is the planning goal for peak hour traffic on US-191, meaning that LOS E and F are unacceptable. This LOS reflects conditions on the US-191 corridor; some cross-street intersection movements may exceed this LOS threshold. However, these capacities and LOS standards are useful to help identify when a corridor may require widening. Table 1 summarizes the estimated daily service volumes used in the capacity analysis.

US-191 Typical Section	Signal Spacing	Maximum Service (two-way daily volume)/LOS D
Three Lanes (1 NB, 1 TWLTL, 1 SB)	>½ mile	14,500 veh/day
Four Lanes (1 NB, 1 TWLTL, 2 SB)	>½ mile	21,500 veh/day
Five Lanes (2 NB, 1 TWLTL, 2 SB)	>½ mile	32,800 veh/day

**Table 1. Daily Level of Service Volumes – US-191 Study Area**

## Existing Traffic and Level of Service

Figure 17 illustrates the existing daily traffic volume (the blue areas) and LOS D capacity (the orange line) along US-191. The north end of the study area, near Millcreek Drive, is on the left side of the figure and the south end, near Meador Drive, is on the right side. The daily traffic volumes are based on the traffic counts collected at the north and south ends of the corridor. For the rest of the corridor, the daily traffic volumes are estimated from turn movement counts at six intersections.

As shown in Figure 17, the daily traffic volumes are below the LOS D service volume. However, near Lemon Lane the daily traffic volumes are approaching the capacity of a three-lane highway. At this location, the estimated capacity only exceeds the daily traffic volume by approximately 1,500 vehicles per day.

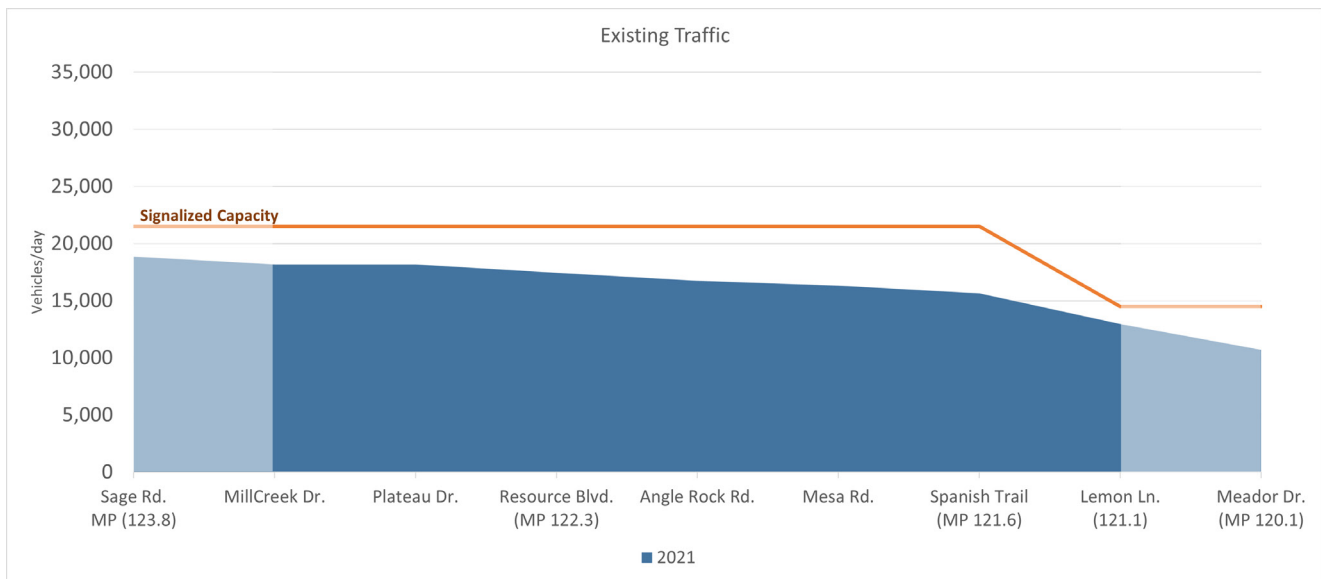


Figure 17. Existing 2021 Daily Traffic Volumes and LOS D Capacity

## 4.2 Future Corridor Traffic

Future travel demand is an essential part of transportation planning. Traffic forecasts are used to identify transportation needs that may not be apparent based on existing demand. For this study, future traffic volumes are estimated using the Utah Statewide Travel Model (USTM) travel demand model (TDM). USTM is owned and maintained by UDOT and is the primary model in rural areas where UDOT is responsible for coordinating transportation planning. The USTM is the primary tool for predicting future travel and traffic volumes in the study area.

## Travel Demand Model

The travel demand model has two primary inputs: land use data and transportation system data. The land use data includes residential and employment data for the entire state, divided into geographic blocks called Traffic Analysis Zones (TAZ). The travel model inputs are prepared for a base year and a future year. The base year for this study is 2019 (because both the socioeconomic model inputs and published traffic volume data are available for that year) and the future year is 2050. In travel modeling, the base year always lags the current year by a few years because of the need to have land use input and calibration data.

The TAZ were refined along US-191 to improve model resolution for the frontage road analysis. This included splitting several TAZs and adding other functionally classified roads to match the existing transportation network and more accurately model local travel patterns. To validate the model for the study area, base year model volumes were compared to published traffic volumes. Free flow speeds on some roadways were adjusted to bring the model volumes closer to the observed volumes.

## Planned Growth

Grand County's population is projected to increase 13,000 people by 2050, representing a 29 percent increase (see Figure 18). Employment is also expected to increase with an additional 2,800 new jobs over the next 30 years (see Figure 19). By 2050 there are anticipated to be over 10,000 jobs in the county.

Although these growth assumptions used in the travel model may appear to be lower than expected, these forecasts are higher than the more recent draft estimates published by Kem C. Gardner Policy Institute for the 2020-2060 State and County Projections. The draft projections published on January 11, 2022, show more limited population growth with only 12,474 people by 2050. This represents a reduction of almost 1,000 people compared to the earlier estimates assumed in the TDM. The employment totals are similar between the projections with a modest increase from 10,141 to 10,176 jobs.

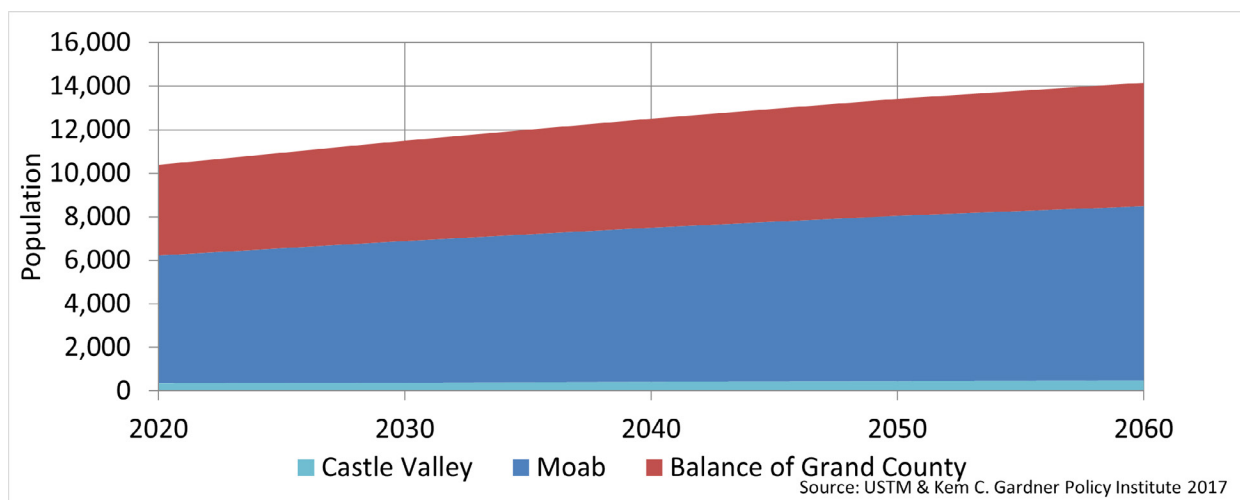


Figure 18. Population Growth by City

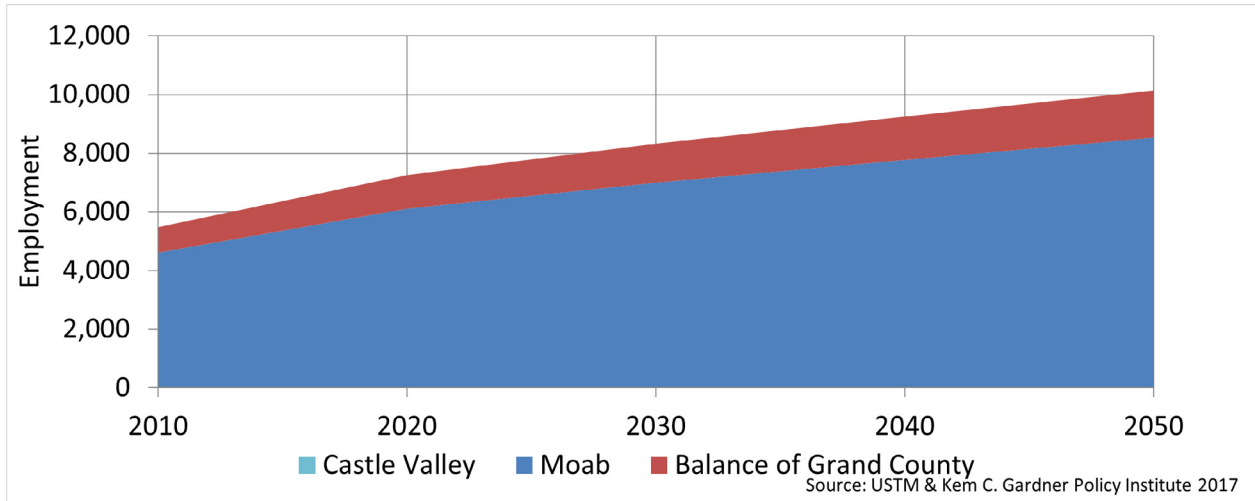


Figure 19. Employment Growth by City

### No-Build Daily Corridor Traffic

The steady growth that is expected in Moab and Grand County will place greater demand on the transportation system. To evaluate these demands on US-191, future daily traffic forecasts were developed from the existing traffic volumes and USTM data. The travel model was run for the base year (2019) and the future year (2050) using the current lane configuration. The difference between these models was then used to estimate the traffic growth, which was applied to the existing traffic volumes.

Figure 20 and Figure 21 show the forecasted daily traffic volumes and LOS D capacity with the current US-191 configuration. These figures show the traffic growth along the corridor with Figure 9 indicating that the corridor, without improvements, will be at the LOS D capacity by 2030.

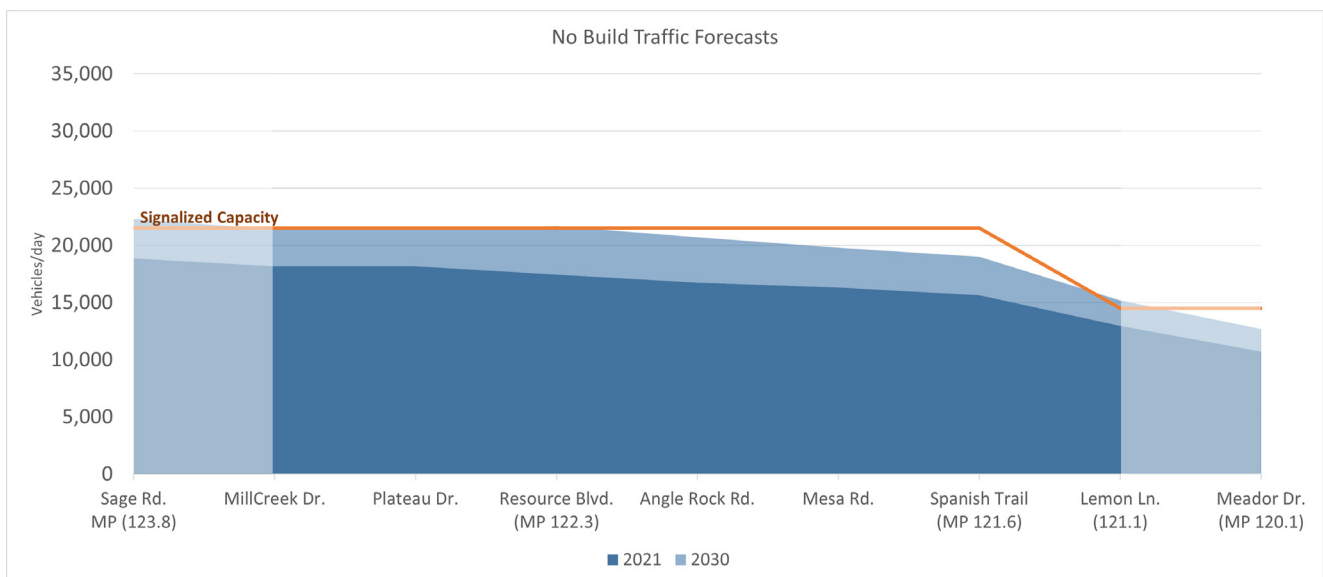
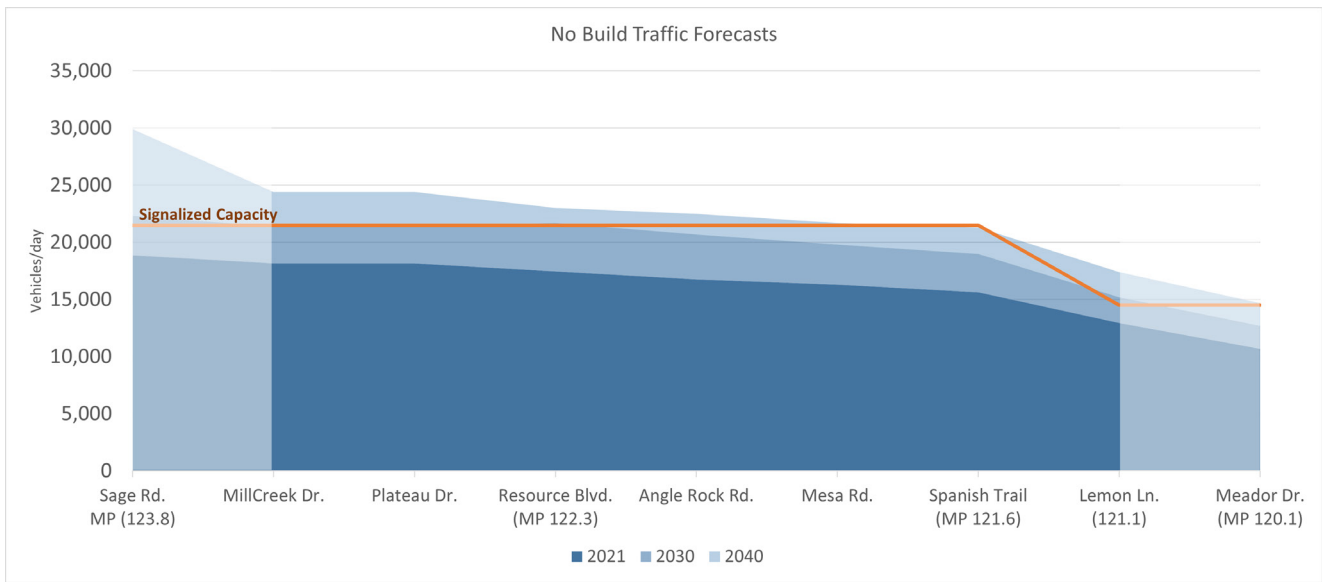
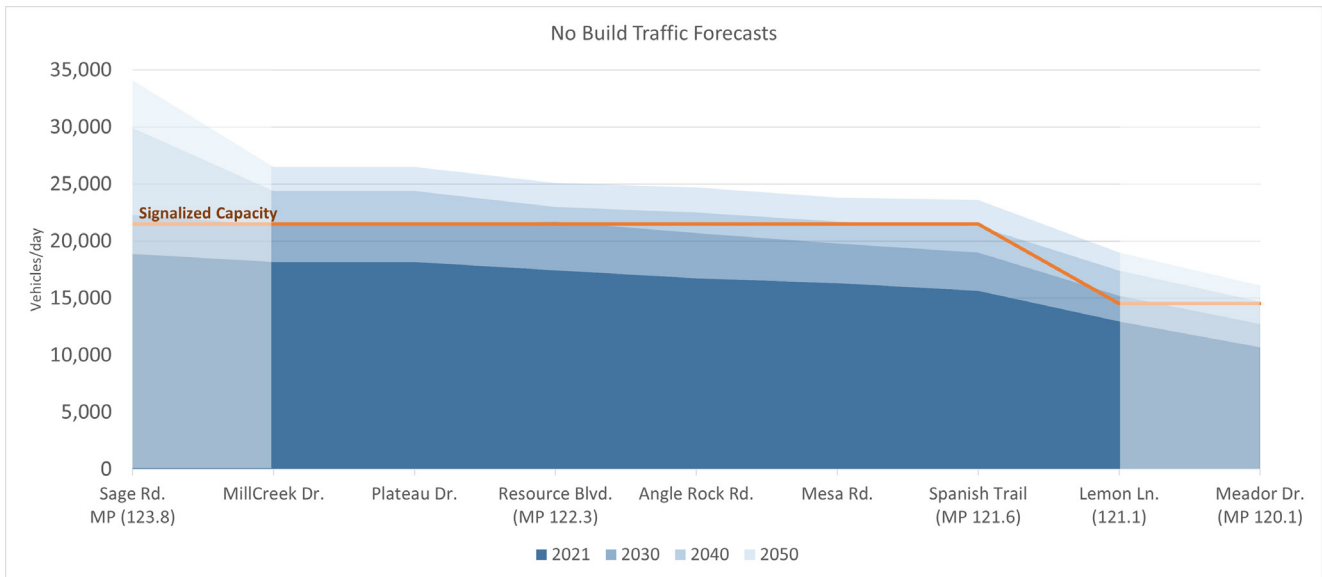


Figure 20. 2030 No-Build US-191 Daily Traffic Volumes and LOS D Capacity



**Figure 21. 2040 No-Build US-191 Daily Traffic Volumes and LOS D Capacity**

By 2040, most of the corridor is expected to operate and LOS E or worse. The only exception is the segment from approximately Mesa Road to Spanish Trail Drive, which is just below the LOS D daily service volume (see Figure 21). The entire corridor, without improvements, is anticipated to operate at LOS E or worse by 2050 (see Figure 22).



**Figure 22. 2050 No-Build US-191 Daily Traffic Volumes and LOS D Capacity**

## Frontage Roads Traffic Forecasts

Future traffic forecasts for a build scenario assume two-way frontage roads on both the east and west sides of US-191. These frontage roads were assumed to extend from the intersection of Aggie Boulevard/Millcreek Drive on the north to the intersection of Lemon Lane/KOA Campground on the south. These frontage roads include full access to US-191 via signalized intersections at Millcreek Drive, Resource Boulevard, and Spanish Trail Road.

The forecasted daily traffic volumes on US-191 are the highest on the northern segment from Millcreek Drive to Resource Boulevard, followed by the Resource Boulevard to Spanish Trail Road segment (see Figure 23). The southern segment from Spanish Trail Road to Lemon Lane has the lowest forecast traffic volumes, which are approximately 25 percent lower than the northern segment. The frontage road traffic forecast follows a similar pattern with daily traffic forecasts of 1,400 to 1,500 vehicles per day on the northern segments and 500 to 600 vehicles per day on the southern segment.

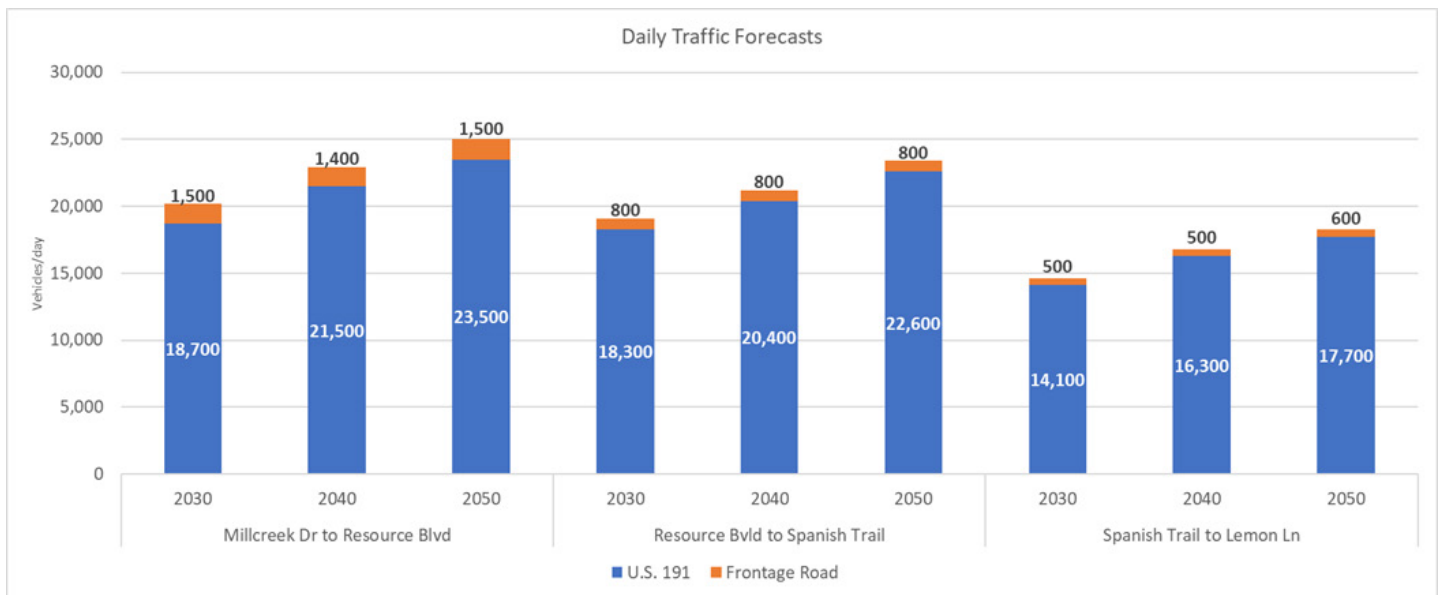


Figure 23. Daily Traffic Forecasts US-191 and Frontage Roads

## Mainline US-191 Traffic Reductions

Figure 24 illustrates the traffic reduction on mainline US-191 with the two-way frontage roads. The reduction is greatest on the north end where there is imminent development, including the Utah State University Campus (see Section 6.1 for more information). The traffic reductions decrease moving south where development is expected but is more speculative. The overall traffic reduction on mainline US-191 is expected to be between four and five percent.

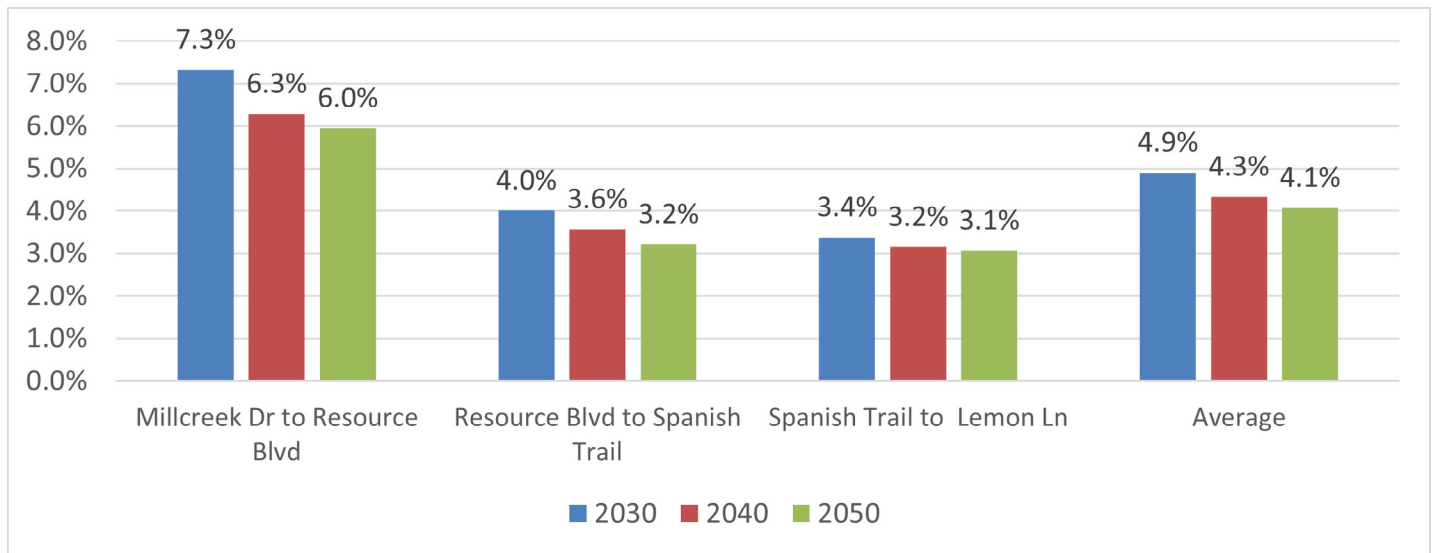


Figure 24. US-191 Main Line Traffic Reduction with Frontage Roads

## Build Daily Corridor Traffic with Frontage Road

Figure 25 through 28 summarize the existing and forecasted traffic volumes with the two-way frontage roads while keeping the same number of lanes on US-191 mainline (i.e., no additional improvements to mainline). Although the percent reduction in traffic from the frontage road system is relatively modest, it extends the LOS D exceedance year from 2030 to 2040. By 2040, the northern segment from Millcreek Drive to Resource Boulevard is expected to be near LOS D while the southern segment from Spanish Trail Road to Lemon Lane will exceed LOS D. By 2050, the entire study corridor is above LOS D and mainline US-191 will need to be widened to five lanes to operate at LOS D or better. In summary, the frontage road system is anticipated to push back the need to widen mainline US-191 to five lanes from 2030 to 2040.

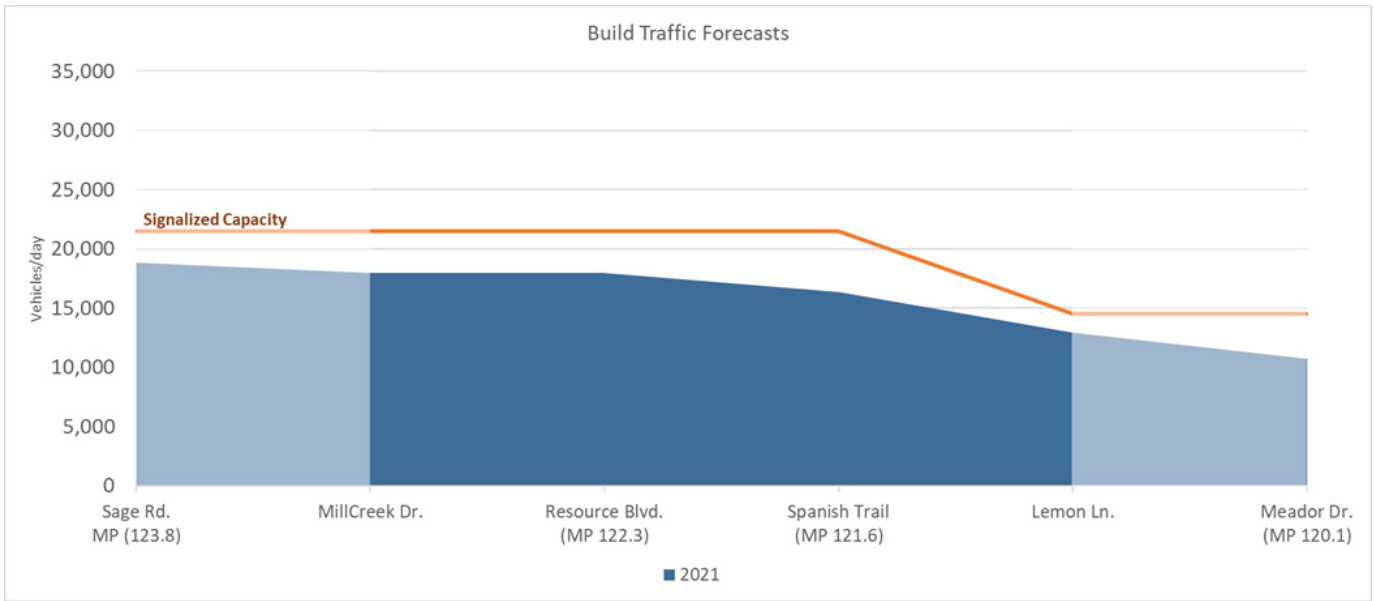


Figure 25. Year 2021 Build Two-way Frontage Roads US-191 Daily Traffic Volumes and LOS D Capacity

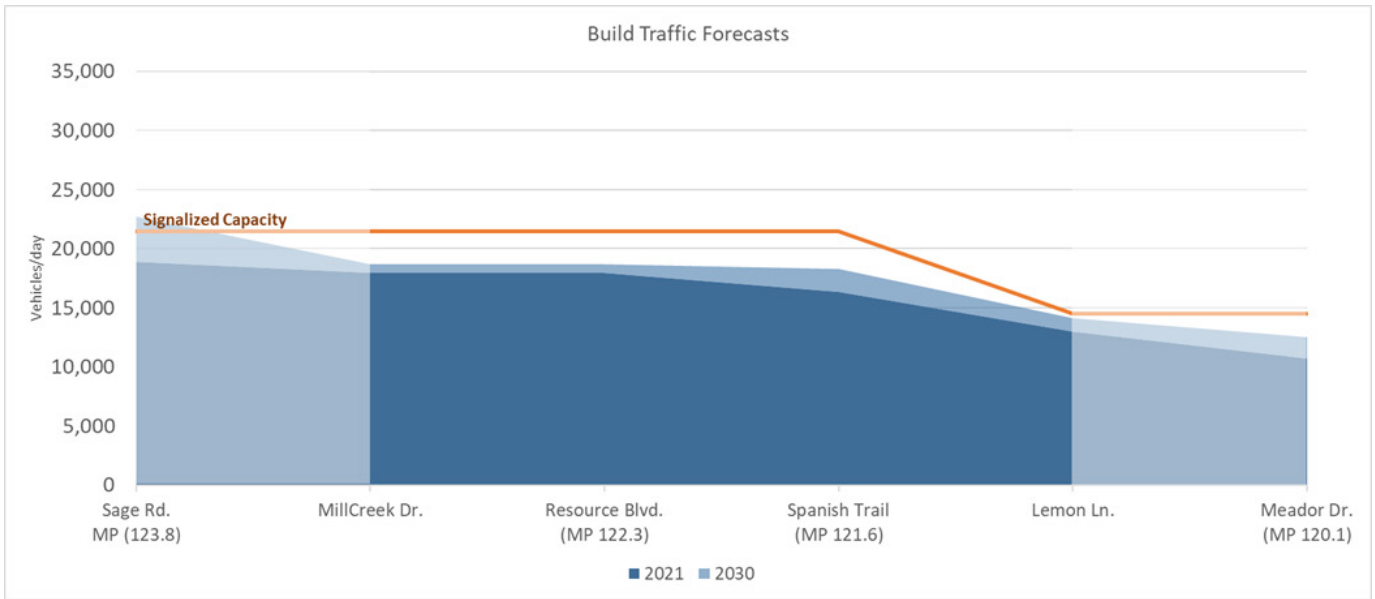


Figure 26. Year 2030 Build Two-way Frontage Roads US-191 Daily Traffic Volumes and LOS D Capacity

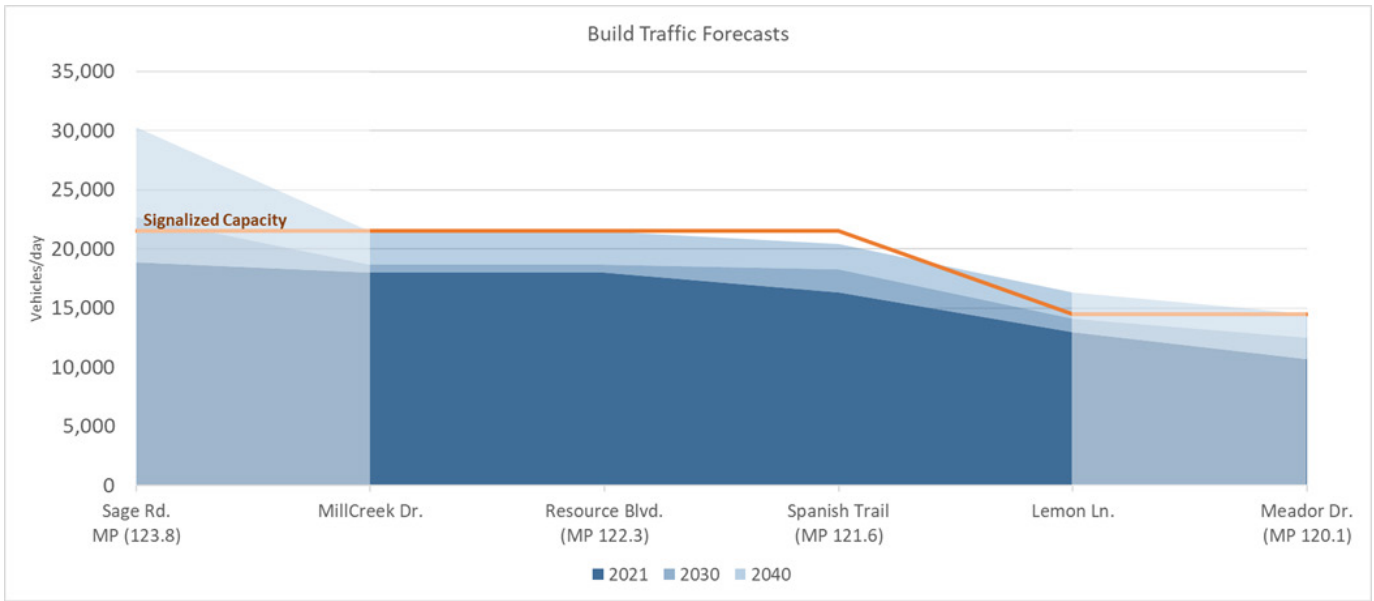


Figure 27. Year 2040 Build Two-way Frontage Roads US-191 Daily Traffic Volumes and LOS D Capacity

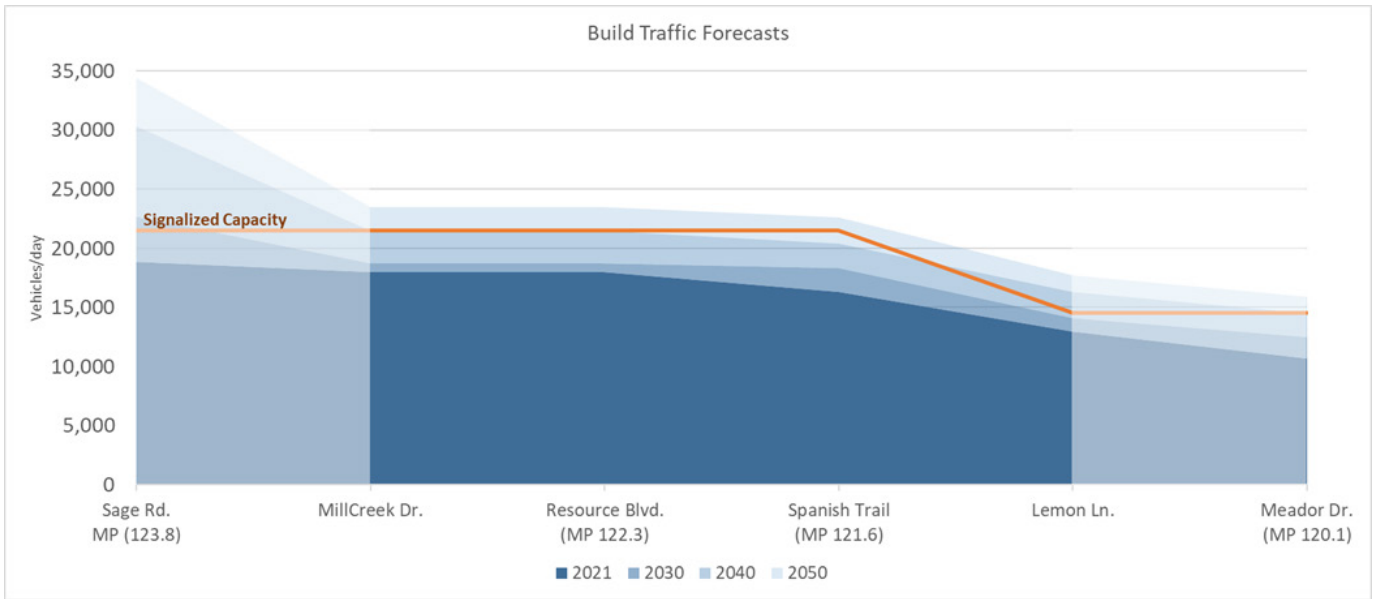


Figure 28. Year 2050 Build Two-way Frontage Roads US-191 Daily Traffic Volumes and LOS D Capacity

## 5.0 Safety

### 5.1 Access

The safety concerns described in this section are related, in part, to the high number of accesses (i.e., any location that allows vehicles to exit or enter the corridor) on US-191. Accesses introduce conflict points between vehicles entering and exiting the corridor and vehicles traveling through the corridor. The fewer access points there are the faster vehicles can travel without coming into conflict with another vehicle traveling at slower or variable speeds.

Access points along US-191 are divided into five categories (see Figure 29). There are 66 access points in the study area, with 35 on the west of US-191 and 31 on the east. The majority of these accesses (25 or 38%) are to single businesses.

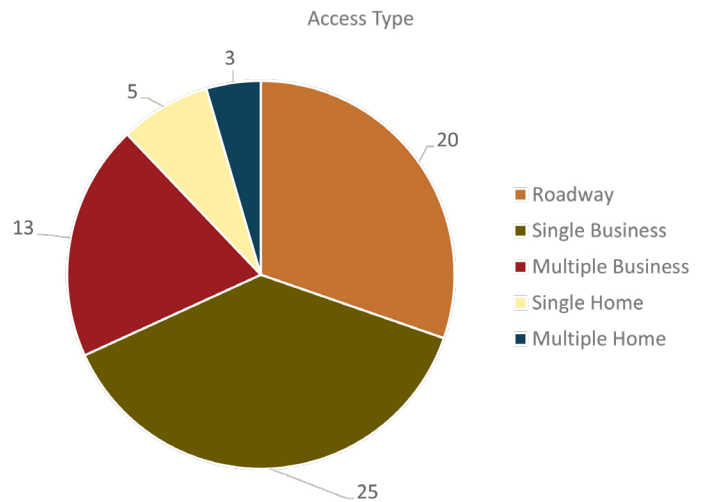


Figure 29. Access by Type

Figure 30 shows the access density along US-191 with yellow representing the highest density and purple representing the lowest density. The middle of the study area, between Plateau Drive and Spanish Trail Road, is the densest.

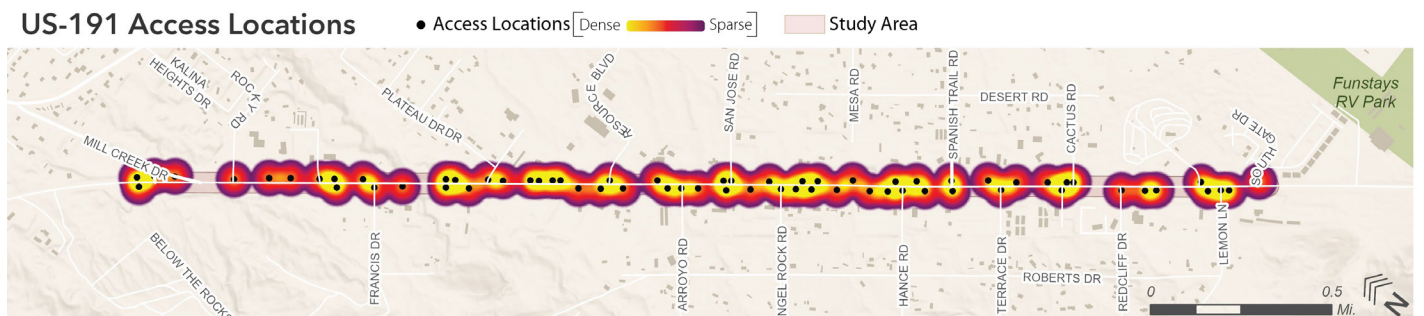


Figure 30. Access Density

### 5.2 Crashes

Six years of UDOT crash data from 2015 through 2020 were reviewed to understand US-191’s safety history. As shown in Figure 31, the number of crashes along US-191, between La Sal Loop and Arches National Park, varies by segment. Excluding the segments through Moab, more crashes (62) have occurred in the 2.5-mile-long study area than any other segment. By comparison, the 4-mile-long segment north of Moab from MP 127 to Arches National Park, which has comparatively higher average annual daily traffic, had 73 crashes during the same period.

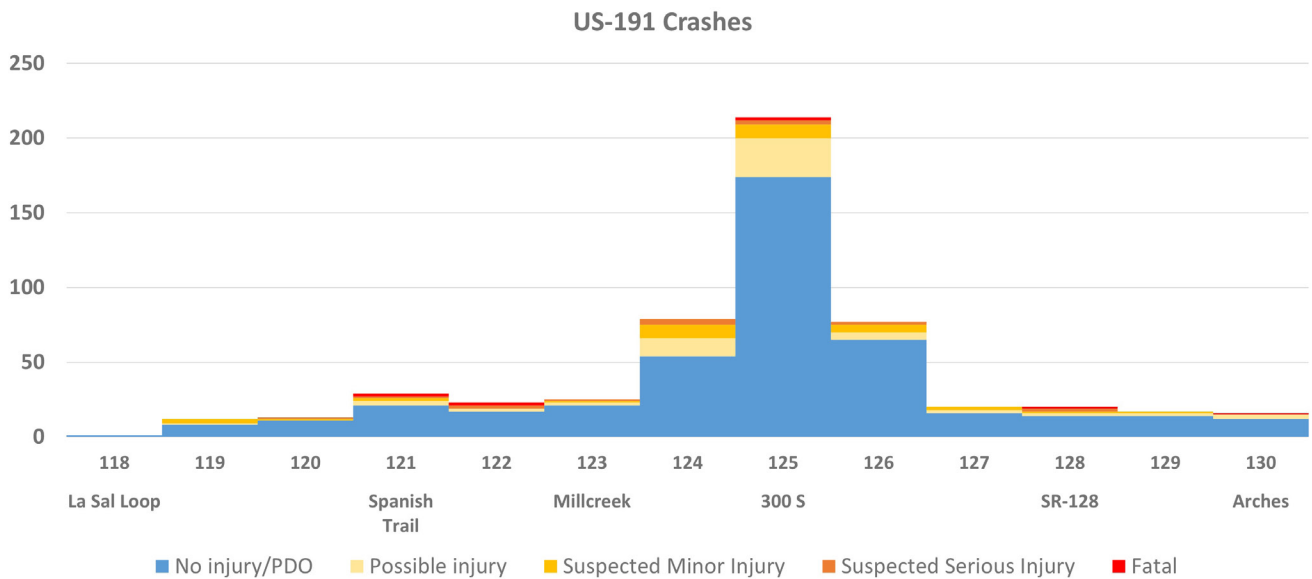


Figure 31. Crash Locations and Severity

The majority (56 percent) of collisions involve single vehicles striking stationary roadside objects or wildlife. Wildlife collisions account for 19 incidents; the majority of these occurring at night. The remaining collisions involve multiple vehicles, with angle and front-to-rear being the most common type (see Figure 32). Eleven of the 27 (40 percent) multi-vehicle collisions shown in Figure 33 are between Plateau Drive and Spanish Trail Road—the segment with the highest access density in the study area (see Figure 30)—indicating a potential correlation between crashes and access.

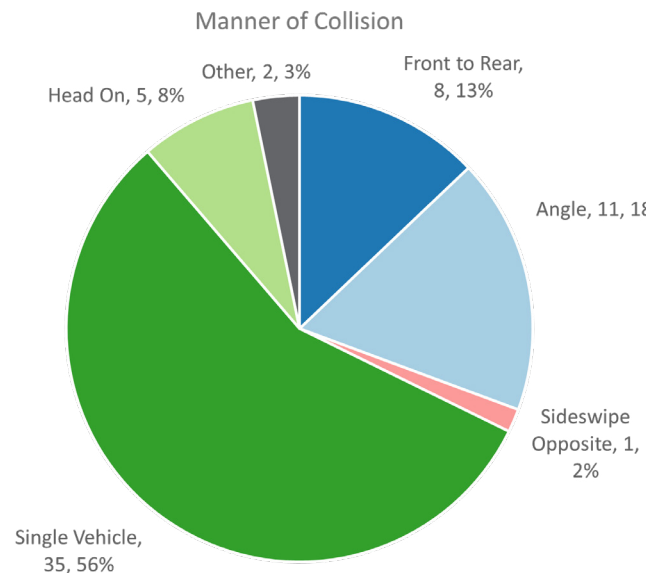


Figure 32. Manner of Collision

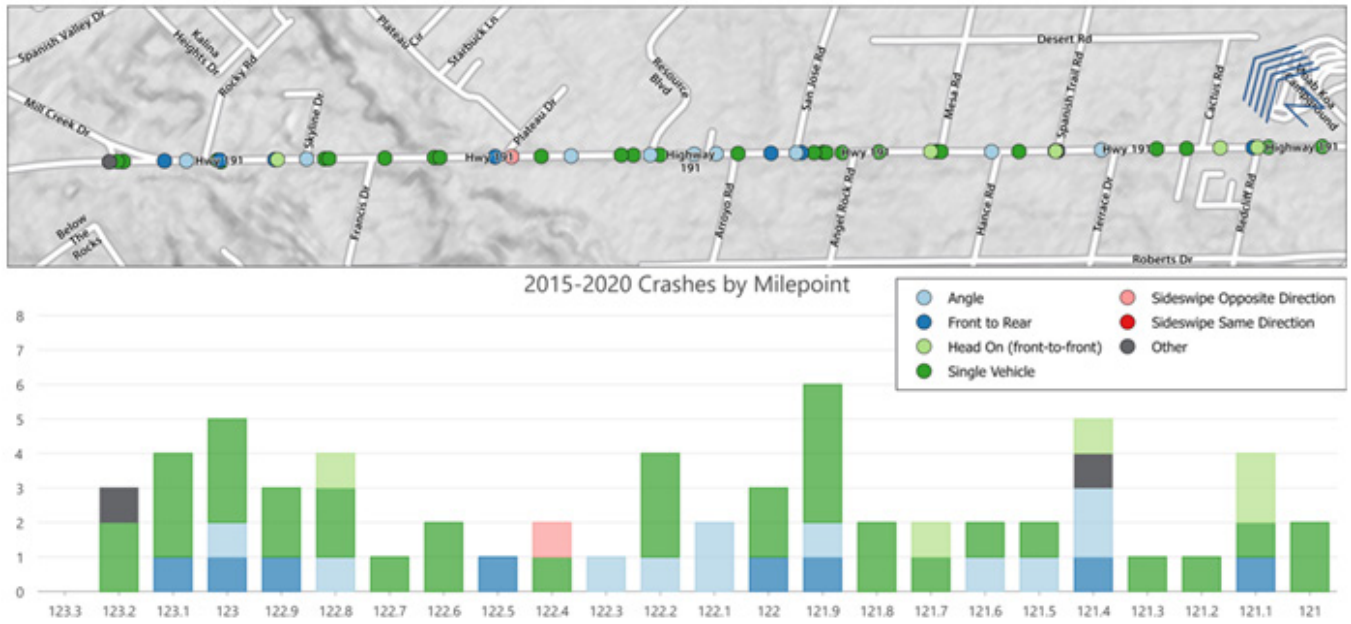


Figure 33. Crash Locations and Type

Figure 34 shows that US-191’s crash rate (red dashed line) is in the statewide average (blue bar) for rural arterial roads with similar average annual daily traffic. However, when compared to the severe crash rate, US-191 is well above the statewide average (see Figure 35).

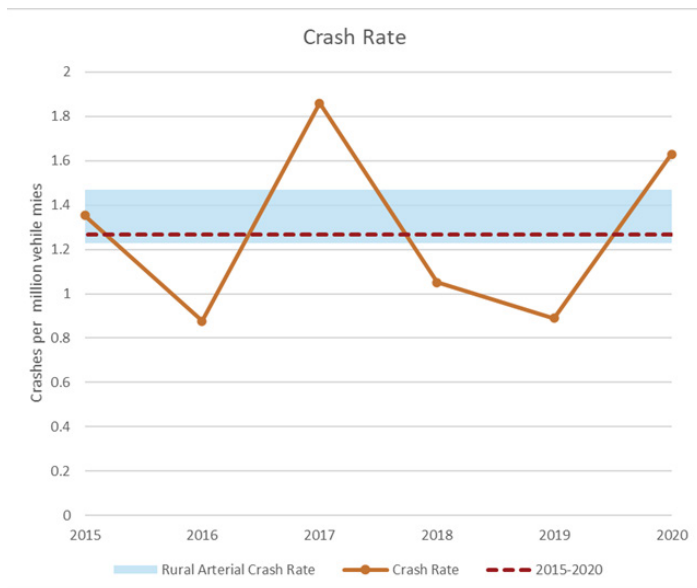


Figure 34. Average Statewide Crash Rate Compared to US-191

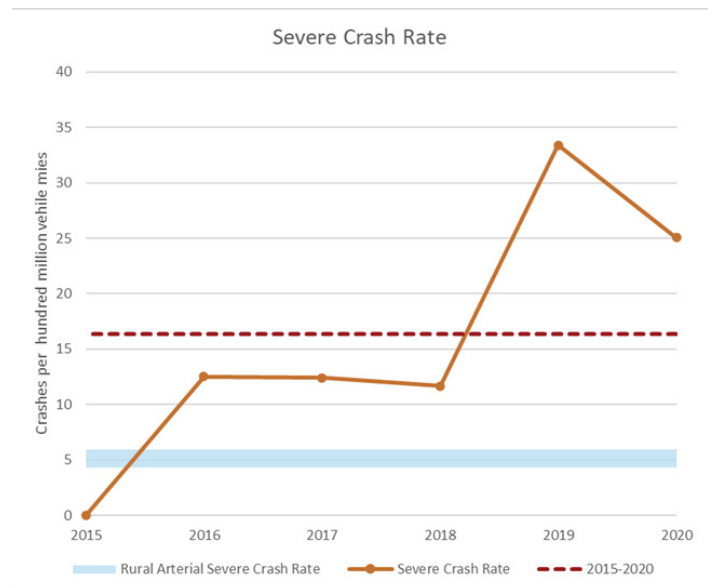


Figure 35. Average Statewide Severe Crash Rate Compared to US-191

Although 74 percent of crashes did not result in personal injuries, 13 percent either had serious injuries or were fatal (see Figure 36). Each crash with serious injuries cites roadway geometry as a contributing factor. All of the fatal crashes occurred between Plateau Drive and Spanish Trail Road (see Figure 37). Driver behavior, not roadway geometry, appears to be the primary cause for each fatality, except for one crash involving a u-turn near Plateau Drive. Each serious injury and fatality are described in greater detail below.

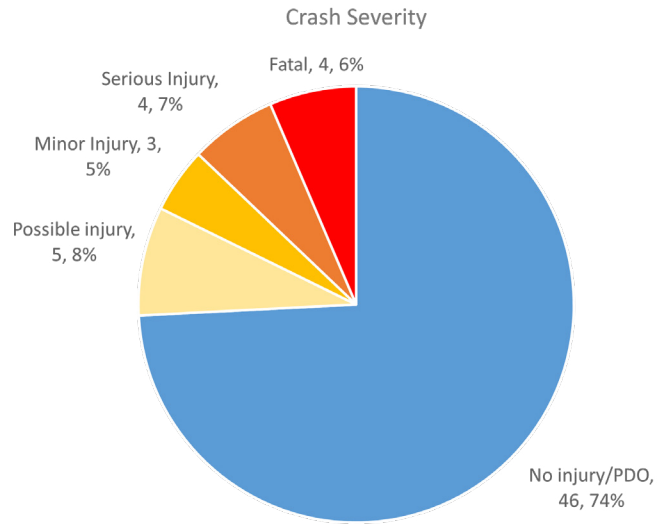


Figure 36. Crashes by Severity

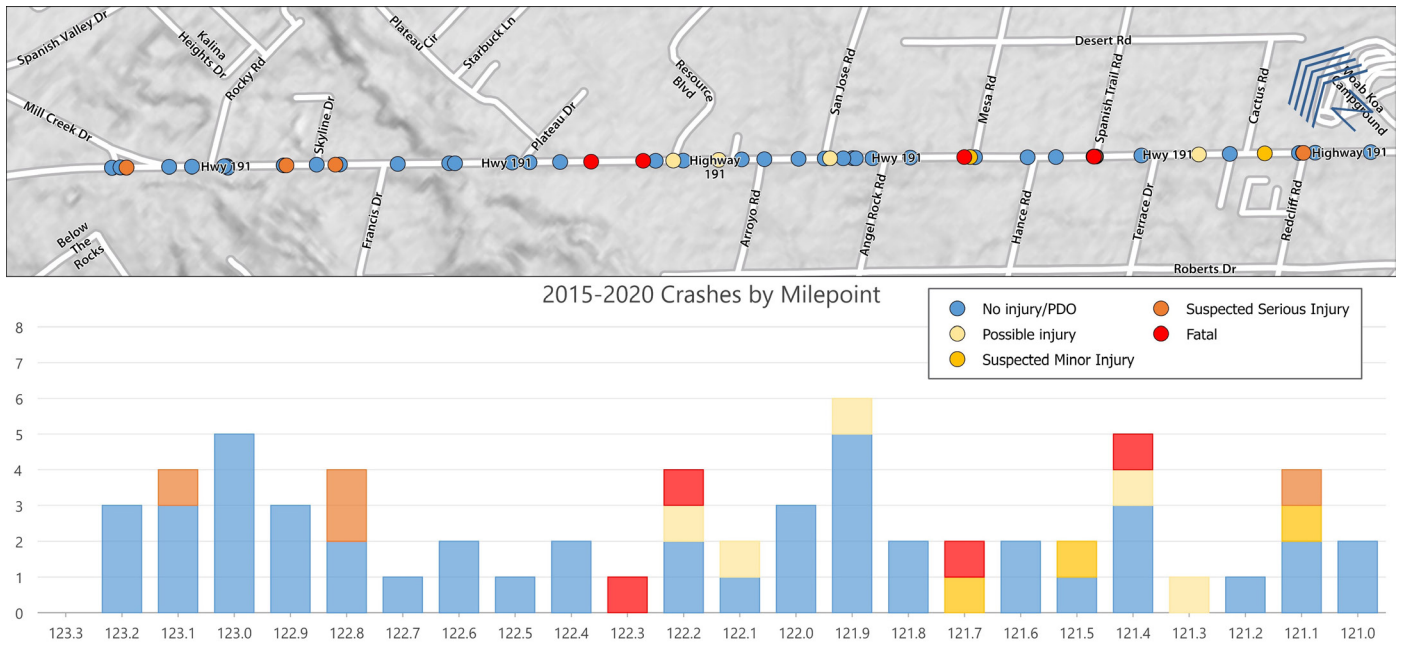
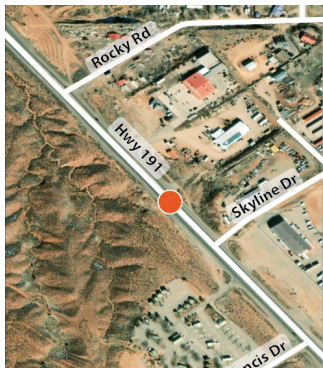


Figure 37. Crash Locations and Severity

**The following describes the cause of each serious injury.**



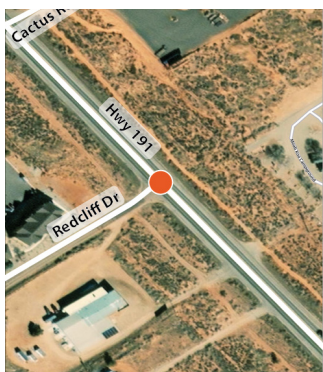
Mile Post 122.89      Date 7/7/2020 8:04 AM

A mid-block head-on collision where the northbound vehicle crossed the centerline. Distracted driving and roadway geometry are cited as contributing factors.



Mile Post 123.17      Date 9/4/2019 11:30 AM

A single-vehicle crash where the vehicle drove off the road at the Mill Creek Drive intersection. Travel speed is estimated at 60 miles per hour (MPH), 5 MPH over the posted speed limit. Roadway geometry is cited as a contributing factor.



Mile Post 121.11      Date 8/21/2019 6:49

A head-on crash where the southbound vehicle crossed the centerline and collided with a heavy commercial truck. The driver, in their 70s, is cited as driving 10 MPH over the 65 MPH speed limit. Speed and roadway geometry are cited as contributing factors.

**The following describes the circumstances behind each fatality.**



Mile Post 121.71      2/25/2016 7:25 PM

A head-on crash at night involving a teenage driver, two southbound vehicles, and one northbound vehicle. One vehicle veered off the road. One individual was not wearing a seatbelt. Drowsy driving and the age of the driver are cited as contributing factors.



Mile Post 122.27      4/13/2019 9:17 PM

A pedestrian fatality at night involving a single vehicle. The pedestrian was struck as they were improperly lying, kneeling, or standing in the roadway. Alcohol is suspected to be a contributing factor.



Mile Post 122.36      7/14/2017 5:50 AM

An angle crash from a southbound vehicle making a u-turn and colliding with a northbound vehicle. A motorcycle was involved. Drugs are suspected to be a contributing factor.



Mile Post 121.48      7/31/2020 3:26 PM

A fatality involving a southbound vehicle turning left at the intersection that stopped in the opposing lane. A teenager and two adults were involved. Drugs and/or medications and distracted driving are cited as contributing factors.

### 5.3 Safety Summary

Between 2015 and 2020, the number of crashes on this segment of US-191 is higher than other nearby segments north of Moab. Forty percent of multi-vehicle crashes are between Plateau Drive and Spanish Trail Road, which also has the highest access density in the study area, indicating a potential correlation between the number of accesses and crashes. Although the overall crash rate is similar to the statewide average for rural arterial roads, the crash severity rate is well above the statewide average. Roadway geometry is cited as a contributing factor in four of the eight serious or fatal crashes.

## 6.0 Environmental Considerations

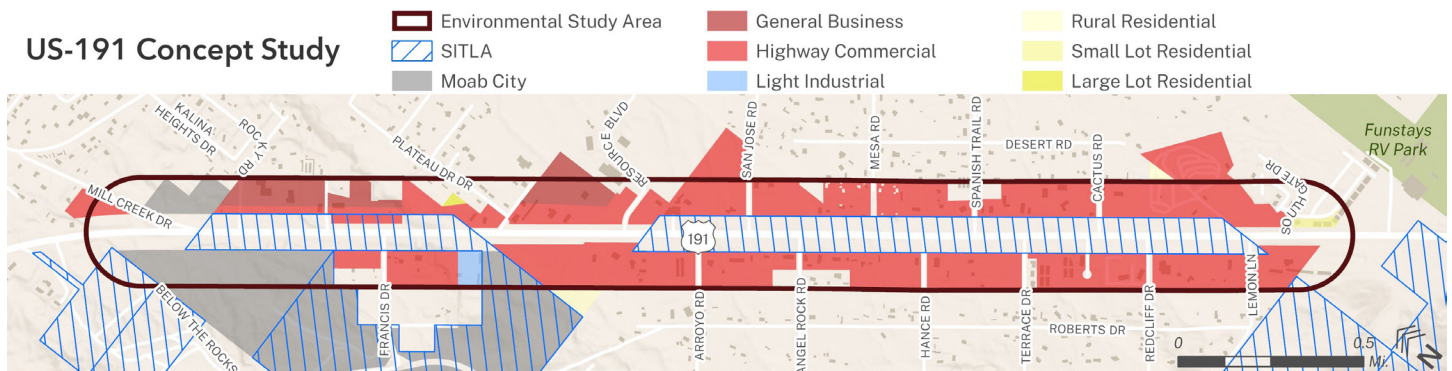
The following is a high-level analysis of applicable environmental resources that could influence future project decisions, including the environmental document type and preferred improvements. This information is solely based on secondary data; field surveys were not conducted. Additional field investigations during subsequent project phases are recommended. For additional information, consult with UDOT Environmental Services.

### 6.1 Existing Land Use, Ownership, and Zoning

The study area is mostly developed with a mix of commercial and residential land uses. Recent development proposals include a 317-unit apartment complex near the southeast corner of US-191 and Mill Creek Drive. Utah State University is opening a new extension in Fall 2022 west of US-191 that will be accessible via Aggie Boulevard (the west leg of the US-191/Mill Creek Drive intersection). This campus includes 270 multi-family residential units, up to 510 single-family units, and 426,000 square feet of educational space.

The US-191 right-of-way is primarily defined by land administered by the Utah School and Institutional Trust Lands Administration (SITLA) (see Figure 38). SITLA has preserved this corridor from neighboring development to accommodate the future expansion of US-191. However, where SITLA does not administer the right-of-way near Plateau Road, development has encroached closer to the highway. Based on the preliminary concept, up to six commercial full acquisitions and relocations could be required to accommodate the frontage roads.

Zoning is often evaluated to understand future land use. Figure 38 shows that the entire study area is planned to be either commercial, light industrial, or residential, indicating that existing residential parcels may be redeveloped. In general, commercial areas generate more vehicle trips than residential areas. If the study area redevelops as planned and US-191 remains in its current configuration, the traffic and safety issues described in Section 4.0 and Section 5.0 could get worse.



**Figure 38. Zoning and Proposed Developments**

## 6.2 Historic Properties

Section 106 of the National Historic Preservation Act and its implementing regulations (36 Code of Federal Regulations (CFR) Part 800) require Federal agencies, including UDOT per agreements with the Federal Highway Administration, to coordinate the identification of and effects on eligible historic properties with the State Historic Preservation Office and, in some cases, Native American tribes. A property is considered historic if it is eligible for listing on the National Register of Historic Places. Eligible properties are those that are at least 50 years old and possess integrity of location, design, setting, materials, workmanship, and association.

In addition to Section 106, Section 4(f) of the Department of Transportation Act of 1966 and its implementing regulations (23 CFR 774) provide another layer of protection. All eligible historic properties, except for archaeological sites not warranting preservation-in-place, are considered Section 4(f) properties. Section 4(f) first requires the avoidance of eligible historic properties. This often requires an alternatives analysis that is often beyond what is typically required for categorical exclusions and environmental assessments prepared under the National Environmental Policy Act (NEPA) and its implementing regulation (40 CFR 1500-1508). This alternatives analysis is documented in an Individual Section 4(f) Analysis and the respective NEPA document.

UDOT may approve the use of a Section 4(f) property only after it has determined that:

1. There is no feasible and prudent avoidance alternative to the use of land from the property; and
2. The action includes all possible planning to minimize harm to the property resulting from such use; or
3. The use of the property, including any measure(s) to minimize harm committed to the project will have a de minimis impact on the property.



California condor populations in Utah are experimental and found almost exclusively in and around Zion National Park and the Kolob Terrace of Iron, Kane, and Washington counties. They prefer vast, undeveloped landscapes with canyons, cliffs, and rocky outcroppings for nesting, perching/resting, and roosting. Because the study area is beyond the locations where condors are most commonly found in Utah and it lacks suitable habitat, it is unlikely that improvements on US-191 would negatively affect California condors.

Mexican spotted owl habitat is commonly mixed-conifer and pine-oak forests; however, they can be found in pinyon-juniper and ponderosa pine. Nesting habitat is typically made of complex forest structures or rock canyons, and contains mature or old-growth stands that are uneven-aged, multi-storied, and have high canopy closure. In the northern portion of its range (southern Utah and Colorado), most nests are in caves or on cliff ledges in steep-walled canyons. Although the study area is in the species' range, the required suitable habitat is not present; therefore, it is unlikely that improvements on US-191 would negatively affect Mexican spotted owls.

#### **6.4 Wetlands and Waters of the U.S.**

Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers (USACE) to regulate certain activities involving the discharge of dredged or fill material into waters of the U.S. (WOUS). WOUS include rivers, streams, lakes, wetlands, and other special aquatic sites. Under Section 404, dredged and/or fill activities may not be permitted where there exists:

1. A practicable alternative that is less damaging to the aquatic environment, or
2. The nations' waters would be significantly degraded

For linear transportation projects that have minimal impacts to aquatic features, a Nationwide Permit 14 can be applied if a project impacts under 0.5 acres of wetlands, or a Programmatic General Permit 10 (also known as a Stream Alteration Permit) can be applied if there are less than 300 feet of streambed impacts. To receive authorization under these permits, an application must be submitted to demonstrate how the project satisfies all conditions identified in the permit(s). Mitigation is often required to compensate for WOUS impacts.

Figure 41 shows the U.S. Geological Survey National Hydrography Dataset drainage network features in the study area. A desktop review indicates that each feature crossing the study area is ephemeral (i.e., water flows for a short time immediately after heavy precipitation) and once connected to Pack Creek, which flows to the Colorado River. However, current aerial imagery shows that ongoing development in and around the study area has either modified these drainage connections (i.e., piped) or severed the connections entirely.

The National Wetland Inventory Dataset does not identify any known wetlands in the study area; however, conversations with Moab City staff during this study indicate there is a potential spring-fed wetland at the northwest corner of the US-191/Mill Creek Drive intersection (see Figure 41). This potential wetland is also bisected by an ephemeral wash, which could contribute to its hydrology.

Further field investigation is recommended to ascertain the jurisdictional status of each wash and confirm the potential wetland meets USACE wetland criteria.



Figure 41. Potential Waters of the U.S.

## 7.0 Concept Cost Estimate and Preliminary Design

### 7.1 Cost Estimate

After the concept design was fully completed, a planning-level project cost estimate was generated. The costs are separated into US-191 mainline construction costs and frontage road construction costs. Both categories are broken into three segments (north to south) as shown in the table below. The total cost estimate for all segments (with the construction year 2022) is \$56 million USD.

No.	Segment (north to south)		Construction Year			
			2022			2027
	Start	End	US-191 Mainline	Frontage Roads	Total	Total
1	Millcreek Ave	Resource Blvd	\$9,006,000	\$16,828,000	\$25,834,000	\$33,812,000
2	Resource Blvd	Spanish Trail	\$6,752,000	\$10,318,000	\$17,070,000	\$21,816,000
3	Spanish Trail	Southern Termini	\$6,597,000	\$6,547,000	\$13,144,000	\$16,583,000
Totals			\$22,355,000	\$33,693,000	\$56,048,000	\$72,211,000

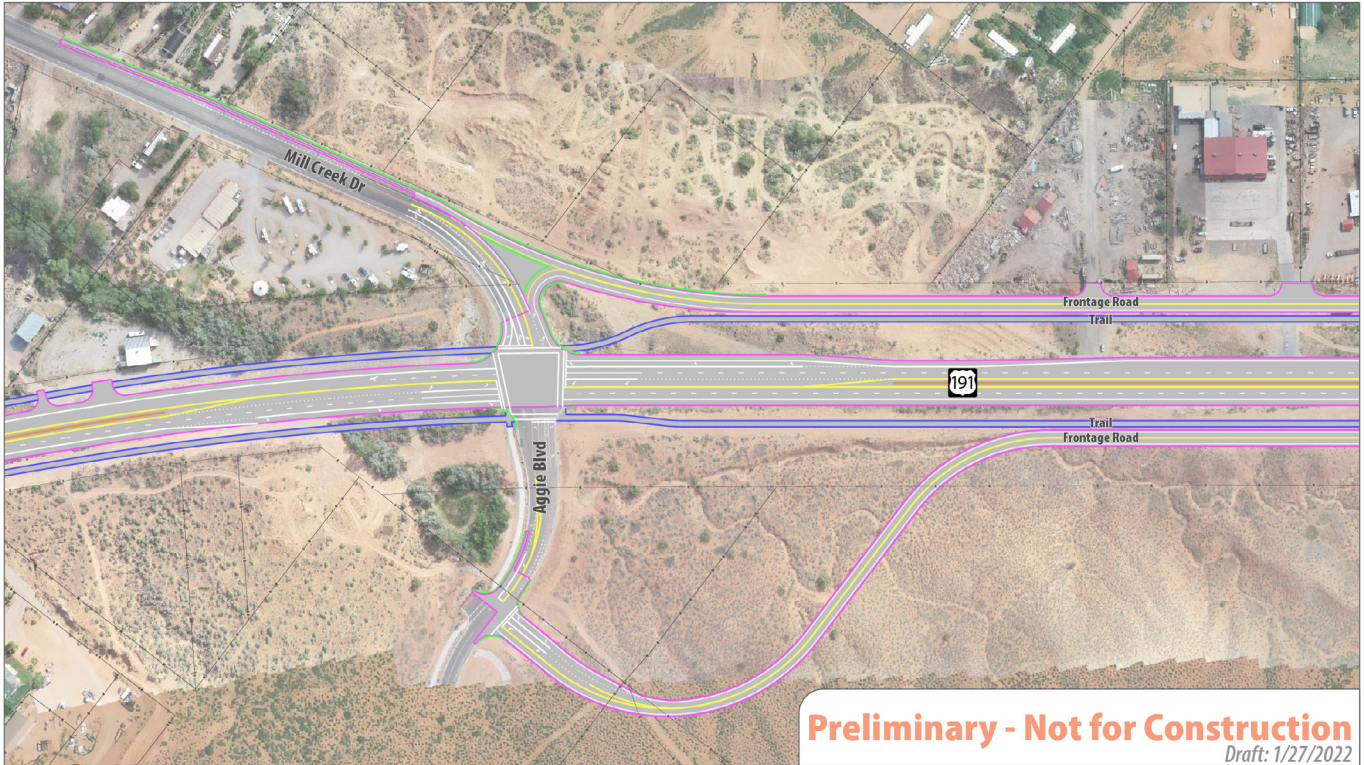
Table 2. Cost Estimate Summary

### 7.2 Preliminary Concept Design

Below are graphics showing the preliminary concept designs at the primary access points between the frontage road and US-191 mainline. Specifically, the locations shown include the northern project termini, signalized intersections at Resource Boulevard and Spanish Trail Road, and the southern project termini.

# US-191 South Moab Concept Study

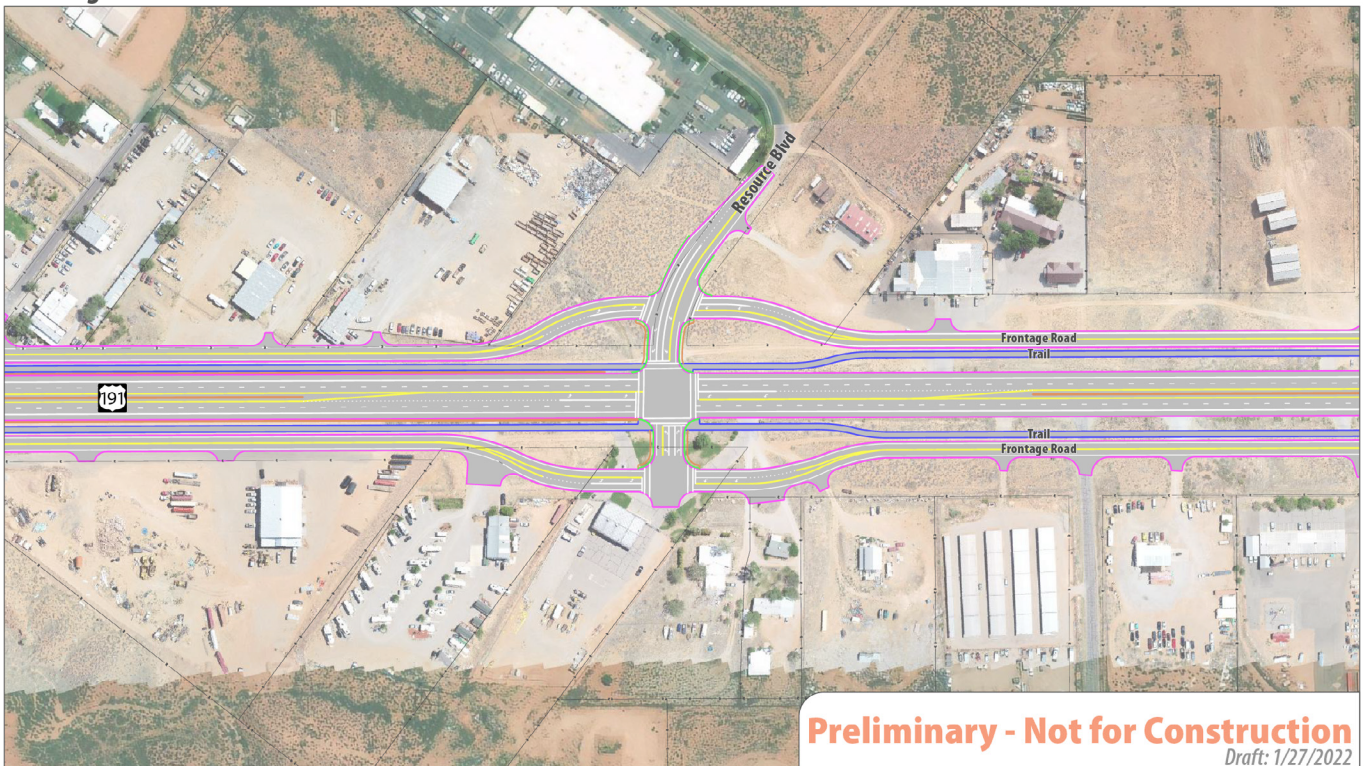
## Frontage Road Tie-In at Northern Project Termini



**Preliminary - Not for Construction**  
Draft: 1/27/2022

# US-191 South Moab Concept Study

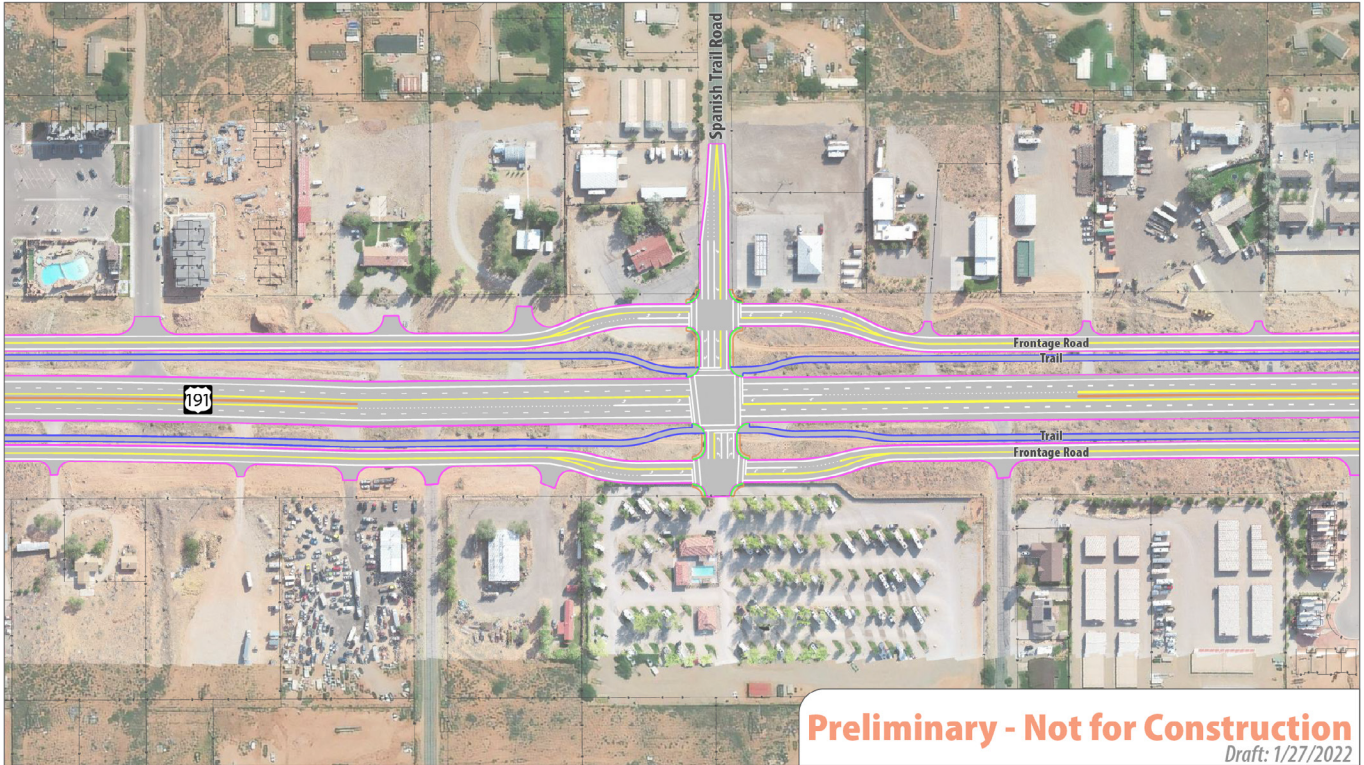
## Frontage Road Intersection at Resource Blvd



**Preliminary - Not for Construction**  
Draft: 1/27/2022

# US-191 South Moab Concept Study

## Frontage Road Intersection at Spanish Trail Rd



# US-191 South Moab Concept Study

## Frontage Road Southern Project Termini

