MEMORANDUM

TO: Myron Lee, Dixie MPO

FROM: Horrocks Traffic Group

DATE: June 14, 2024

SUBJECT: Northern Corridor Traffic Analysis for BLM SEIS

The purpose of this memo is to describe the travel demand and traffic operations analyses performed with respect to the purpose and need and alternatives development of the Northern Corridor in support of the Northern Corridor Supplemental Environmental Impact Study (SEIS) being prepared by the Bureau of Land Management (BLM). The memo addresses population growth and its impact on east/west travel demand in Washington County, Utah in 2050 and evaluates potential transportation solutions to meet the identified future travel demands. This memorandum details data collection efforts, study methodology, and traffic operations for 2024 and 2050 under the Terminate UDOT Right-of-Way (ROW) action and five other action alternatives.

STUDY METHODOLOGY

Data Collection

Data collected to perform the intersection analysis for the project included roadway geometry, signal timings, field visits to observe traffic conditions, roadway and intersection volumes, speeds, travel times, and vehicle classification information. Data was obtained from the Utah Department of Transportation (UDOT) Performance Measurement Systems (PeMS) and automatic traffic recorders, pneumatic tube counts, origin-destination information collected using Bluetooth technology, and both manual and video intersection turning movement counts. 2024 PM peak hour turning movement counts were performed at the following intersections:

- Snow Canyon Parkway and Bluff Street
- Northbound Bluff Street Flyover at Red Hills Parkway/Snow Canyon Parkway
- Southbound Bluff Street Flyover at Red Hills Parkway/Snow Canyon Parkway
- Sunset Boulevard and Bluff Street
- 500 North and Bluff Street
- 300 North and Bluff Street
- St. George Boulevard and Bluff Street
- St. George Boulevard and Main Street
- St. George Boulevard and 1000 East
- I-15 Diverging Diamond Interchange at St. George Boulevard
- St. George Boulevard and River Road/Red Cliffs Drive
- 200 East (Skyline Drive) and Red Hills Parkway
- 1000 East and Red Hills Parkway

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Traffic Analysis Software

The basic tools used for the travel demand and traffic operations analyses included the Dixie Metropolitan Planning Organization (DMPO) Regional Travel Demand Model (TDM) and Vissim traffic simulation software from the PTV Group. Vissim is a microscopic traffic simulation software program that is used to perform detailed peak hour traffic operations analysis. Table 1details the analysis type and use of each of the software packages.

Table 1: Study Software

Software Package	Use/Analysis Type	Output/Performance Measure
Dixie Cube Travel Demand Model v3.0	Development of future travel demand volumes	Daily and peak hour turning movement volumes, County-Wide Vehicle-Miles-Traveled (VMT)
VISSIM (2023-08)	Basic Freeway Segments, Weaving Areas	Density, Speed, Percent of Traffic Demand Served
	Ramp Junctions	Density, Speed, Percent of Traffic Demand Served, Number of Lane Changes
	Intersections	LOS, Queue Length
	Overall Roadway Network System	Travel Time, Delay, Vehicle Miles Traveled

Regional Travel Demand Model Overview

Future travel demand forecasts for Washington County were developed using DMPO TDM. The TDM predicts future travel demand based on projections of land use, socioeconomic patterns, and transportation system characteristics. The model is run using the TP+/Cube software. References to “the model” in this report refer to the scripts and data maintained by DMPO, not to the Cube software. At the time of this study, the DMPO official version of the TDM is 3.0, which is calibrated to represent 2023 base year travel conditions and predict 2050 traffic volume and travel conditions.

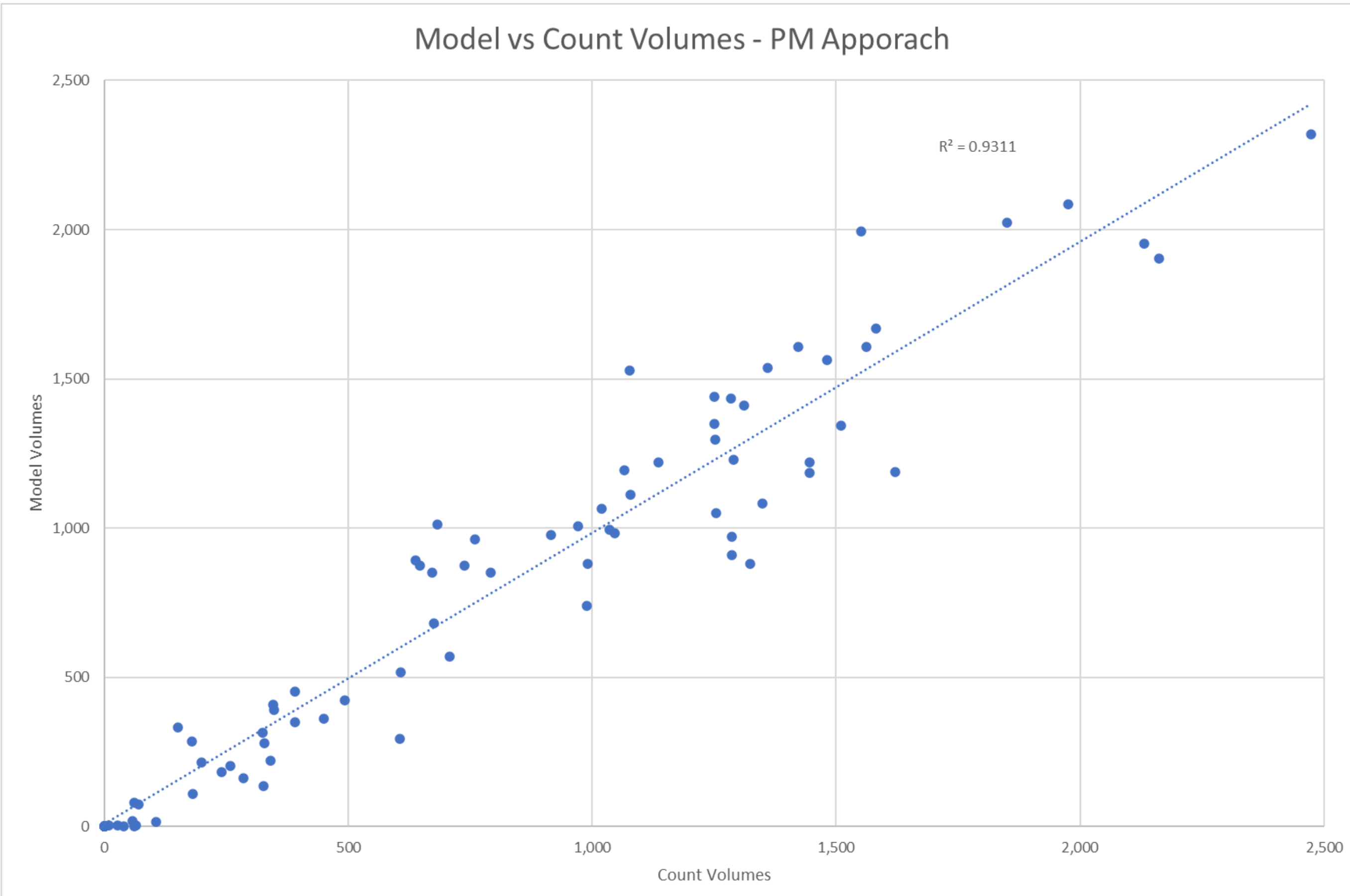
Specific inputs to the model include socioeconomic forecasts and transportation system data. For the DMPO TDM, the Washington County area was broken up into roughly 910 smaller geographical parts called traffic analysis zones (TAZ), which are populated with socio-economic data used for trip generation from the University of Utah’s Gardner Policy Institute. The socioeconomic data includes population, employment, and average household income. Household data is further classified by household size, number of workers, and average income. Employment data is classified into twelve categories, which include two for public schools. The transportation system data includes both roadway and transit networks. The roadway network includes freeways, arterial routes, and collector routes. The transit network includes local bus routes.

The DMPO TDM uses the traditional four-step modeling process consisting of trip generation, trip distribution, mode split, and trip assignment. It includes an auto ownership model to better estimate trip generation and mode split. The model provides a feedback loop during trip distribution, allowing traffic congestion to influence trip distribution patterns.

Existing socio-economic and transportation system data were used to create a base-year (2023) model. Future year forecasts are prepared by running the model using future year socioeconomic and transportation system data.

TRAVEL DEMAND MODEL CALIBRATION

The approach volumes collected from counts at the study intersections were compared to the approach volumes from the existing conditions Travel Demand Model output file. The following figure illustrates this comparison.



Graph 1: TDM Output vs Manual Count Comparison

The R^2 value, which measures the strength of the correlation, was used to evaluate the relationship between the two volume sets. An R^2 value of 0.93 indicates a strong correlation between the actual counts and the TDM output, demonstrating the model's accuracy.

WASHINGTON COUNTY POPULATION

Population and employment forecasts used in the DMPO TDM come from The University of Utah's Gardner Policy Institute, which provides demographic information for the Utah State Legislature and Office of the Governor. The county-level forecasts from the Gardner Policy Institute were then distributed at a city level and ultimately a TAZ level by the DMPO using land-use plans, information provided by local municipal planners, and growth trends. It is forecasted that over the next 30 years the population in Washington County will more than double, with heavy growth expected in Hurricane, St. George's south block area, Washington City fields area, Santa Clara, and Ivins. Table 2 shows the population of cities in Washington County in 2010, 2020, and projected out to 2050.

Table 2: City Population Growth in Washington County

City Name	2010	2020	2030	2040	2050
Apple Valley	574	754	1,102	1,388	1,639
Enterprise	1,394	1,832	2,677	3,371	3,983
Hilldale	659	866	1,265	1,593	1,882
Hurricane	14,521	19,087	37,006	62,797	91,250
Ivins	6,728	8,844	12,922	16,274	19,225
La Verkin	3,158	4,150	6,064	7,638	9,023
Leeds	767	1,008	1,472	1,854	2,190
New Harmony	181	239	348	439	518
Rockville	174	228	333	420	496
Santa Clara	5,606	7,369	10,766	13,560	16,018
Springdale	513	674	985	1,241	1,466
St. George	74,446	97,855	133,795	150,865	159,560
Toquerville	1,190	1,564	2,286	6,797	12,344
Unincorporated	4,831	6,350	9,278	11,685	13,804
Virgin	412	542	792	997	1,178
Washington	21,420	28,155	41,137	51,810	61,205
County Total	136,572	179,515	262,228	332,728	395,781

DISTRICT TO DISTRICT TRAVEL DEMAND

A district is a combination of several TAZs that are created to be able to evaluate travel characteristics of larger areas. Using the model's output for 2024 and 2050, travel demand between District 1 (Ivins, Santa Clara, west St. George, and the Ledges area) and the surrounding districts to the east (Leeds, Toquerville, Washington, Hurricane, and the southeast St. George areas) were compared in order to determine, at a higher level, the expected increase in east-west travel demand across these areas of Washington County between 2024 and 2050 (see Figure). As shown in Figure, the travel demand between District 1 and the surrounding areas is expected to increase at a similar rate to the population increase with travel demand nearly doubling over the next 30 years.

Screenline Analysis

To determine how the increase in travel demand is expected to translate to surface street traffic, a screenline analysis was performed. A screenline analysis consists of drawing an imaginary line across a section of roadways and summing all traffic that crosses the line. Because of topographic restrictions, a large portion of travel from District 1 is concentrated north of 100 South in St. George along Bluff Street, Red Hills Parkway, and St. George Boulevard. Three screenlines were examined: Screenline A-A, which looks at total east-west travel just west of the St. George Boulevard I-15 interchange, Screenline B-B, which looks at total north-south travel across Red Hills Parkway, Bluff Street, and Diagonal Street, and Screenline C-C which looks at total north-south travel across Red Hills Parkway, I-15, and Red Cliffs Drive. These are shown in Figure 2.

As shown in Figure 2, traffic across the screenlines is expected to increase between 44% to 88% from 2024 to 2050. At a planning level, a typical travel lane can be expected to accommodate between 5,000 and 7,500 vehicles per day (vpd). In 2050 under the Terminate UDOT ROW alternative, the average vpd per lane for all screenlines is expected to be between 9,000 and 13,000 vpd per lane.

2050 Volume Development

The existing 2024 traffic volumes (adjusted for weekly and seasonal variations) along with the 2023 and 2050 model output data were used for calculating the projected future 2050 volumes per the methodology described in the UDOT document "Utah Travel Demand Forecasting," which follows Chapter 8 of the National Cooperative Highway Research Program's (NCHRP) Report 255. This process involves comparing the 2023 model volumes with actual 2024 count data. The difference between the two volumes is used to make an adjustment to the 2050 volumes. This helps to correct for errors in the model where it might be over-predicting or under-predicting volumes. Existing 2024 and estimated 2050 volumes used in the analysis are included in the Appendix.

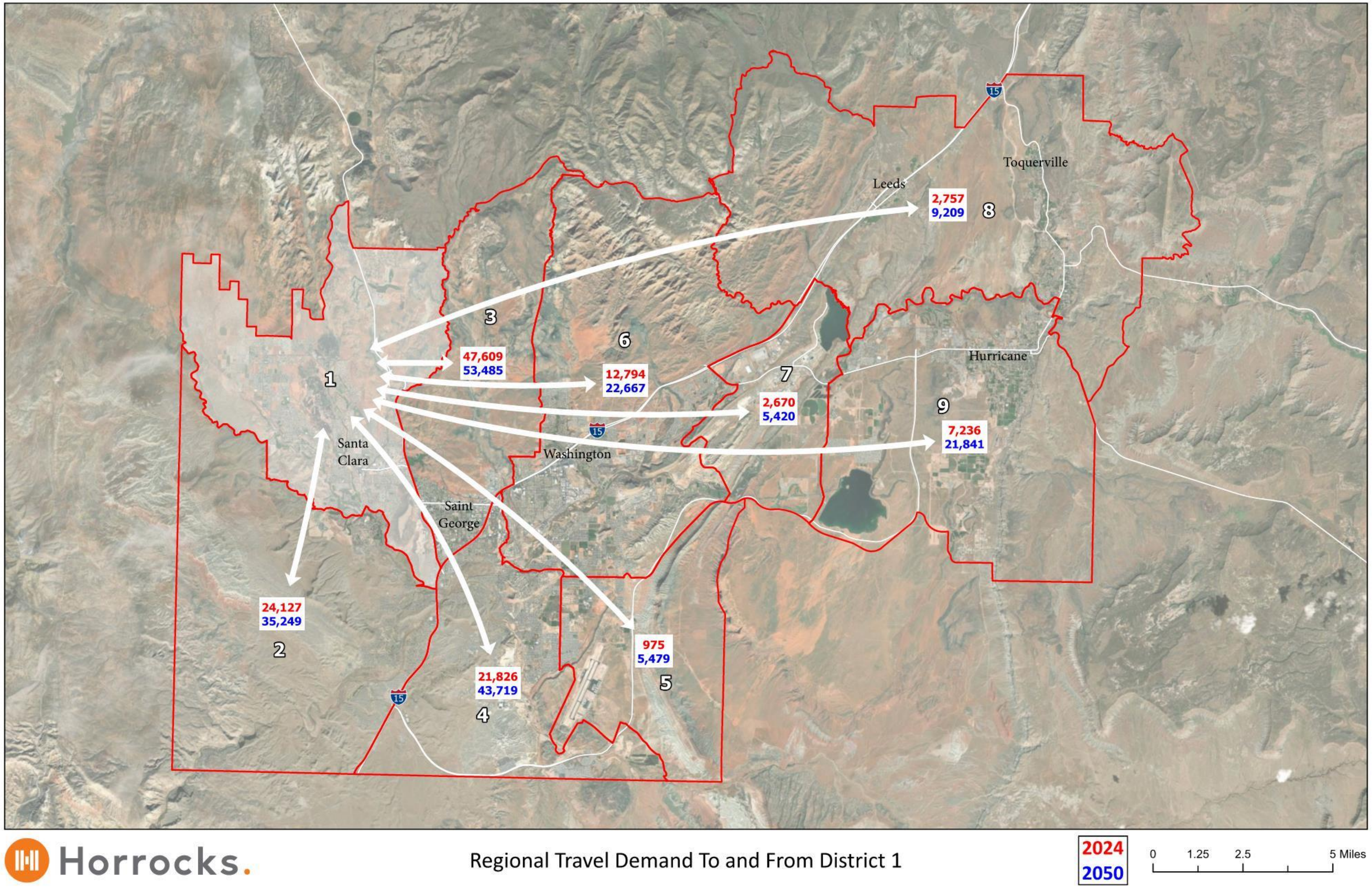
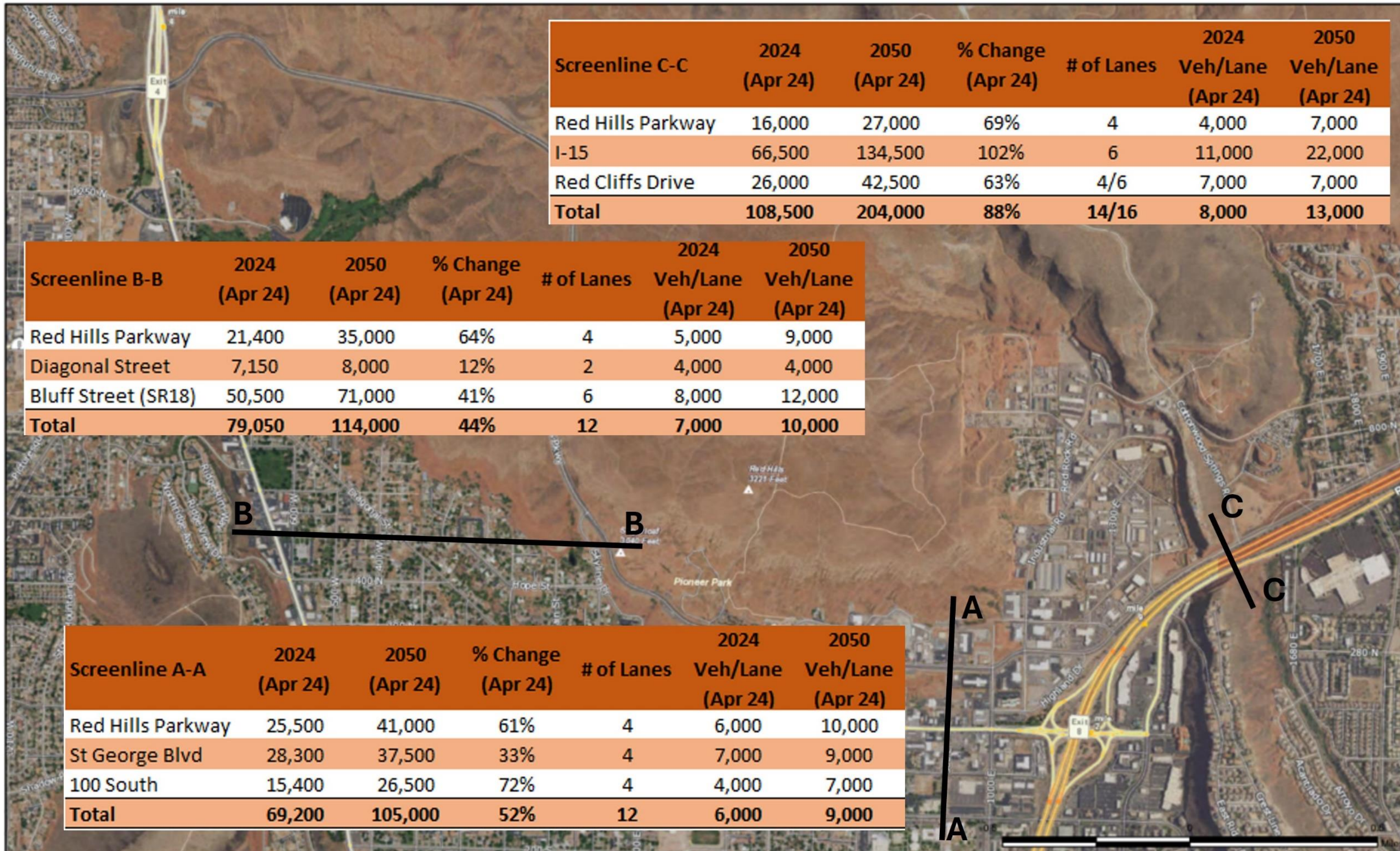


Figure 1: Regional Travel Demand to and From District 1



Screenline C-C	2024 (Apr 24)	2050 (Apr 24)	% Change (Apr 24)	# of Lanes	2024 Veh/Lane (Apr 24)	2050 Veh/Lane (Apr 24)
Red Hills Parkway	16,000	27,000	69%	4	4,000	7,000
I-15	66,500	134,500	102%	6	11,000	22,000
Red Cliffs Drive	26,000	42,500	63%	4/6	7,000	7,000
Total	**108,500**	**204,000**	**88%**	**14/16**	**8,000**	**13,000**

Screenline B-B	2024 (Apr 24)	2050 (Apr 24)	% Change (Apr 24)	# of Lanes	2024 Veh/Lane (Apr 24)	2050 Veh/Lane (Apr 24)
Red Hills Parkway	21,400	35,000	64%	4	5,000	9,000
Diagonal Street	7,150	8,000	12%	2	4,000	4,000
Bluff Street (SR18)	50,500	71,000	41%	6	8,000	12,000
Total	**79,050**	**114,000**	**44%**	**12**	**7,000**	**10,000**

Screenline A-A	2024 (Apr 24)	2050 (Apr 24)	% Change (Apr 24)	# of Lanes	2024 Veh/Lane (Apr 24)	2050 Veh/Lane (Apr 24)
Red Hills Parkway	25,500	41,000	61%	4	6,000	10,000
St George Blvd	28,300	37,500	33%	4	7,000	9,000
100 South	15,400	26,500	72%	4	4,000	7,000
Total	**69,200**	**105,000**	**52%**	**12**	**6,000**	**9,000**

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Figure 2: Study Screenlines

Date
8/31/2024

VISSIM MODEL OVERVIEW

Model Limits - The Vissim model includes the following corridors:

- Bluff Street (SR-18) from Snow Canyon Parkway to 100 South
- St. George Boulevard from Bluff Street to River Road
- Red Hills Parkway from Bluff Street to Green Spring Drive
- Red Cliffs Drive between St George Blvd and Green Spring Drive
- I-15 between Exits 8 and 13

Geometry - Roadway geometric features such as the number of lanes, lane widths, and grades were built into the Vissim model using aerial photography, CADD files, and field visits.

Analysis Period - Traffic was modeled for 2-hour periods in the PM between 4:00 PM to 6:00 PM. Daily counts collected using pneumatic tubes showed the AM peak hour traffic to be much lower than PM peak hour traffic. Therefore, only PM peak hour analysis was performed for the study.

Vehicle Composition - The vehicle composition, including truck percentages used for the model's vehicle inputs, was determined using a combination of manual traffic counts at the study intersections and PEMS data for mainline I-15. Details of the vehicle composition used for the analysis are contained in the Appendix.

Routing - Origin-Destination pairs used to route vehicles through the model's network were determined by the DMPO TDM and Bluetooth data in the study area. Turning movement ratios were used in areas that were not included in the O-D data collection area.

Signal Timing - Existing conditions were modeled with signal timings obtained from the UDOT Traffic Operations Center Signal Group. Future conditions were modeled with the same general signal timing parameters, but with optimized phasing.

VISSIM MODEL CALIBRATION

For this project, version 2023-07 of the Vissim microsimulation software was used to model traffic in the study area. A model of the existing geometry and traffic volumes was prepared to replicate the typical traffic conditions. The Vissim software is based on two different driving behavior models, the Wiedemann-74 and Wiedemann-99 methodologies. The Wiedemann-74 model is used primarily in urban traffic conditions, and the Wiedemann-99 model is used for inter-urban motorway or freeway conditions. In the study area both types of roadway behavior are present, therefore both methodologies are used. Default parameters for the Wiedemann-74 methodology are presented in Table 3. Default parameters for Wiedemann-99 are presented in Table 4.

Table 3: Wiedemann-74 Model Parameters

Model Parameter	Value
Average standstill distance	6.56
Additive part of safety distance	2.00
Multiplicative part of safety distance	3.00

Table 4: Wiedemann-99 Model Parameters

Model Parameter	Value
CC-0; Standstill distance	4.92
CC-1; Headway time	0.90
CC-2; 'Following' variation	13.12
CC-3; Threshold for entering 'Following'	-8.00
CC-4; Negative 'Following' threshold	-0.35
CC-5; Positive 'Following' threshold	0.35
CC-6; Speed dependency for oscillation	11.44
CC-7; Oscillation acceleration	0.82
CC-8; Standstill acceleration	11.48
CC-9; Acceleration with 50 mph	4.92

Criteria used in calibrating the Vissim model was taken from Federal Highway Administration's (FHWA) Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software (FHWA, 2004). The calibration uses the GEH statistic to compare observed vs modeled volume flow. The formula used to calculate the GEH statistic is:

$$\boldsymbol{GEH} = \sqrt{\frac{(\boldsymbol{E}-\boldsymbol{V})^2}{(\boldsymbol{E}+\boldsymbol{V})/2}}$$

where E equals the modeled volumes and V equals the observed volume.

Based on FHWA's document the following calibration criteria and targets listed in Table 5 were used:

Table 5: Calibration Criteria

Criteria and Measure	Calibration Acceptance Targets	Condition Met?
Hourly Flows, Model Versus Observed		
Within 400 veh/hr, for Flow >2700 veh/hr	> 85% of cases	Yes
Sum of All Link Flows	Within 5% of sum of all link counts	Yes
GEH Statistic < 5 for Individual Link Flows	> 85% of cases	Yes
GEH Statistic for Sum of All Link Flows	GEH < 4 for sum of all link counts	Yes
Travel Times, Model Versus Observed		
Travel Times Within 15%	> 85% of cases	Yes
Visual Audits		
Individual Link Speeds: Visually Acceptable Speed-Flow Relationship	To analyst’s satisfaction	Yes
Bottlenecks: Visually Acceptable Queueing	To analyst’s satisfaction	Yes

The Vissim model was calibrated by testing various combinations of driver behavior parameter adjustments against field measurements and observations. Initial model runs with default values showed congestion levels below what was observed in the field. Queues, particularly around the Green Spring Drive and Telegraph Street intersection were much lower than field observations. The Vissim Wiedemann-74 default parameters were adjusted up until the model generally matched observed conditions. An additional driver behavior was created for links that had a high degree of side friction from accesses. No adjustments were made to the Wiedemann-99 parameters. Table 6 details the revised Wiedemann-74 parameters:

Table 6: Revised Wiedemann-74 model Parameters

Model Parameter	Original Value	Adjusted Value	Side Friction
Average standstill distance	6.56	6.56	6.56
Additive part of safety distance	2.00	2.25	2.5
Multiplicative part of safety distance	3.00	3.25	3.5

Based on the comparison of the Vissim model outputs to field measurements (travel times, traffic flows, and speeds), the Vissim model meets the calibration targets and accurately represents PM peak hour conditions for the existing 2024 analysis.

MEASURES OF EFFECTIVENESS

There are several measures of effectiveness (MOE) that can be used in traffic analyses such as Level of Service (LOS), queue length, percent of traffic served, lane density, travel time, volume/capacity ratio, etc. For the purposes of this study, LOS was the primary MOE analyzed as it portrays a good, high-level summary of traffic conditions. LOS is a term used to describe the traffic operations of an intersection, based on congestion and delay, and a freeway, based on density. LOS ranges from A (almost no congestion or delay) to F (traffic demand exceeds capacity and the intersection experiences long queues and delay). LOS D is generally acceptable for urbanized intersections and was used for this analysis. LOS E is the threshold when the intersection reaches capacity. The delay criteria used to assign a letter grade to an intersection for signalized and unsignalized intersections is shown in Table 7 below.

Table 7: Highway Capacity Manual Intersection LOS Criteria

Level of Service		Traffic Conditions	Average Control Delay (sec/veh)	
			Signalized	Unsignalized
Acceptable	A	Free Flow Operations / Insignificant	0 ≤ 10	0 ≤ 10
	B	Smooth Operations / Short Delays	10 ≤ 20	10 ≤ 15
	C	Stable Operations / Acceptable Delays	20 ≤ 35	15 ≤ 25
	D	Approaching Unstable Operations / Tolerable Delays	35 ≤ 55	25 ≤ 35
Unacceptable	E	Unstable Operations / Significant Delays Begin	55 ≤ 80	35 ≤ 50
	F	Very Poor Operations / Excessive Delays Occur	> 80	> 50

NO BUILD OPERATIONS

Intersection Operations

The calibrated Vissim model was run under existing 2024 and 2050 PM peak hour Terminate UDOT ROW conditions to assess the current and future traffic operations and determine the impacts of terminating the previously approved UDOT ROW application and not making any modifications to the study area other than those already included in local and regional long-range transportation plans. The following sections detail the operations analysis for the study intersections. Table 8 details the PM peak hour intersection delay and corresponding LOS for each of the study intersections under the existing 2024 and 2050 Terminate UDOT ROW scenarios.

Table 8: Existing/2050 Terminate UDOT ROW PM Peak Hour LOS

Intersection	2024 Existing	2050 Terminate UDOT ROW
RHP/Bluff Street	B	B
Sunset/Bluff Street	C	D
SG Blvd/Bluff Street	C	F
SG Blvd/Main Street	C	C
SG Blvd/1000 East	D	F
I-15 Exit 8 SB Ramps	C	F
I-15 Exit 8 NB Ramps	C	C
SG Blvd/River Road	E	D
RHP/200 East	A	A
RHP/1000 East	C	F
I-15 Exit 10	C	C
Green Spring/Buena Vista	C	C
Green Spring/Telegraph Street	E	E
I-15 Exit 13 SB Ramps	A	B
I-15 Exit 13 NB Ramps	A	B

As shown in the table the following intersections are expected to experience failing conditions by 2050 under the Terminate UDOT ROW scenario:

- Bluff Street and St George Blvd
- SG Blvd/1000 East
- I-15 Exit 8 SB Ramp
- Red Hills Pkwy and 1000 East
- Telegraph Street and Green Spring Drive

Future congested conditions are centered around the primary east-west corridors of Red Hills Parkway, St. George Boulevard and Telegraph Street. The 1000 East/Red Hills Parkway intersection experienced the highest degree of congestion with queues that extended nearly a mile. It should be noted that the congested conditions at several intersections meter traffic in such a way that other intersections that appear to be operating at an acceptable LOS may only be doing so because they do not experience the full travel demand due to the upstream congestion.

ALTERNATIVES DEVELOPMENT AND EVALUATION

As part of the study, six alternatives were analyzed. The six alternatives were evaluated based on their ability to address the study area operational problems discussed under the Terminate UDOT ROW analysis above. Two of the alternatives are outside the National Conservation Area (NCA) while three of the alternatives cross through the NCA in some fashion. The six alternatives are:

1. Terminate UDOT ROW
2. T-Bone Mesa Alignment (through the NCA)
3. UDOT Application Alignment (through the NCA)
4. Southern Alignment (through the NCA)
5. Red Hills Parkway Expressway
6. St George Blvd/100 South One-Way Couplet

ALTERNATIVES EVALUATION

Each of the alternative concepts, in addition to the Terminate UDOT ROW alternative, were analyzed using the methodology and software discussed in the previous sections of this memo. The following measurements were calculated for each alternative:

1. Level-of-Service at each of the study intersections using Vissim microsimulation models
2. Shifts in travel patterns for the major study corridors for each of the NCA corridor alignments.

INTERSECTION LEVEL-OF-SERVICE (LOS)

Table 9 details the average vehicle delay and corresponding LOS for each of the study intersections under each alternative under 2050 PM peak hour conditions.

Table 9: 2050 PM Peak Hour Alternative Vehicle Delay/LOS Comparison

Intersection	Terminate UDOT ROW	NCA: T-Bone Mesa (Alt 2)	NCA: UDOT (Alt 3)	NCA: Southern (Alt 4)	Non-NCA: RHP Expressway (Alt 5)	Non-NCA: SG Blvd/100 S One-way Couplet (Alt 7)
RHP/Bluff Street	15/B	18/B	17/B	15/B	17/B	15/B
Sunset/Bluff Street	39/D	37/D	42/D	48/D	30/C	48/D
SG Blvd/Bluff Street	123/F	71/E	71/E	82/F	67/E	54/D
SG Blvd/Main Street	20/C	19/B	20/C	20/C	19/B	19/B
SG Blvd/1000 East	102/F	49/D	52/D	88/F	54/D	32/C
I-15 Exit 8 SB Ramps	109/F	37/D	40/D	65/E	47/D	37/D
I-15 Exit 8 NB Ramps	25C	30/C	30/C	27/C	31/C	24/C
SG Blvd/River Road	49/D	50/D	51/D	50D	50/D	49/D
RHP/200 East	6/A	8/A	8/A	5/A	1/A	6/A
RHP/1000 East	125/F	29/C	27/C	67/E	21/C	38/D
I-15 Exit 10	34/C	31/C	32/C	33/C	30/C	34/C
Green Spring/ Buena Vista	34/C	34/C	33/C	34/C	29/C	42/D
Green Spring/ Telegraph Street	57/E	51/D	53/D	56/E	49/D	60/E
I-15 Exit 13 SB Ramps	19/B	27/C	24/C	21/C	19/B	20/B
I-15 Exit 13 NB Ramps	19/B	23/C	23/C	20/B	19/B	19/B

As shown in Table 9, under each of the alternatives the St George Blvd/Bluff Street intersection operates at LOS E or worse conditions for all alternatives except for the One-Way Couplet. The Green Spring Drive/Telegraph Street intersection operates at borderline D/E conditions under each of the alternatives. Outside those two intersections, the T-Bone Mesa Alignment, UDOT Application Alignment, Red Hills Pkwy Expressway, and One-Way Couplet alternatives improved operations at each of the study intersections to LOS D or better.

As mentioned previously, there are additional MOEs (queue lengths, travel times, v/c ratios, etc.) that could also be analyzed that would provide additional insight into how the system as a whole operates. The results of these analyses would not be expected to affect any of the intersections that operate at LOS D or better. There are also other locations, such as Tabernacle Street with the One-Way Couplet, that are also affected by regional shifts in travel demand that occur with each alternative that were not part of the analyses. Depending on the alternative chosen, this additional analysis may be necessary to better understand the impacts to other corridors. However, the LOS analyses capture the high-level operational impacts of the changed volumes on the critical regional routes that are most affected by the travel demand shifts of each alternative.

NORTHERN CORRIDOR ALIGNMENT COMPARISONS

Further comparisons were made between the three alternative which cross through the NCA: T-Bone Mesa Alignment, UDOT Application Alignment, and Southern Alignment to help understand the subtle differences each of these alternatives have on regional traffic performance. The following sections detail those comparisons.

AREA OF INFLUENCE

Using the DMPO TDM, heat maps were created showing the area of influence of the T-Bone Mesa Alignment, the UDOT Application Alignment, and the Southern Alignment. These are shown in Figures 3-5. The colors represent the various TAZs that are affected by the alternative and to what relative extent they are affected. A darker area would have more trips that are using that alternative than a lighter area.

As shown in Figure 3, the T-Bone Mesa Alignment provides more direct east/west access between west Street George, Ivins, and Santa Clara to Washington and Hurricane when compared to the other alternatives, increasing the area of influence in those areas. The T-Bone Mesa alignment, which is further north than the UDOT Alignment, decreased the amount of usage from the Washington area as the extra length of travel on Cottonwood Road caused traffic in that area to use Red Hills Parkway instead.

The UDOT Application Alignment provides more direct accesses to west Street George, Ivins, Santa Clara, and Washington as shown in Figure 4. There was a large amount of travel between the Washington area and west Street George, Ivins, and Santa Clara via Cottonwood Road and the Northern Corridor.

As shown in Figure 5, the Southern Alignment primarily serves the Green Springs north area with very little usage from Ivins, Santa Clara, northwest St. George, northeast Washington, Hurricane, and Toquerville. This is due to this route being 1.5 miles longer than the UDOT Application Alignment.

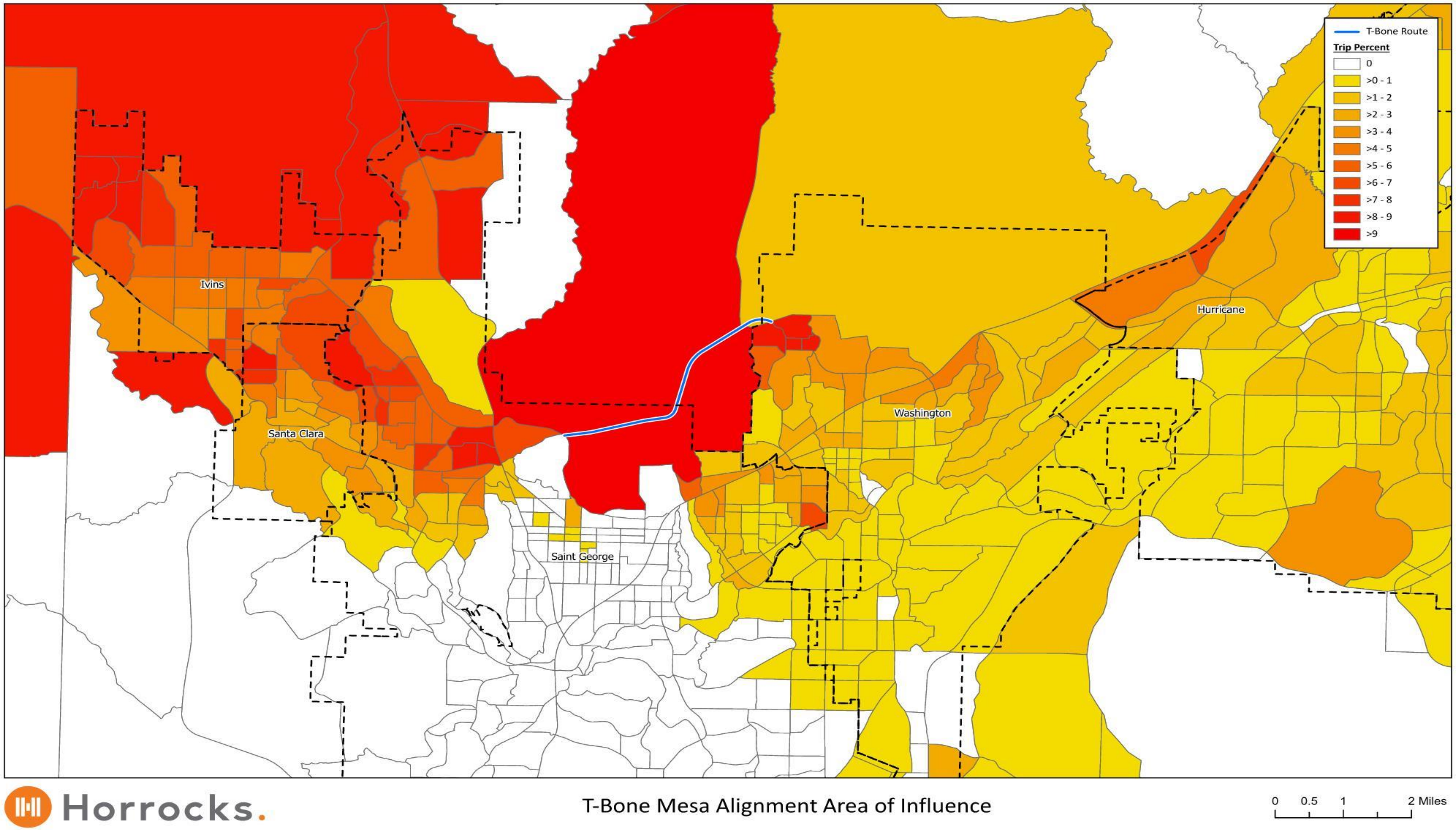

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Figure 3: T-Bone Mesa Alignment Area of Influence

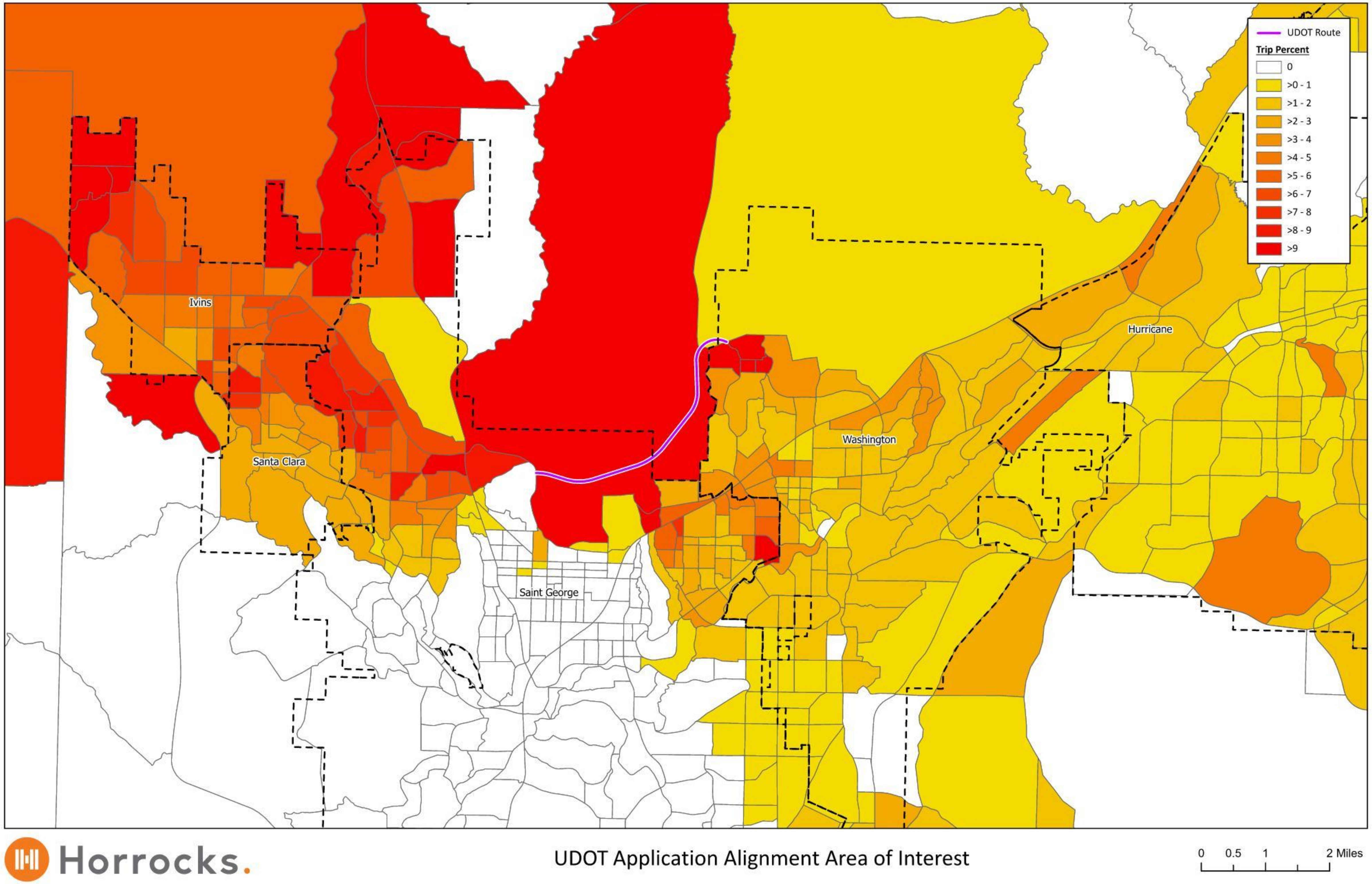


Figure 4: UDOT Application Alignment Area of Influence

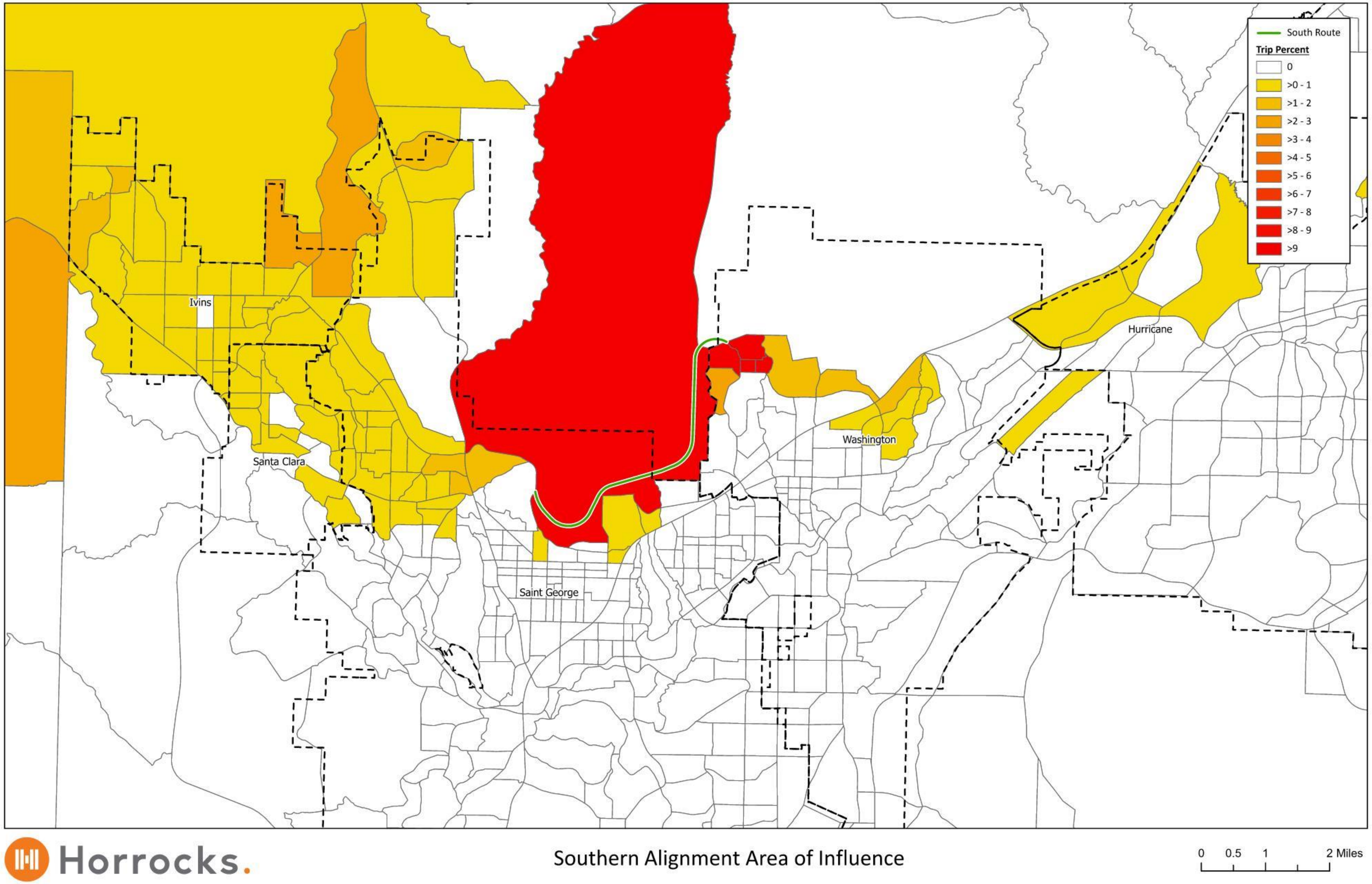


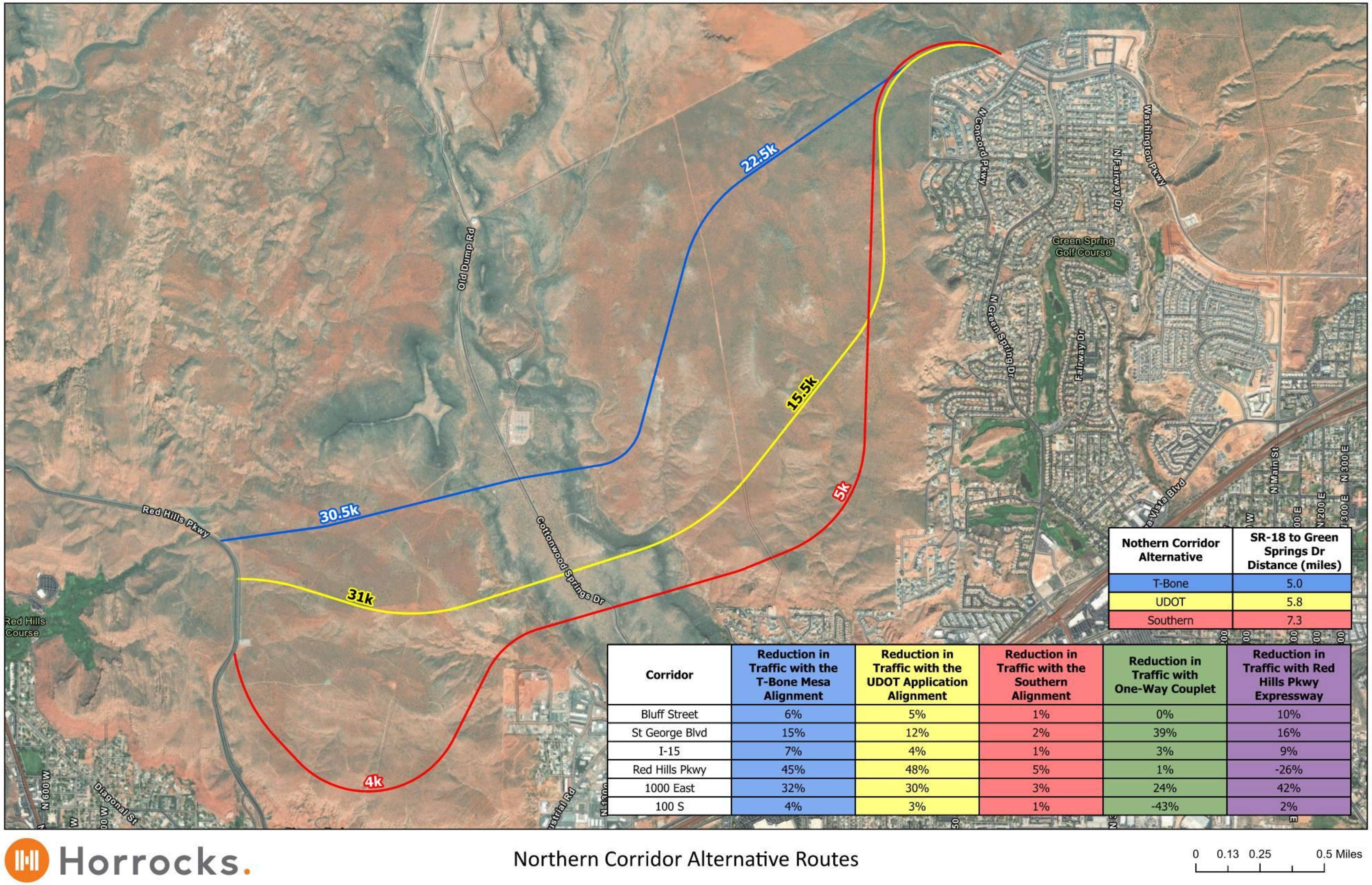
Figure 5: Southern Alignment Area of Influence

DAILY VOLUME COMPARISON

The anticipated daily volumes for the T-Bone Mesa Alignment, UDOT Application Alignment, and the Southern Alignment in 2050 are shown in Figure 6. The figure also shows the percent reduction in traffic on the major surrounding corridors associated with each alternative. The T-Bone Mesa Alignment carries between 22,500-30,500 vpd while the UDOT Application Alignment carries between 15,500-31,000 vpd and the Southern Alignment is only expected to carry between 4,000-5,000 vehicles per day (vpd) in 2050.

The T-Bone Mesa Alignment showed a reduction in travel on the major surrounding corridors between 6%-45% while the UDOT Application Alignment showed a reduction ranging between 4%-48% and the Southern Alignment only showed between 1%-5% reduction. The Red Hills Parkway Expressway alternative increases traffic on Red Hills Parkway by 26% while decreasing the remaining corridors by 15% to 20%. The St. George Boulevard/100 South One-Way Couplet alternative increases the traffic on 100 S by 43% while decreasing the remaining corridors by 0% to 39%.

Table 10 provides the average annual daily traffic (AADT) volumes for each of the alternatives for various roadway segments on Bluff Street, Street George Blvd, 100 South, and Red Hills Parkway.



Nothern Corridor Alternative	SR-18 to Green Springs Dr Distance (miles)
T-Bone	5.0
UDOT	5.8
Southern	7.3

Corridor	Reduction in Traffic with the T-Bone Mesa Alignment	Reduction in Traffic with the UDOT Application Alignment	Reduction in Traffic with the Southern Alignment	Reduction in Traffic with One-Way Couplet	Reduction in Traffic with Red Hills Pkwy Expressway
Bluff Street	6%	5%	1%	0%	10%
St George Blvd	15%	12%	2%	39%	16%
I-15	7%	4%	1%	3%	9%
Red Hills Pkwy	45%	48%	5%	1%	-26%
1000 East	32%	30%	3%	24%	42%
100 S	4%	3%	1%	-43%	2%

Figure 6: Daily Volumes and Percent Traffic Reduction

Table 10: Average Annual Daily Traffic (2050 AADT) Comparison

Roadway	Segment	Terminate UDOT ROW	T-Bone Mesa Alignment	UDOT Application Alignment	Southern Alignment	One-Way Couplet	Red Hills Expressway
Bluff Street	Snow Canyon to Sunset	33,000	37,000	36,000	33,500	34,000	32,000
Bluff Street	Sunset to Blvd	71,000	67,000	67,500	70,500	70,500	64,000
SG Blvd	Bluff Street to Main	28,000	25,000	25,500	27,500	17,000	25,000
SG Blvd	Main to 1000 East	37,500	35,000	35,000	36,500	25,500	35,000
SG Blvd	1000 East to I-15 Ramps	63,000	53,500	55,500	62,000	38,500	53,000
Red Hills Pkwy	Bluff Street to Skyline Dr	35,000	45,500	45,000	36,500	36,000	48,500
Red Hills Pkwy	Skyline Dr to 1000 East	41,000	23,000	21,500	39,000	40,500	52,000
Red Hills Pkwy	1000 East to I-15 Crossing	31,000	30,500	35,500	30,000	38,500	33,000
100 S	Bluff Street to Main	17,000	16,000	16,500	17,000	23,500	14,000
100 S	Main to 1000 East	26,500	25,500	25,500	26,500	38,000	26,000
100 S	1000 East to River Road	29,000	26,000	27,000	29,000	28,500	28,000

VEHICLE MILES TRAVELED

Table 11 compares the vehicle miles traveled (VMT) for all of Washington County under each of the alternatives from the DMPO TDM, excluding those previously eliminated.

Table 11: Washington County Vehicle Miles Traveled Comparison

Year	Scenario	Daily	PM Peak Period (4-6 pm)
2024	Existing	4,995,349	1,193,699
2050	Terminate UDOT ROW	10,461,936	2,537,591
2050	T-Bone Alignment	10,730,919	2,620,629
2050	UDOT Alignment	10,733,042	2,623,818
2050	Southern Alignment	10,483,312	2,546,514
2050	Red Hills Expressway	10,599,602	2,580,022
2050	St. George Blvd/100 S One-Way Couplet	10,588,935	2,578,743

As shown in Table 11, each of the alternatives increase the overall VMT for Washington County. This is typical with roadway improvements as bottlenecks in the network are removed and people can travel longer distances in shorter amounts of time.

CONCLUSION

Future growth in Washington County is expected to increase the east-west travel demand across the St. George urbanized area causing unacceptable levels of congestion along key corridors by the year 2050. The following alternatives showed substantial improvements to the study corridors:

1. T-Bone Mesa Alignment
2. UDOT Application Alignment
3. Red Hills Parkway Expressway
4. Street George Blvd/100 South One-Way Couplet

Depending on the alternative chosen, additional analysis may be beneficial to better understand the full extent of traffic operations (queue lengths, v/c ratios, etc.) and how they may affect other environmental, socio-economic, and quality of life issues along each corridor and adjacent corridors affected by the alternative.