Northeast Tooele County Study

April 2022

UDOT
Keeping Utah Moving

TOOELE COUNTY

WASATCH FRONT REGIONAL COUNCIL

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Tooele City
Est. 1853

UTA

Northeast Tooele County Study

Avenue Consultants with Bio-West and Penna Powers

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1 EXECUTIVE SUMMARY

The Utah Department of Transportation, in conjunction with Tooele County, Wasatch Front Regional Council, Utah Transit Authority, Tooele City, and Grantsville City, performed a study of travel between Tooele and Salt Lake Counties. Most of the travel between the two counties is via I-80, which means that congestion or incidents due to crashes, construction, or weather can lead to extreme travel delays. In 2019, there were six days with delays of over 90 minutes per vehicle, which combined accounted for 25 percent of the travel delay that year. There were two such high delay days in 2018 and none in 2020. The purpose of the study was to evaluate potential solutions to improve travel between the Tooele Valley and Salt Lake County.

Based on public feedback and in consultation with the study partners, the following three goals were identified for travel in the study area:

1. Provide a reliable and safe connection between Tooele and Salt Lake Counties near Lake Point
2. Consider the character of the surrounding community and potential growth consistent with existing general plans
3. Improve access to I-80 as a major ingress/egress to the Tooele Valley

Nearly 20 potential solutions were identified to improve travel in the study area. These potential solutions were evaluated using evaluation criteria based on the study goals, including traffic performance, incident delay, and potential environmental impacts. After evaluating all the potential solutions and eliminating those that would not adequately meet the goals and combining potential solutions with similar characteristics and impacts, a total of four primary potential solutions were identified with an additional three sub-options. **Figure 1** schematically presents each of the four recommended potential solutions and sub-options. The four primary recommended potential solutions are:

1. **Additional Lanes on I-80** – Widening I-80 to four lanes in each direction
2. **S.R. 201 Bypass** – Extension of S.R. 201 to the west with westbound lanes on the north side of I-80 and eastbound lanes on the south side
3. **S.R. 201 Extension Between I-80 & Railroad**– Extension of S.R. 201 on the south side of I-80 between the freeway and the railroad tracks
4. **S.R. 201 Extension East of Railroad** – Extension of S.R. 201 south of the railroad tracks that would continue east of the railroad through the Lake Point area and connect to S.R. 36 at Mills Junction

All the recommended potential solutions would include widening of S.R. 36 to three travel lanes in each direction through the study area and an I-80 eastbound auxiliary lane. Potential solutions 2 and 3 would have one and two sub-options, respectively that would vary where and how the S.R. 201 extensions would connect to S.R. 36.

Concept designs and rough cost estimates (see **Table 1**) were prepared for each of the recommended solutions.

Table 1. Recommended Potential Solution Rough Cost Estimates (2026 Dollars)

#	Recommended Potential Solution	S.R. 36 Widening	Non-S.R. 36 Portion	Total Cost
1	Additional Lanes on I-80	$24.8 M	$90.7 M	$116 M
2	S.R. 201 Bypass	$24.8 M	$159 M	$184 M
3	S.R. 201 Extension Between I-80 & Railroad	$24.8 M	$228 M	$253 M
4	S.R. 201 Extension East of Railroad	$24.8 M	$286 M	$311 M

WITHOUT IMPROVEMENT

VEHICLE TRAVEL TIME*	INCIDENT DELAY*	WETLAND IMPACTS
12 minutes	80 minutes	0 acres

* **Vehicle Travel Time**: Average travel time from S.R. 201 to Mills Junction (2050 estimates)
* **Incident Delay**: Computer models of an incident that would close two lanes on I-80 (2050 estimates)
* **I-80 EB/WB**: All solutions also include an eastbound auxiliary lane from S.R. 36 to S.R. 201

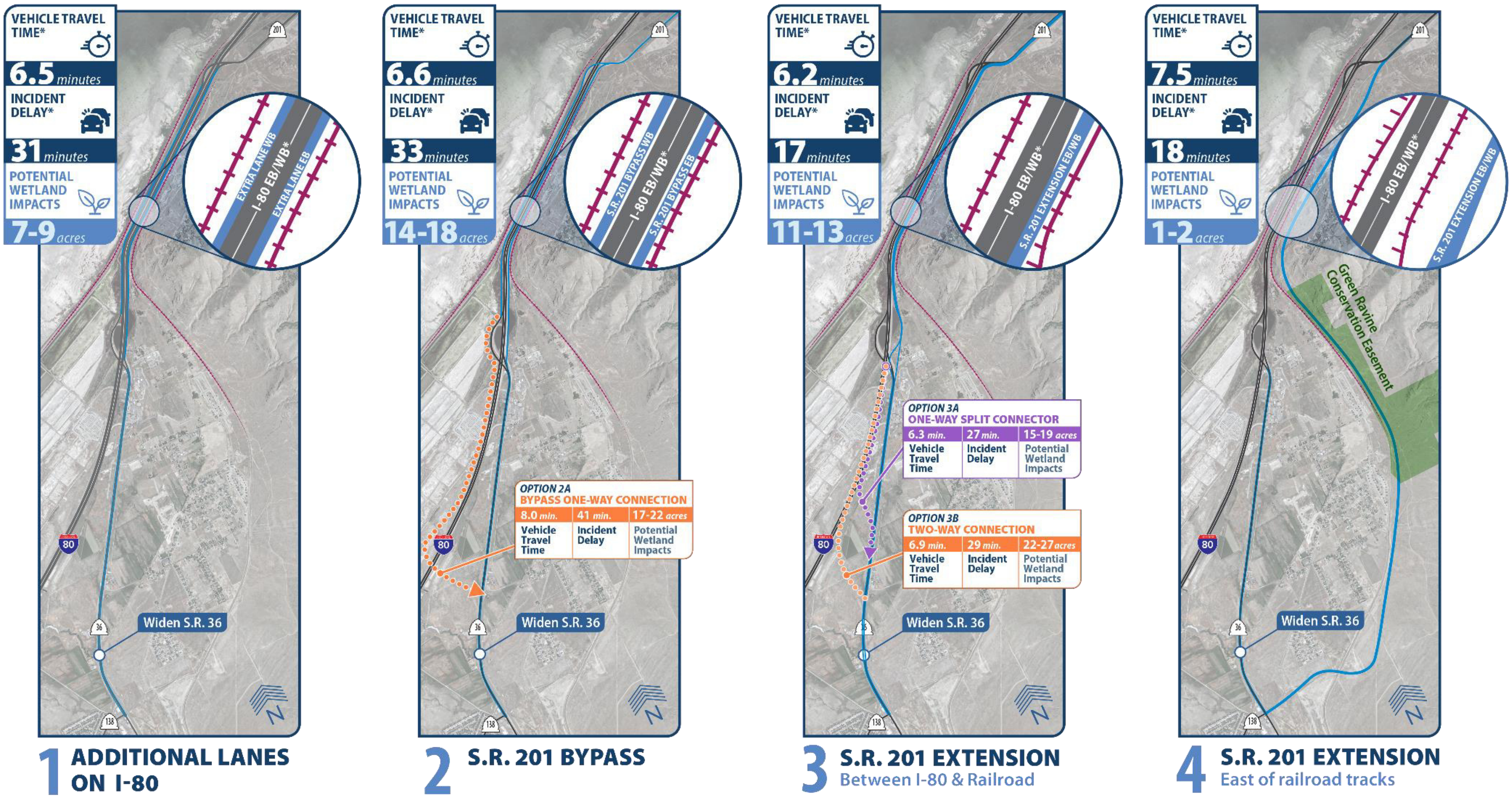


Figure 1: Recommended Potential Solutions

2 INTRODUCTION/STUDY PURPOSE

The Northeast Tooele County Study is an evaluation of travel between northeast Tooele County, namely the Tooele Valley, and Salt Lake County. Most of the travel between the two areas is via I-80 and S.R. 36. With limited route options having a fixed capacity, travel is often characterized by recurring congestion on S.R. 36 and unreliability on I-80 due to crashes or weather incidents. The purpose of the study was to evaluate potential solutions to improve travel between the Tooele Valley and Salt Lake County.

The study began with an analysis of existing conditions to quantify and better understand the nature of the transportation issues within the study area. This was followed by the creation of goals and objectives to guide both the development and evaluation of potential solutions to be considered. There was then a brainstorming session for the study team to develop the list of potential solutions followed by the technical analysis of those solutions. The potential solutions were first analyzed for traffic performance. Those solutions that met the traffic performance thresholds were then evaluated for high-level environmental and property impacts. Concept designs and preliminary cost estimates were then developed for the final set of potential solutions that made it through both levels of screening.

Public outreach and stakeholder coordination was performed throughout the study process. This effort began with a review of comments received from prior public outreach efforts, which were used in the development of the draft goals and objectives. The initial online public outreach for this study was done to solicit comments on the draft goals and objectives and to allow for them to identify transportation issues or needs. One-on-one meetings were held with specific stakeholders, including industry representatives and large landowners. Throughout the study, the team held regular meetings with representatives from Utah Department of Transportation (UDOT), Tooele County, Wasatch Front Regional Council (WFRC), and Utah Transit Authority (UTA). Occasional meetings were also held with additional representatives from those same groups plus Tooele City and Grantsville City. Finally, a second public outreach effort was held near the end of the study to solicit feedback on the final set of potential solutions.

STUDY AREA

The study area can generally be described as the area between Mills Junction (i.e., the intersection of S.R. 36 & Pole Canyon Road, formerly S.R. 138) on the west and the I-80 & S.R. 201 interchange on the east. The north limit is the railroad tracks on the north side of I-80 and the south limit is a few hundred feet south of the railroad tracks on the south side of I-80. The study area is shown in **Figure 2**.

Figure 2: Study Area

3 GOALS & OBJECTIVES

The development of study goals and objectives was an important step to ensuring that the study team understood the local transportation issues and needs and that the potential solutions would solve those needs. Rather than immediately reach out to the public to ask them what their biggest transportation issues and concerns are, the study team realized that the issues were not new to Tooele County citizens, nor were some of the likely solutions. The study team also knew that several groups had conducted public involvement processes as part of previous planning efforts. As such, the study team decided to begin by reviewing previous public comments to build a foundation for both study substance and public process. This review resulted in a targeted approach of engaging the public to gather input that would specifically guide the study process while avoiding "engagement fatigue."

Six transportation-related studies and projects in the Tooele Valley conducted over the past nearly 10 years were reviewed. These studies include:

- Tooele Valley Long-Range Transportation Plan (2019)
- Tooele County General Plan, including Transportation Plan (2016)
- Tooele County Active Transportation Implementation Plan (2018)
- S.R. 201 to S.R. 36 Traffic Study (2017)
- Oquirrh Connection Feasibility Study (2017)
- Midvalley Highway Environmental Impact Statement (2011)

In addition to reviewing public comments captured via the studies listed above, the study team also coordinated efforts with the concurrent Tooele Transit Study team to consider public feedback received by that team as both studies progressed.

Details of the studies review can be found in **Appendix A: Previous Public Comment and Needs Review**, but the following items are a few of the findings most relevant to the Northeast Tooele County Study:

- Strong need to reduce congestion/improve flow between Tooele and Salt Lake Counties around the point
- Strong need to address access to I-80 and easing congestion in the Lake Point/Stansbury Park area
- Frustration regarding the lack of an alternative high-capacity route between Tooele and Salt Lake Counties leading to extreme delays when crash, construction, or weather incidents result in lane closures on I-80 between S.R. 36 and S.R. 201
- Mixed feelings about a new roadway near the railroad tracks on the east side of Lake Point with people living in the area and those concerned about environmental impacts opposed to the concept, and people living elsewhere in the valley in favor of the concept
- Need to improve safety near the I-80 & S.R. 36 interchange where there are unsignalized business accesses

Based on the review of public comments from previous studies, a draft set of goals and objectives were developed. These goals and objectives were reviewed with the study team and local government representatives and then virtually shared with the public for their comment via the study website. As a companion to this opportunity, stakeholders could identify geography specific issues or needs on a web-based input tool. This outreach process yielded nearly 500 comments, which were reviewed and incorporated into the study and solutions development process. A full list of the comments can be found in **Appendix B: Initial Public Outreach Comments**. The results of the comments are very similar to those from the previous studies. After minor revisions based on comments received, the goals and objectives were finalized and are shown in **Figure 3**.

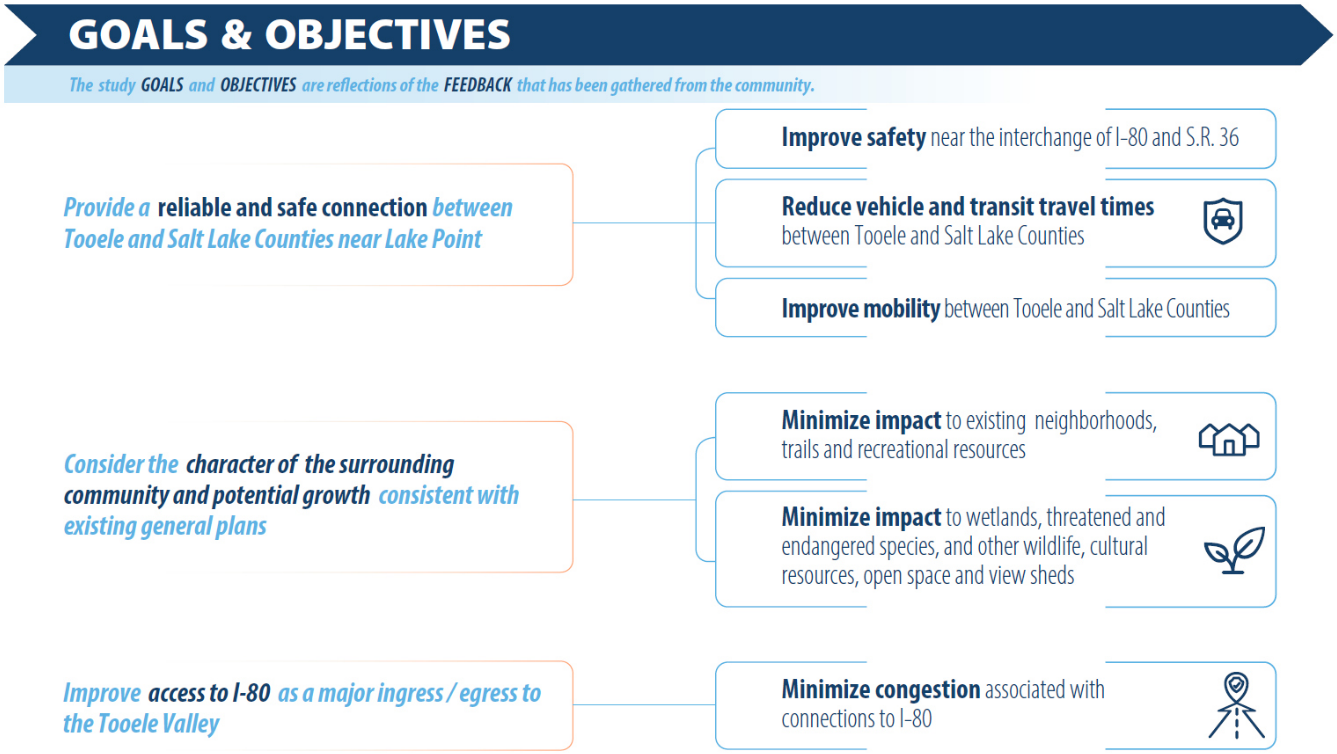


Figure 3: Goals and Objectives

With the goals and objectives in place, screening criteria were then developed to be used in evaluating potential solutions for their ability to accomplish the goals and objectives. At least one evaluation criterion was developed for each objective. **Table 2** shows the evaluation criteria for each goal/objective.

Table 2. Goals, Objectives, and Evaluation Criteria

Goal	Objectives	Evaluation Criteria
Provide a reliable, safe connection between Tooele and Salt Lake Counties near Lake Point	Improve mobility between Tooele and Salt Lake Counties	Person throughput capacity
		I-80 incident delay
	Reduce vehicle and transit travel times between Tooele and Salt Lake Counties	AM & PM peak hour travel times between Mills Junction & S.R. 201
	Improve safety near the interchange of I-80 and S.R. 36	Potential for fewer or less severe crashes
Consider the character of the surrounding community and potential growth consistent with existing general plans	Minimize impact to existing neighborhoods, trails, and recreational resources	Direct property impacts to developed private property
		Impacts to community cohesiveness and gathering spots
		Direct property impacts to recreational resources
	Minimize impact to wetlands, threatened and endangered species and other wildlife, cultural resources, open space and view sheds	Impacts to wetlands
		Impacts to wildlife
		Impacts to cultural resources
		Impacts to designated open space
Improve access to I-80 as a major ingress/ egress to the Tooele Valley	Minimize congestion associated with connections to I-80	Intersection and/or arterial Level of Service on S.R. 36 from S.R. 138 to I-80

As described in subsequent sections, these evaluation criteria were used to evaluate potential solutions to solve the primary transportation needs and issues in the study area.

4 EXISTING AND FUTURE NO BUILD TRAFFIC ANALYSIS

An analysis of traffic operations in the study area was performed to quantify some of the traffic issues that were brought up by the public and to create a model that could be used to analyze the performance of the potential solutions. Once a calibrated existing conditions model was developed, it was used to analyze future conditions with no transportation improvements in the study area. The results of this "no build" traffic analysis were used as a baseline for comparison for the potential solutions. The following sections present the analysis methodology and the results of the existing and future no build traffic analysis results.

4.1 Analysis Methodology

The analyses performed for this study used the Utah Statewide Travel Model (USTM) to develop future traffic volumes, the Vissim traffic modeling software for the traffic operations analysis, and the UDOT-purchased HERE data via the ClearGuide website for travel time data. This section describes how each of these tools were used.

4.1.1 Utah Statewide Travel Model

The Utah Statewide Travel Model (USTM) is a tool used to predict future travel and traffic volumes for rural and semi-rural areas throughout the state, including Tooele Valley. USTM is owned and maintained by UDOT. Version 2b of the model was used for this study.

The travel model has two primary inputs: land use data and transportation system data. The land use data consists of residential and employment data for the entire region. This data is prepared in geographic blocks called Traffic Analysis Zones (TAZs). The travel model inputs are prepared for a base year, which in this case was 2019, and for a future year, which in this case was 2050. A base year of 2019 was used because travel model inputs were available for that year. 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. Minor adjustments were made to the default 2019 and 2050 land use inputs to be consistent with the Tooele Transit Feasibility Study.

The future transportation network includes planned projects from the Utah Unified Transportation Plan, which is prepared by UDOT in coordination with the four Metropolitan Planning Organizations in Utah and contains a list of projects that are planned to meet the state's future transportation needs over a 30-year horizon. Future Tooele Valley projects included in the Unified Plan are:

- S.R. 36 widening to three lanes in each direction between I-80 and 1000 North
- S.R. 138 widening to two lanes in each direction between Midvalley Highway and Grantsville
- I-80 widening to three lanes in the eastbound direction from S.R. 36 to S.R. 201
- I-80 widening to three lanes in each direction between Midvalley Highway and S.R. 36

Using the land use and transportation system inputs, the travel model predicts how many trips will be generated in the region, where those trips are going, and the transportation facilities that will be used to get there. To prepare the model for use, several TAZs were split in the study area to improve the resolution of the model in the area and to more accurately reflect local travel patterns.

4.1.2 Vissim Traffic Analysis Software

The Vissim software was selected for this study because it is the state-of-the-art traffic microsimulation tool preferred by UDOT that allows for the evaluation of complex scenarios and customization of driver behavior. The existing conditions model that forms the basis of all the traffic operations analyses was built by entering the physical characteristics of the roadway system into the model, including number of lanes, turn lane configurations, and distances between intersections. Traffic control configurations were also entered into the model, including existing traffic signal timing data obtained from the UDOT Traffic Operations Center.

For each Vissim scenario (e.g., existing conditions, 2050 no build conditions), the simulation model was run ten times and the results averaged. This is necessary because as a simulation model each run is different. Performing a number of runs and averaging the results gives statistically valid outputs.

Five key measures of effectiveness were extracted from the Vissim models to analyze traffic performance within the study area. The first was intersection and turning movement delay, which was used to determine level of service (LOS), as described in the *Highway Capacity Manual*, which set the industry standard for traffic operations analysis. LOS describes the operating performance of an intersection or roadway. LOS is measured quantitatively and is reported on a scale from A to F, with A representing the best performance and F the worst. For signalized intersections, an overall LOS is reported for the entire intersection based on the average delay of all vehicles, whereas for unsignalized intersections LOS is based on the average delay for the approach with the highest delay. **Table 3** provides a brief explanation for each LOS and the associated average delay per vehicle for signalized and unsignalized intersections.

Table 3. Intersection Level of Service Criteria

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

Source: Highway Capacity Manual 2016, *Transportation Research Board, Washington D.C*

Two measures of effectiveness were used for the freeway analysis, speed and vehicle density. Density is measured in passenger cars per mile per lane and is used to determine freeway LOS for different segment types as shown in **Table 4**. Because density is difficult for people to relate to their own driving experience, speed was also reported to provide some more context regarding freeway performance.

Table 4. Freeway Level of Service Criteria

Level of Service	Traffic Conditions	Density (passenger cars/mile/lane)	
		Basic Freeway Segment	Merge/Diverge Freeway Segment
A	Free Flow Operations	0 ≤ 11.0	0 ≤ 10.0
B	Reasonable Free Flow Operations	> 11.0 and ≤ 18.0	> 10.0 and ≤ 20.0
C	Flow Speeds Near Free Flow Speeds	> 18.0 and ≤ 26.0	> 20.0 and ≤ 28.0
D	Flow Speeds Begin to Decline	> 26.0 and ≤ 35.0	> 28.0 and ≤ 35.0
E	Operation at Capacity	> 35.0 and ≤ 45.0	> 35.0 and ≤ 43.0
F	Unstable Flow	> 45.0	> 43.0

Source: Highway Capacity Manual 2016, *Transportation Research Board, Washington D.C*

There are three freeway segment types that were used for this study: basic, merge and diverge. Basic segments are over 1,500 feet from an interchange ramp and are not affected by vehicles entering and exiting the freeway. Merge and diverge segments are within 1,500 feet of freeway ramps and are affected by entering and exiting traffic, respectively.

The fourth key measure of effectiveness is vehicle travel time and speed. Vissim allows users to specify travel time segments anywhere within the model area. By aggregating various segments, travel times and speeds were obtained between various origins and destinations. Vehicle speeds are used to determine arterial roadway level of service by comparing the travel speed to the free-flow speed using the criteria described in **Table 5**.

Table 5. Arterial Level of Service Criteria

Level of Service	Traffic Conditions	Free-Flow Speed (mph)	
		60	55
A	Free-Flow Operation	>48	>44
B	Reasonably Unimpeded Operation	>40	>37
C	Stable Operation	>30	>28
D	Less Stable Condition	>24	>22
E	Unstable Operation and Significant Delay	>18	>17
F	Flow at Extremely Low Speed	≤18	≤17

Note: Any arterial segment with a volume-to-capacity ratio greater than 1.0 at the downstream intersection is LOS F.

The fifth key measure of effectiveness is the 95th percentile queue length for each intersection turning movement at each study intersection. The length of the 95th percentile queue is identified as the queue distance that will only be exceeded five percent of the time during the analysis period. The 95th percentile queue lengths are determined by measuring the maximum queue length every 90 seconds during each simulation model run. This results in 40 data points for each hour that is simulated (3,600 seconds / 90 seconds = 40). So, ten one-hour model runs results in 400 data points. A statistical analysis is then performed on all the queue length data points to calculate the 95th percentile queue length. This is a valuable measure of effectiveness that helps to identify issues such as queuing between intersections and queues that exceed their turning movement storage.

4.1.3 HERE Travel Time Data

UDOT's HERE data travel time data was used for calibrating the existing conditions Vissim model and for analyzing travel times and delays from Salt Lake City to Tooele City. The data comes from anonymized GPS data from a sample of vehicles in the overall traffic stream. For the Vissim modeling, it was used to make sure that the model replicated normal conditions. For travel between the counties, it was used to identify incidents and to quantify their effect on travel time. The HERE data can be obtained in five-minute bins and provides values for free-flow speed, average travel time, average delay, and average travel speed.

For the Vissim modeling, travel time segments were created from S.R. 36 & 1000 North to the I-80 & S.R. 201 interchange and HERE data was collected for March 20, 2020, which is the day when traffic counts were performed, and traffic conditions observed. For travel from Salt Lake City to Tooele City, HERE data was collected for every weekday in 2019.

4.2 Existing Conditions Analysis

This section describes the traffic analysis of 2020 existing AM and PM peak hour conditions.

4.2.1 Traffic Volumes

Freeway mainline and intersection turning movement counts were collected on Tuesday, March 10, 2020 for the AM (6:30-8:30) and PM (4:30-6:30) peak periods on mainline I-80, at 15 intersections, and 9 driveways, as shown in **Figure 4**. These counts were performed immediately before the Covid-19 pandemic, so it was not necessary to make volume adjustments to account for changes in traffic patterns due to the pandemic.

The collected turning movement traffic volumes were balanced throughout the study area so that the volume exiting one intersection was the same as the volume arriving at the next intersection to create existing AM and PM peak hour volumes. Figures showing the existing peak hour traffic volumes can be found in **Appendix C: Existing Peak Hour Traffic Volumes**.

The existing freeway volumes show nearly 3,200 eastbound vehicles on the I-80 segment between S.R. 36 and S.R. 201 in the AM peak hour and just over 3,500 vehicles westbound vehicles on that same segment in the PM peak hour. There is a very heavy directional split on that segment during the peak hours with 80% of the I-80 traffic heading eastbound during the AM peak hour and 70% traveling westbound during the PM peak hour. During those peak hours in the peak direction on that segment, over 85% of the I-80 traffic uses the S.R. 36 interchange, while approximately 30% uses the S.R. 201 interchange. In the AM peak hour, over 2,700 vehicles enter eastbound I-80 at S.R. 36 and in the PM peak hour over 3,000 vehicles exit westbound I-80 at S.R. 36.

Table 6 shows the total AM and PM peak hour intersection volumes for the signalized S.R. 36 study intersections. On average, the PM intersection volumes are 18% higher than the AM volumes. The highest intersection volumes are at Saddleback Boulevard with its proximity to I-80 and S.R. 138 with high demand on three of the four approaches. North of S.R. 138, all the intersections have high north-south volumes and relatively low side street traffic. With Grantsville being a major generator in the region, south of S.R. 138, the volumes drop by almost 1,000 vehicles in both the AM and PM peak hours and then begin increasing moving south.

Figure 4: Traffic Count Locations

Table 6. 2020 Peak Hour Intersection Volumes

Study Intersection	Existing 2020	
	AM Peak Hour	PM Peak Hour
Saddleback Blvd & S.R. 36	3,658	4,244
Sunset Rd & S.R. 36	3,344	3,903
Canyon Rd & S.R. 36	3,346	3,880
S.R. 138 & S.R. 36	3,495	4,229
Stansbury Pkwy & S.R. 36	2,851	3,484
Village Blvd & S.R. 36	2,912	3,532

4.2.2 Model Calibration

Calibration of the existing conditions Vissim model focused on having the model accurately replicate observed queues and vehicle behaviors and matching the HERE travel time data. Field observations of traffic operations were performed the same day and at the same time as the traffic counts. It involved driving up and down the corridor multiple times to collect information on queue lengths, overall driving behavior, and lane utilization issues. Based on these observations, the following changes were made to the Vissim default parameters:

- The additive and multiplicative part of safety distances were changed along with the minimum and maximum lane change distances on southbound S.R. 36 from Saddleback Blvd to S.R. 138. This was done to replicate the rolling queue observed during PM peak hour.
- Lane change distance values for the southbound lane drop on S.R. 36 south of Sunset Lane was adjusted so that the model matched the lane utilization observed during PM peak hour for the rightmost lane at Saddleback Boulevard where only 16% of the southbound traffic was using the third lane during the PM peak hour.

4.2.3 Analysis Results

The 2020 existing freeway performance for I-80 is presented in **Table 7** for the AM and PM peak hours. The table shows that I-80 performs well with no segment operating worse than LOS C. All of the freeway segments have speeds of 70 mph or greater except for the EB merge of the S.R. 36 on-ramp in the AM peak hour, which operates at 63 mph. Detailed Vissim analysis results can be found in **Appendix D: Detailed Existing Vissim Results**.

Table 7. Existing 2020 Freeway Level of Service

	Freeway Segment	Segment Type	LOS / Density (vehicles/mile/lane)	
			AM Peak Hour	PM Peak Hour
Westbound	I-80 east of S.R. 201	Basic	A / 3	B / 15
	I-80 from S.R. 201 to S.R. 36	Merge	A / 4	B / 13
		Basic	A / 5	C / 23
		Diverge	A / 5	C / 20
	I-80 between S.R. 36 ramps	Basic	A / 1	A / 3
	I-80 west of S.R. 36	Merge	A / 1	A / 1
		Basic	A / 1	A / 3
Eastbound	I-80 west of S.R. 36	Basic	A / 3	A / 2
	I-80 from S.R. 36 to S.R. 201	Merge	B / 15	A / 5
		Basic	C / 21	A / 8
		Diverge	B / 12	A / 6
	I-80 east of S.R. 201	Basic	B / 14	A / 4

Existing delay and LOS results for key study intersections are shown in **Table 8**. During the AM peak hour all intersections along S.R. 36 perform at LOS D or better. The eastbound queue at the intersection of S.R. 138 & S.R. 36 backs up through Beaman Way and causes high delays on the side streets. The PM peak hour has higher volumes and higher delays than the AM peak hour. The S.R. 36 & S.R. 138 intersection is shown as failing with about 150 seconds of delay per vehicle. This is largely due to high delays and long queues on the southbound approach.

Table 8. Existing 2020 Intersection Delay and Level of Service

Intersection	Existing AM		Existing PM	
	LOS / Delay (sec/veh)	% of Vehicles Served	LOS / Delay (sec/veh)	% of Vehicles Served
Saddleback Blvd & S.R. 36	A / 7	98%	B / 15	98%
Sunset Rd & S.R. 36	-	-	E / 50 (WB[1])	98%
Canyon Rd & S.R. 36	A / 6 (WB[1])	93%	A / 5 (WB[1])	93%
S.R. 138 & S.R. 36	D / 43	98%	**F / 151**	91%
Stansbury Pkwy & S.R. 36	A / 10	99%	B / 11	91%
Village Blvd & S.R. 36	B / 12	99%	A / 8	92%

[1] For unsignalized intersections the approach with the highest delay is presented.

The table also shows the percentage of vehicles that were served in the Vissim models. This is an important measure of effectiveness for understanding how well the roadway network can handle the traffic demand.

Values less than 100% are indicative of congested intersections where demand exceeds capacity. The table shows that the percent served for the PM peak hour model at S.R. 138 is 91% and that the intersections south of there have similar values. This occurs because the southbound percent served is 86% at S.R. 138 which brings down the overall percent served for that intersection and the intersections south of it. This is indicative of a location where the demand exceeds the available capacity, in this case on the southbound approach by approximately 15%. Detailed Vissim results are presented in **Appendix D: Detailed Existing Vissim Results**.

Travel times for vehicles traveling on I-80 and S.R. 36 through the heart of the study area are shown in **Table 9**. Northbound/eastbound is the peak direction of travel during the AM peak hour and has a travel time of 6.2 minutes per vehicle. In the PM peak hour, westbound/southbound is the peak direction with a travel time of 10.9 minutes per vehicle, which is more than five minutes longer than during the AM peak hour. This delay is almost entirely due to the S.R. 36 & S.R. 138 intersection where there are about 2,800 vehicles approaching the intersection which exceeds the capacity of a two-lane arterial road resulting in an arterial LOS of F for southbound S.R. 36 and an average travel speed of 19 mph. Detailed travel time and arterial LOS results can be found in **Appendix D: Detailed Existing Conditions Vissim Results**.

Table 9. Existing Vehicle Travel Times

Direction	Travel Time Segment	Distance (mi.)	AM Peak Hour		PM Peak Hour	
			Time (min.)	Speed (mph)	Time (min.)	Speed (mph)
Westbound/ Southbound	I-80 (S.R. 201 to S.R. 36)	3.2	2.9	66	3.2	60
	S.R. 36 (I-80 to S.R. 138)	2.5	2.8	54	7.7	19
Total		**5.7**	**5.7**	**60**	**10.9**	**31**
Northbound/ Eastbound	S.R. 36 (S.R. 138 to I-80)	2.5	2.8	54	2.7	56
	I-80 (S.R. 36 to S.R. 201)	3.2	3.4	56	2.8	69
Total		**5.7**	**6.2**	**55**	**5.5**	**62**

The 95th percentile queue lengths show limited queuing over 1,000 feet in the AM peak hour with the eastbound and northbound approaches at the S.R. 36 & S.R. 138 intersection having 95th percentile queue lengths of 2,050 and 1,100 feet, respectively. This can be attributed to the high demand of vehicles heading to the freeway. The PM peak hour has a substantial 95th percentile queue length of 13,000 feet (approximately 2.5 miles) on southbound S.R. 36 at S.R. 138, which was also reflected in the travel times and delays for that segment. The analysis also shows a southbound 95th percentile queue of 1,425 feet at the Saddleback Blvd intersection in the PM peak hour. With such high volumes, queues build rapidly when the light turns red; however, with three through lanes, the queues are able to clear once the light turns green. Detailed queue results can be found in **Appendix D: Detailed Existing Conditions Vissim Results**.

4.2.4 2022 Conditions with Midvalley Highway Traffic Analysis Results

An analysis of 2022 conditions with Midvalley Highway was performed to estimate the benefits associated with the new roadway. The opening of Midvalley Highway is projected to reduce the peak hour volumes at the S.R. 138 & S.R. 36 intersection by 10-15%. Based on that analysis, the PM delay at the S.R. 138 & S.R. 36 intersection is estimated to decrease by over 100 seconds per vehicle, from 151 seconds down to 49 with 99% of vehicles served. Similarly, the westbound/southbound travel time from S.R. 201 to Bates Canyon Road is projected to decrease by four minutes, from 13.2 to 9.2. The southbound 95th percentile queue is estimated to drop from 13,000 feet to less than 5,000 feet.

4.2.5 Incident Analysis

The HERE travel times were used to obtain travel times between Salt Lake City and Tooele City, particularly in the PM peak period when many Tooele Valley citizens are returning home after work in the greater Salt Lake area. Data was collected for years 2017-2020. The data was analyzed for the peak direction for the AM and PM peak periods. Average delays were calculated for every 15-minute interval. The maximum delay for each weekday period was determined and tabulated. The year with the highest average delay and the most extreme delay days, defined as greater than 60 minutes of delay, was 2019. **Figure 5** shows the day-by-day maximum PM travel times from Salt Lake City to Tooele City for 2019. It shows six days with over 120 minutes of delay per vehicle, which accounted for 25% of the total delay that year. Note that in 2018 there were only two days with delays great than 90 minutes and zero in 2020.

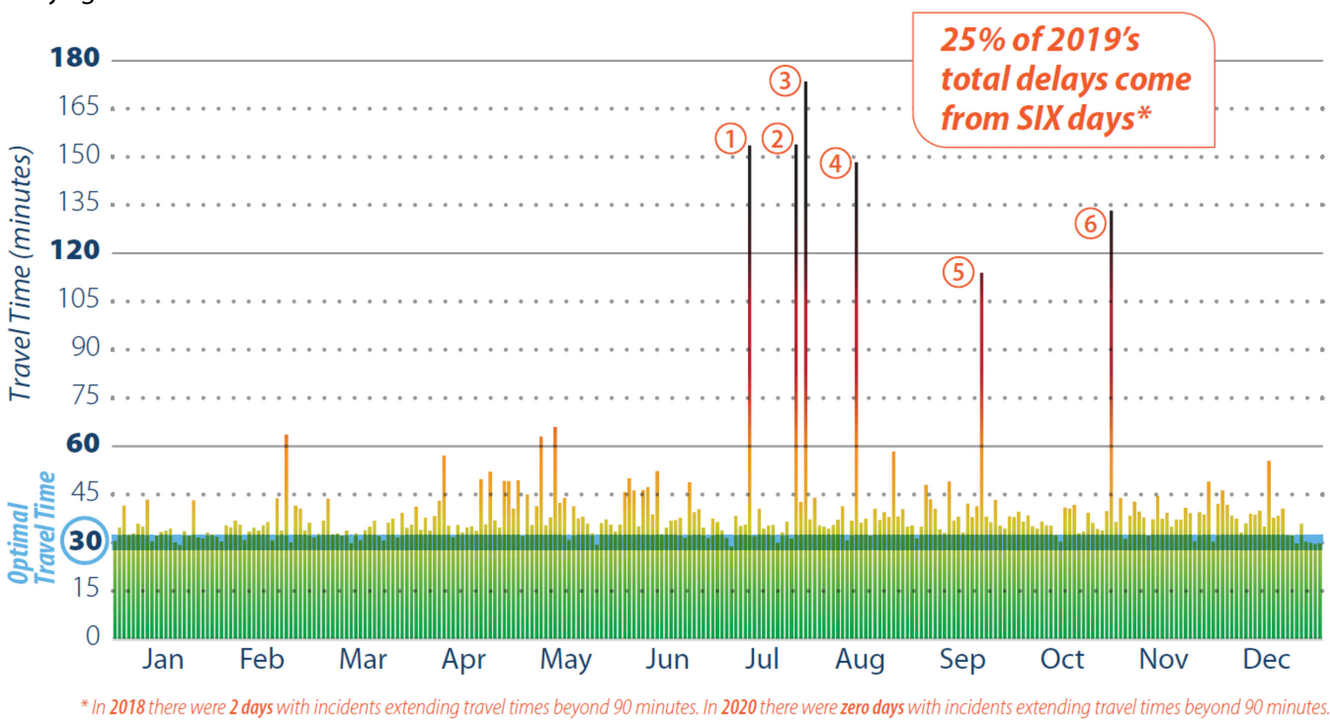


Figure 5: Maximum 2019 PM Travel Times – Salt Lake City to Tooele City

4.3 2050 No Build Conditions Analysis

This section describes the traffic analysis of 2050 No Build AM and PM peak hour conditions. The analysis generally assumed that currently funded projects within the study area would be built, along with projects outside of the study area that are included on the Utah Unified Transportation Plan. The exception was S.R. 36 widening north of S.R. 138 which wasn't included because it was part of the potential solutions to be evaluated. It was originally thought that some potential solutions would not require widening of S.R. 36, but initial traffic analyses showed that S.R. 36 widening would still be required with all potential solutions. Key projects and assumptions regarding the 2050 No Build transportation system are as follows and shown in **Figure 6**:

- I-80 auxiliary lanes in both directions between S.R. 36 and S.R. 201
- S.R. 36 widening to three lanes in each direction from Village Boulevard to 1000 North (S.R. 112)
- Midvalley Highway (S.R. 179) with a new I-80 interchange and one lane in each direction between I-80 and S.R. 138
- Reconstruction of the east leg of the S.R. 138 intersection to have exclusive left, through, and right lanes
- Signalization of the S.R. 36 and Canyon Road intersection

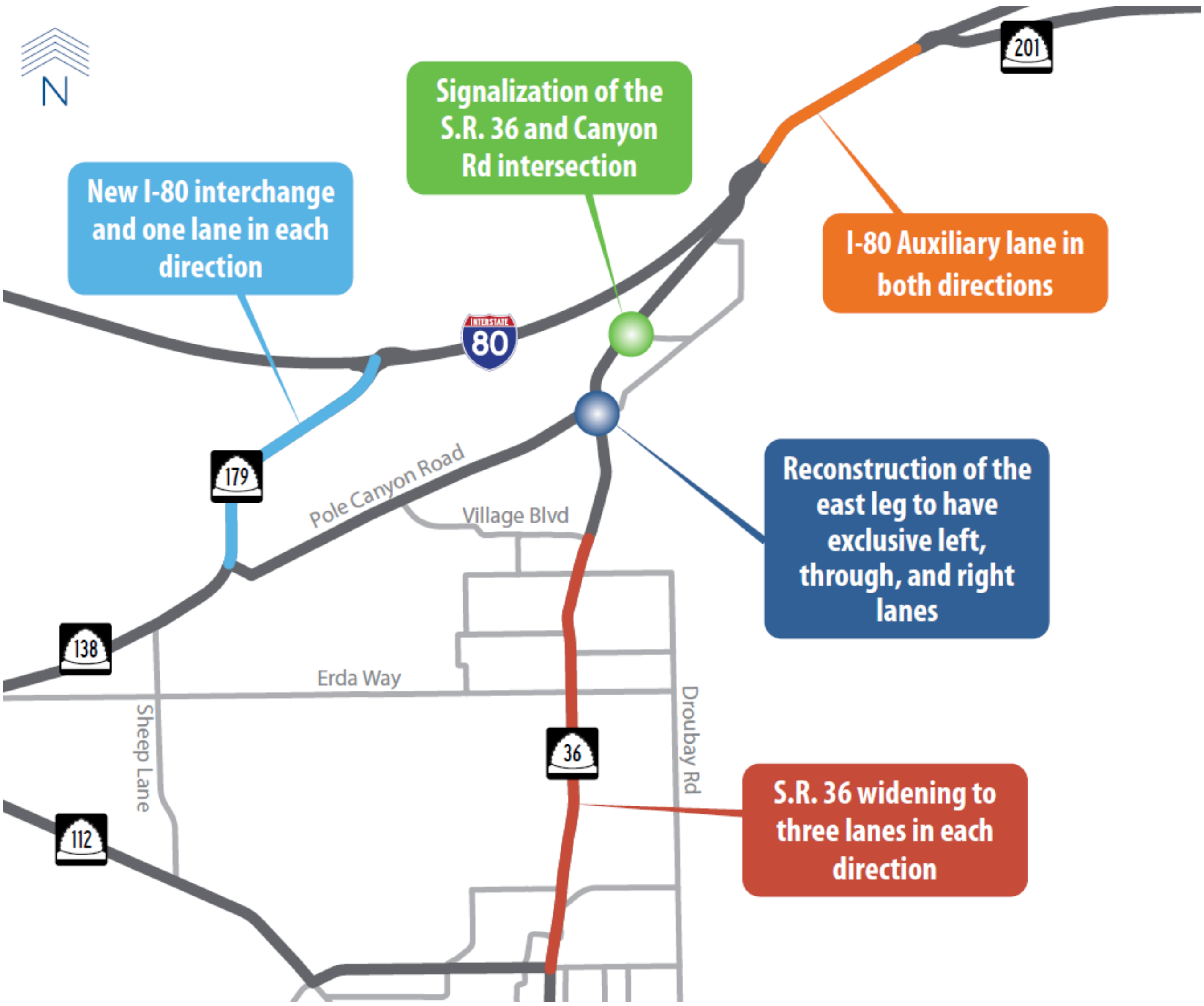


Figure 6: Assumed 2050 No Build Transportation System Improvements

4.3.1 Traffic Volumes

The future AM and PM peak hour volumes were developed using principles described in the National Highway Cooperative Research Program (NCHRP) Report 255 document. The process uses the existing peak hour traffic volumes obtained from the traffic and data from USTM. The travel model was run for the base year (2019) and for the future year (2050). The difference between the base year and future year model volumes was used to estimate the traffic growth for each intersection leg, which was then applied to the existing intersection leg volumes, both entering and exiting. The future individual movement volumes were then balanced to ensure the correct number of inbound and outbound vehicles on each leg of the intersection. Figures showing the 2050 No Build traffic volumes can be found in **Appendix E: 2050 No Build Traffic Volumes**.

The 2050 No Build freeway volumes on I-80 between S.R. 36 and S.R. 201 are expected to increase by about 65% compared to the existing volumes resulting in nearly 5,400 eastbound vehicles in the AM peak hour and over 5,700 westbound vehicles in the in the PM peak hour. **Table 10** shows the peak hour volumes in the peak direction of travel for I-80 and the east interchange ramps at S.R 36 and the S.R. 201 ramps. Aside from the growth on the highest volume segment, it also shows substantial growth in I-80 volumes west of the S.R. 36 interchange, which is due to traffic using Midvalley Highway.

Table 10. Existing and 2050 No Build Freeway Peak Hour Volumes (Peak Direction Only)

Location	Westbound (PM Peak Hour)			Eastbound (AM Peak Hour)		
	Existing	2050 No Build	Difference	Existing	2050 No Build	Difference
I-80 (west of S.R. 36 ramps)	479	2,110	1,630 / 341%	427	1,890	1,460 / 343%
S.R. 36 Ramps	*3,023*	*3,620*	*600 / 20%*	*2,736*	*3,370*	*630 / 23%*
I-80 (between S.R. 36 and S.R. 201)	3,502	5,730	2,230 / 64%	3,163	5,260	2,100 / 66%
S.R. 201 Ramps	*1,085*	*1,620*	*540 / 49%*	*896*	*1,270*	*370 / 42%*
I-80 (east of S.R. 201 ramps)	2,417	4,110	1,690 / 70%	2,267	3,990	1,720 / 76%

Weekday peak hour traffic along S.R. 36 is projected to increase by an average of about 35% under 2050 No Build conditions. **Table 11** shows a comparison of both the existing and 2050 No Build peak hour intersection volume and percent changes from 2020 to 2050. The intersections south of S.R. 138 see the highest growth rates at about 40%. This is due to the presence of Midvalley Highway pulling traffic from the north side of S.R. 138.

Table 11. Existing and 2050 No Build Peak Hour Volumes

Study Intersection	AM Peak Hour			PM Peak Hour		
	Existing 2020	2050 No Build	% Change	Existing 2020	2050 No Build	% Change
Saddleback Blvd & S.R. 36	3,658	4,570	25%	4,244	5,380	27%
Sunset Rd & S.R. 36	3,344	4,250	27%	3,903	5,020	29%
Canyon Rd & S.R. 36	3,346	4,280	28%	3,880	5,150	33%
S.R. 138 & S.R. 36	3,495	4,680	34%	4,229	5,930	40%
Stansbury Pkwy & S.R. 36	2,851	3,970	39%	3,484	4,910	41%
Village Blvd & S.R. 36	2,912	4,050	39%	3,532	4,980	41%

4.3.2 Analysis Results

The freeway analysis shows that freeway performance is expected to deteriorate substantially with segments operating at LOS F in the westbound direction of the 2050 PM peak hour, as shown in **Table 12**. This primarily due to queues backing onto the freeway from the S.R. 36 interchange.

Table 12. 2050 No Build Freeway Level of Service

	Freeway Segment	Segment Type	LOS / Density (vehicles/mile/lane) AM Peak Hour	LOS / Density (vehicles/mile/lane) PM Peak Hour
Westbound	I-80 east of S.R. 201	Basic	A / 4	**F / 58**
	I-80 from S.R. 201 to S.R. 36	Merge	A / 6	**F / 64**
		Basic	A / 6	**F / 76**
		Diverge	A / 7	**F / 83**
	I-80 between S.R. 36 ramps	Basic	A / 3	B / 12
	I-80 west of S.R. 36	Merge	A / 2	A / 6
		Basic	A / 4	B / 12
Eastbound	I-80 west of S.R. 36	Basic	B / 12	A / 7
	I-80 from S.R. 36 to S.R. 201	Merge	B / 15	A / 6
		Basic	C / 23	A / 10
		Diverge	C / 23	B / 11
	I-80 east of S.R. 201	Basic	C / 26	A / 8

A summary of the 2050 No Build intersection analysis results are shown in **Table 13**. The S.R. 36 & S.R. 138 intersection is to operate at LOS F during the AM and PM peak hours with high delays, long queues, and low percent served values indicating a system that is over capacity. This bottleneck results in queues spilling back from the intersection and causing upstream intersections to also fail. In fact, during the PM peak the queues are projected to extend all the way to I-80 causing it to fail as well. Meanwhile, the downstream intersections show artificially good results because the full vehicle demand is unable to make it to them. Detailed Vissim results can be found in **Appendix F: Detailed 2050 No Build Vissim Results.**

Table 13. 2050 No Build Intersection Delay and Level of Service Results

Intersection	AM Peak Hour		PM Peak Hour	
	LOS / Delay (sec/veh)	% of Vehicles Served	LOS / Delay (sec/veh)	% of Vehicles Served
Saddleback Blvd & S.R. 36	B / 12	89%	**F / 96**	77%
Canyon Rd & S.R. 36	B / 11	88%	**F / >180**	74%
S.R. 138 & S.R. 36	**F / 106**	87%	**F / >180**	75%
Stansbury Pkwy & S.R. 36	**F / >180**	87%	B / 13	78%
Village Blvd & S.R. 36	**F / 82**	89%	A / 7	80%

The 2050 No Build travel times between S.R. 201 and S.R. 138 are shown **Table 14**. The travel times in the peak directions are substantially longer than those from the existing conditions with over 23 minutes of travel time in the westbound/southbound direction. The majority of the delay is on S.R. 36, which was assumed to only have two travel lanes in each direction in this area. Most of the I-80 delay is also due to the S.R. 36 congestion backing on to the freeway.

Table 14. 2050 No Build Vehicle Travel Times

Direction	Travel Time Segment	Distance (mi.)	AM Peak Hour		PM Peak Hour	
			Time (min.)	Speed (mph)	Time (min.)	Speed (mph)
Westbound/ Southbound	I-80 (S.R. 201 to S.R. 36)	3.2	3.0	65	9.2	21
	S.R. 36 (I-80 to S.R. 138)	2.5	3.1	48	14.0	11
Total		**5.7**	**6.1**	**56**	**23.2**	**15**
Northbound/ Eastbound	I-80 (S.R. 36 to S.R. 201)	3.2	3.1	61	2.8	68
	S.R. 36 (S.R. 138 to I-80)	2.5	3.1	48	2.9	52
Total		**5.7**	**6.2**	**55**	**5.7**	**60**

The 95th percentile queue lengths analysis shows quite a bit of difference between existing and 2050 No Build conditions. **Table 15** compares the two values for intersection approaches where either the existing or 2050 No Build 95th percentile queue length is greater than 1,000 feet. For the AM peak hour, there are large increases in northbound queues, particularly on the south side of S.R. 138, which acts as a bottleneck to northbound flow. For the PM peak hour, the southbound queue basically extends from S.R. 138 all the way to I-80. The only reason that the existing southbound queue at S.R. 138 is longer than the 2050 No Build queue is because the future signal at Canyon Road breaks up the queue. Similarly, the Canyon Road queue is broken up by the Saddleback Boulevard traffic signal.

Table 15. 2020 Existing and 2050 No Build 95th Percentile Queue Lengths

Time Period	S.R. 36 Intersection	Approach	Existing 2020 (ft)	2050 No Build (ft)
AM	Saddleback Boulevard	NB	600	1,775
	Canyon Road	NB	0	1,400
	S.R. 138	NB	1,100	2,400
		SB	175	1,100
		EB	2,050	2,050
	Stansbury Parkway	NB	175	6,275
	Village Boulevard	NB	175	2,525
PM	Saddleback Boulevard	SB	1,425	13,075
	Canyon Road	SB	1,425	7,700
	S.R. 138	NB	225	2,350
		SB	13,000	5,925

4.3.3 Incident Analysis

A common concern expressed by the public was the need for an alternative route for vehicles to travel between Tooele and Salt Lake Counties. As mentioned earlier, in 2019 there were six separate incidents on I-80 that resulted in delays of over 90 minutes per vehicle. These types of occurrences are used as examples for why an alternative route is needed. The study team chose to incorporate an incident analysis into the evaluation of potential solutions.

To perform the analysis, a hypothetical lane closure incident was modeled in Vissim. The incident models were developed to replicate the closure of two lanes in the westbound direction due to an incident during the PM peak period approximately 3,000 feet upstream of the S.R. 36 interchange. Several adjustments were made to the Vissim models to mimic incident conditions:

- Partial routing was introduced near the S.R. 201 on-ramp to shift all traffic to a single lane for a 60-minute period and then return to two lane operations once the incident was cleared.
- Lane change lengths were adjusted at the incident location to encourage drivers to merge near the lane drop.
- Reduced speed areas were placed on the adjacent lanes to account for the “rubber necking” effect of traffic slowing down to see what has happened. Rubber necking continued for some time after the lane closure was cleared to represent time when the vehicles would be moved to the side of the road. Some potential solutions were not as heavily impacted by rubber necking because they have separated facilities
- Dynamic traffic assignment was used so that drivers could choose to change travel routes based on traffic conditions. S.R. 202 was added to the model to provide a connection between I-80 and S.R. 201 to facilitate the changing of routes.

The incident was assumed to start prior to the PM peak period and the models were run for a five-hour period to allow sufficient time for queues to build and then dissipate. Traffic volume data were used to develop a five-hour volume profile with volume peaking at about 5:45 and then decreasing rapidly to be approximately half of the maximum by 6:15. Average vehicle travel times were collected for each 15-minute interval and the maximum value was used to compare potential solutions.

Figure 7 shows the average travel time for a hypothetical incident on westbound I-80 occurring shortly before the PM peak hour and resulting in a 60-minute closure of two of the three lanes followed by 30 minutes of residual slowing. It shows that the maximum average travel time is just less than 80 minutes per vehicle and that it would take nearly three hours after the end of the lane closure for traffic to return to normal operations. This same analysis was performed for the potential solutions to determine how they would perform under the same type of incident.

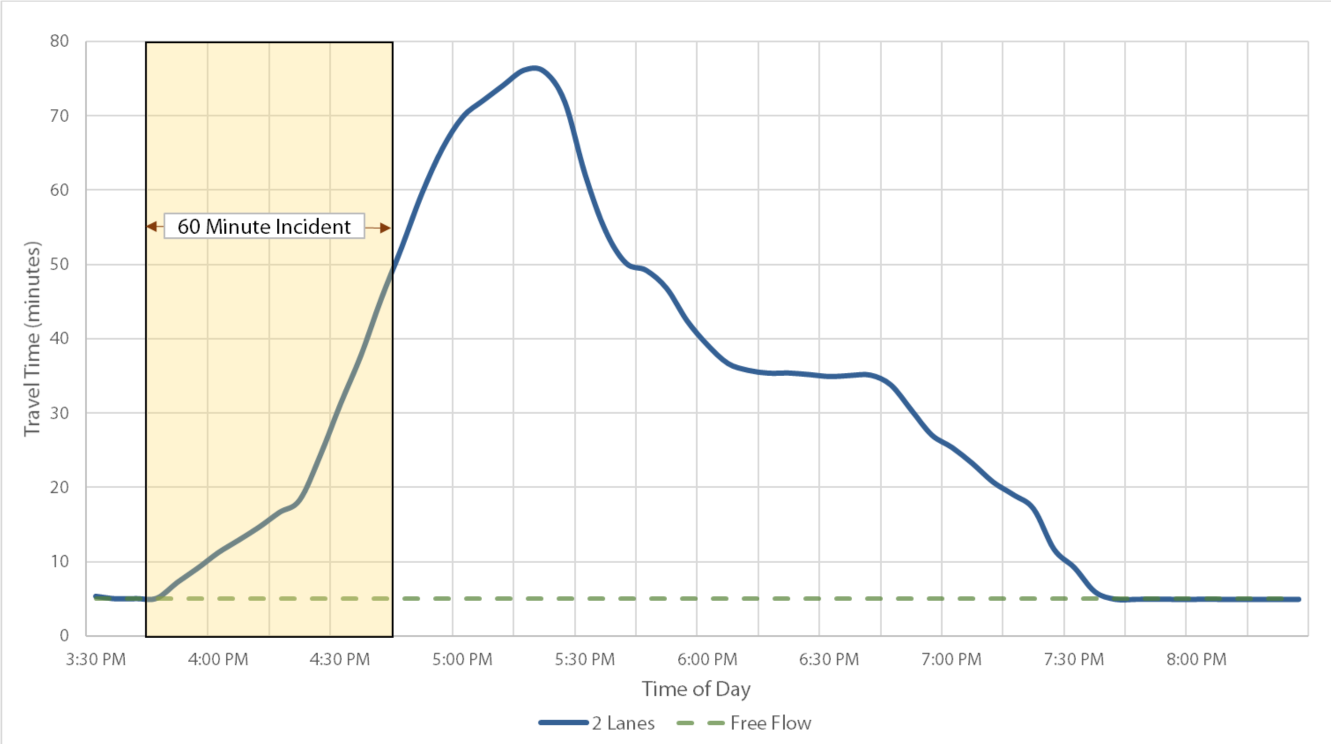


Figure 7: Incident Analysis Travel Times for a 60-minute Westbound Closure of Two Lanes

5 POTENTIAL SOLUTIONS EVALUATION

This section discusses the development of the range of potential solutions to be evaluated, the evaluation process, and the results of the evaluation.

5.1 Potential Solutions Development

Several virtual brainstorming sessions were held with the study team and government stakeholders to ensure that a wide range of potential solutions would be considered for their ability to meet the goals and objectives. The three transportation mobility objectives were:

1. **Improve mobility between Tooele and Salt Lake Counties** – I-80 corridor between counties
2. **Minimize congestion associated with connections to I-80** – S.R. 36 corridor between S.R. 138 and I-80
3. **Improve safety near the interchange of I-80 & S.R. 36** – Hardy Rd/Clinton Landing Rd & S.R. 36 area

A geographic area was specified for each of the mobility objectives and potential solutions were developed in each area to meet the objective associated with that area.

The three locations were initially considered independently, although there was a realization that potential solutions developed for areas one and two would need to be compatible with each other to create viable solutions. Ultimately, each area was screened independently and the resulting potential solutions for one area were combined with compatible solutions from the other area to create the complete solutions that were presented to the public.

The result of the brainstorming meetings was a list of potential solutions for each geographic area. **Figure 8** shows the potential solutions for areas 1 and 2, which are both mobility focused. It's difficult to briefly describe the concepts, so **Appendix G: Brainstorming Concepts** contains sketches of each of the potential solutions. The list of specific concepts is as follows:

Area 1 – I-80 between S.R. 36 and S.R. 201

- Additional Lanes on I-80
- Barrier Separated Lanes on I-80
- Reversible Lanes on I-80
- S.R. 201 Bypass
- S.R. 201 Extension between I-80 & Southeast Railroad Tracks
- S.R. 201 Extension between I-80 & Southeast Railroad Tracks with Reversible Lanes
- S.R. 201 Extension between I-80 & Northwest Railroad Tracks
- Elevated S.R. 201 Extension over I-80 (double decker freeway)
- S.R. 201 Extension East of Southeast Railroad Tracks

Area 2 – S.R. 36 between S.R. 138 and I-80

- Direct S.R. 36 Connection
- S.R. 201 Couplet with One-Way S.R. 36 Connection
- S.R. 36 Connection with One-Way Split
- S.R. 36 Connection with Two-Way Westerly Connection
- S.R. 36 Connection with Two-Way Easterly Connection
- New I-80 Interchange with Direct S.R. 201 to S.R. 36 Connection
- New I-80 Interchange w/ S.R. 201 Couplet
- I-80 Collector-Distributor System with Direct S.R. 201 to S.R. 36 Connection
- I-80 Frontage Road System
- Widen S.R. 36

Area 3 - Hardy Rd/Clinton Landing Rd & S.R. 36 Area Safety Improvements

- Mountain View Road Connection & Raised Median through Hardy Road Intersection
- Limited Median with U-Turn and Mountain View Road Connection
- Continuous Flow Intersection (CFI)
- Move I-80 West Ramps to New Location (eliminates existing I-80 loop on-ramp)
- New Hardy Road Westbound On-Ramp and Traffic Signal at Hardy Road (eliminates existing I-80 loop on-ramp)
- Signalize Hardy Road Intersection and Extend Southbound Left Turn Pocket

After development of the potential solutions to be evaluated, the study team felt that the safety improvements associated with Area 3 didn't really fit with the regional nature of the study. It was decided that UDOT would evaluate safety improvements separately and coordinate with Tooele County on potential solutions in that area. Therefore, this study focused on the evaluation of the potential solutions in areas 1 and 2 to meet the transportation mobility objectives.

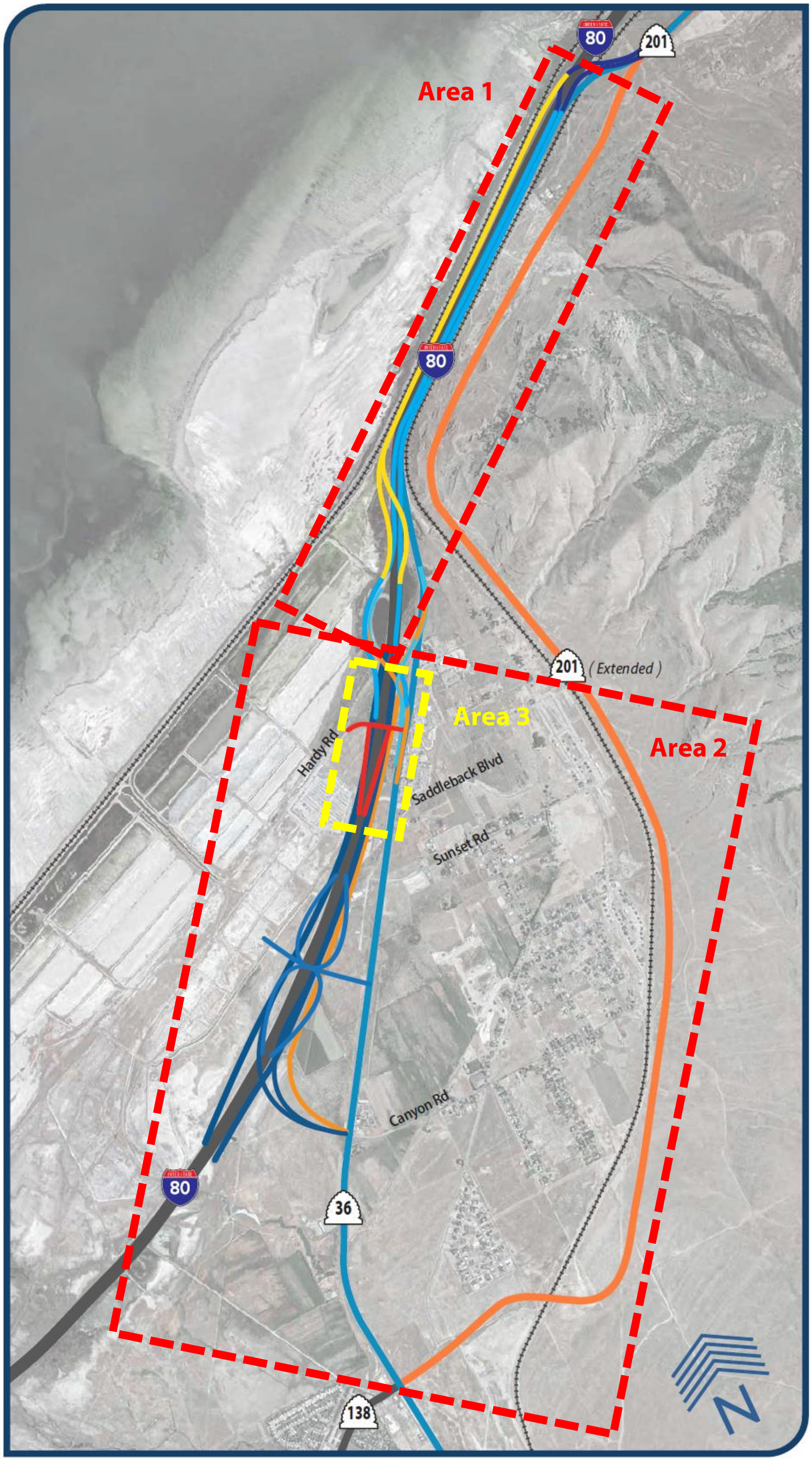


Figure 8: Mobility Focused Potential Solutions

5.2 Evaluation Criteria

During the development of the goals and objectives, a number of potential evaluation criteria were identified. However, during the course of the study, it was determined that a few of those evaluation criteria would not be used, largely due to the lack of differentiating results or a lack of high-quality data on which to compare potential solutions. For example, person throughput capacity between Tooele and Salt Lake Counties was found to be nearly the same for all potential solutions, so it was not used for the screening analysis. The final evaluation criteria were:

Goal 1: Provide a Reliable, Safe Connection between Tooele and Salt Lake Counties

- **I-80 Incident Delay** – Obtained via Vissim modeling analysis
- **PM Peak Hour Travel Times** – Measured travel time in Vissim models from S.R. 201 interchange to S.R. 138 intersection

Goal 2: Consider Community Character and Potential Growth

- **Direct Property Impacts** – Obtained via GIS analysis of potential solution alignments and assumed corridor widths; expressed as the number of potential full and partial acquisitions that would be required
- **Impacts to Structures over 45 Years Old** – Obtained via GIS analysis and used as a proxy for impacts to cultural resources
- **Impacts to Wetlands and Wildlife Habitat** – Obtained via GIS analysis and presented as acres of wetland impacts (wetlands were determined to be the valuable wildlife habitat within the study area)
- **Impacts to Dedicated Open Space** – The Green Ravine Conservation easement was the only protected open space identified in the study area and the acreage of easement impacts were obtained via GIS analysis

Goal 3: Improve Access to I-80

- **Arterial LOS on S.R. 36 between I-80 and S.R. 138** – Obtained via Vissim modeling analysis

5.3 Potential Solutions Screening

Two levels of screening were performed on the potential solutions. The first focused on the traffic performance (i.e., goals 1 & 3) and were used to determine whether the potential solutions would provide sufficient traffic performance. The potential solutions that made it through the initial screening were then evaluated for environmental and property impacts.

Before beginning the "official" screening process, one of the potential solutions was deemed infeasible and eliminated and three other potential solutions were combined with other solutions because they would have similar traffic performance and environmental impacts. The Elevated S.R. 201 Extension over I-80 (Double-Decker Freeway) concept was eliminated because the study team believed it to be infeasible due to high costs and impacts. The three potential solutions that were combined with other solutions were:

- Reversible Lanes on I-80 was combined with Barrier Separated Lanes on I-80 (Area 1)
- S.R. 201 Extension between I-80 & Southeast Railroad Tracks with Reversible Lanes was combined with S.R. 201 Extension between I-80 & Southeast Railroad Tracks (Area 1)
- Widen S.R. 36 was combined with Direct S.R. 36 Connection (Area 2)

The last bullet means that any potential solution that connects to S.R. 36 would include widening of S.R. 36 from wherever the connection point is to Village Blvd.

5.3.1 Level One Screening

A Vissim traffic analysis of 2050 traffic conditions was performed for the eight potential solutions in Area 1 and for the nine potential solutions in Area 2. For the Area 1 scenarios, the Direct S.R. 36 Connection (i.e., S.R. 36 Widening) scenario was assumed for Area 2. For the Area 2 scenarios, the Additional Lanes on I-80 scenario was assumed for Area 1. **Table 16** presents the results of the level one screening analysis. Three of the potential solutions in Area 2 were eliminated due to poor S.R. 36 traffic performance indicated by a failing level of service. All three of the eliminated solutions had a similar configuration that required northbound vehicles on S.R. 36 going to I-80 to make a left turn off S.R. 36 to access I-80. The heavy volumes associated with those left turns caused delays and queuing on S.R. 36 causing it to operate at LOS F.

Table 16. Level One Screening Analysis

Potential Solution	Vehicle Travel Time (min.)	S.R. 36 LOS / Travel Speed (mph)	Incident Delay (min./veh.)
Area 1: I-80 between S.R. 201 and S.R. 36			
No Build	7.8	n/a	80
Additional Lanes on I-80	3.4	n/a	31
Barrier Separated Lanes on I-80	3.4	n/a	33
S.R. 201 Bypass	3.6	n/a	18
S.R. 201 Extension between I-80 & SE Railroad Tracks	3.1	n/a	17
S.R. 201 Extension between I-80 & NW Railroad Tracks	3.1	n/a	20
S.R. 201 Extension East of SE Railroad Tracks	3.2	n/a	18
Area 2: S.R. 36 between S.R. 138 and I-80			
No Build	13	**F / 11**	80
Direct Connection to Widened S.R. 36	3.1	A / 48	17
S.R. 201 Couplet with One-Way S.R. 36 Connection	3.2	A / 47	27
S.R. 36 Connection with One-Way Split	4.5	C / 36	41
S.R. 36 Connection with Two-Way Westerly Connection	3.8	B / 40	29
S.R. 36 Connection with Two-Way Easterly Connection	4.3	C / 35	18
New I-80 Interchange with Direct S.R. 201 to S.R. 36 Connection	19	**F / 8**	n/a[1]
New I-80 Interchange w/ S.R. 201 Couplet	6.6	C / 37	27
I-80 Collector-Distributor System with Direct S.R. 201 to S.R. 36 Connection	14	**F / 11**	n/a[1]
I-80 Frontage Road System	15	**F / 12**	n/a[1]

[1] Incident analysis was not performed because the potential solution was eliminated due to poor S.R. 36 traffic performance

No potential solutions were eliminated due to incident delay. Even though the incident delay values had a wide range between 17 and 41 minutes per vehicle, they all provided substantial benefit compared to the 80 minutes for the No Build.

5.3.2 Level Two Screening

A total of twelve potential solutions (six from each area) made it through the level one screening process, meaning that they would satisfy the mobility goals. These twelve potential solutions were then evaluated for environmental and property impacts via a GIS analysis. The following types of data were used for that analysis:

- Parcels and structures (buildings) including age of structure
- Probable wetlands from National Wetland Inventory and examination of aerial imagery
- Open space information from Salt Lake and Tooele Counties and Utah Open Lands
- Threatened and endangered species information from databases maintained by the Utah Division of Wildlife Resources and the U.S. Fish and Wildlife Service

Preliminary alignments and assumed corridor widths were developed for each potential solution. These alignments were then overlaid with the environmental datasets to estimate the impacts of each alignment. Potential solutions in either area with estimated wetland and wildlife impacts greater than 20 acres were eliminated from further consideration. A summary of the level two screening analysis is presented in **Table 17**. Additional information on this analysis can be found in **Appendix H: Environmental Resource Analysis Memo**.

Table 17. Level Two Screening Analysis

Potential Solution	Property Impacts (# of parcels)		Buildings Over 45 Years Old (#)	Wetland & Wildlife Impacts (acres)	Dedicated Open Space Impacts (acres)
	Full	Partial			
Area 1: I-80 between S.R. 201 and S.R. 36					
No Build	0	0	0	0	0
Additional Lanes on I-80	0	15	0	6-8	0
Barrier Separated Lanes on I-80	0	15	0	10-13	0
S.R. 201 Bypass	0	13	0	13-17	0
S.R. 201 Extension between I-80 & SE Railroad Tracks	4	30	1	6-8	0
S.R. 201 Extension between I-80 & NW Railroad Tracks	3	25	1	**32-39**	0
S.R. 201 Extension East of SE Railroad Tracks	1	40	0	0-1	0
Area 2: S.R. 36 between S.R. 138 and I-80					
No Build	0	0	0	0	0
Direct Connection to Widened S.R. 36	1	12	0	4-5	0
S.R. 201 Couplet with One-Way S.R. 36 Connection	2	28	0	9-11	0
S.R. 36 Connection with One-Way Split	0	11	0	4-5	0
S.R. 36 Connection with Two-Way Westerly Connection	2	25	0	16-19	0
S.R. 36 Connection with Two-Way Easterly Connection	0	27	0	0-1	30-37
New I-80 Interchange w/ S.R. 201 Couplet	0	17	0	8-10	0

Based on the level two screening the S.R. 201 Extension between I-80 & NW Railroad Tracks potential solution was eliminated due to high wetland impacts. None of the property impacts were deemed high enough to warrant elimination of any of the potential solutions. Likewise, impacts to the Green Ravine Conservation Area were not classified as a fatal flaw that would result in the elimination of a potential solution but rather as an issue that would require additional coordination and further evaluation. It is important to note that these are high-level preliminary environmental screenings. More accurate field surveys and resource reports (e.g., wetland delineation) will be prepared in a future environmental study.

5.3.3 Combined Potential Solutions

After level one and level two screening, the resulting potential solutions were examined to determine which solutions from Area 1 were compatible with which Area 2 solutions. **Table 18** shows the Area 1 potential solutions as the columns and the Area 2 solutions as the rows with an "X" signifying compatibility and the gray cells incompatibility.

Table 18. Potential Solution Combinations

		Area 1 Solutions (I-80 between S.R. 201 and S.R. 36)				
		Additional Lanes on I-80	Barrier Separated Lanes on I-80	S.R. 201 Bypass	S.R. 201 Extension between I-80 & SE Railroad Tracks	S.R. 201 Extension East of SE Railroad Tracks
Area 2 Solutions (S.R. 36 between S.R. 138 and I-80)	Direct S.R. 36 Connection	X	X	X	X	
	S.R. 36 Connection w/ One-way Split				X	
	S.R. 201 Bypass w/ One-way S.R. 36 Connection			X		
	S.R. 36 Connection w/ Two-way Westerly Connection				X	
	S.R. 36 Connection w/ Two-way Easterly Connection					X
	New I-80 Interchange and S.R. 201 Couplet			X		

The table shows nine viable combined solutions. The evaluation criteria were combined to get new totals for each new option. **Tables 19** and **20** present the vehicle travel times and combined wetland impacts for each combined solution. Upon reviewing this information, the study team eliminated one of the combined solutions, the S.R. 201 Bypass / New I-80 Interchange and S.R. 201 Couplet, due to a combination of having the highest travel times and high wetland impacts, as shown in red on the tables. The study team also combined the Additional Lanes on I-80 and Barrier Separated Lanes on I-80 potential solutions since they are similar in terms of traffic operations and impacts.

Table 19. Combined Vehicle Travel Times

		Area 1 Solutions (I-80 between S.R. 201 and S.R. 36)				
		Additional Lanes on I-80	Barrier Separated Lanes on I-80	S.R. 201 Bypass	S.R. 201 Extension between I-80 & SE Railroad Tracks	S.R. 201 Extension East of SE Railroad Tracks
Area 2 Solutions (S.R. 36 between S.R. 138 and I-80)	Direct S.R. 36 Connection	6.5 min.	6.5 min.	6.6 min.	6.2 min.	
	S.R. 36 Connection w/ One-way Split				6.3 min.	
	S.R. 201 Bypass w/ One-way S.R. 36 Connection			8.0 min.		
	S.R. 36 Connection w/ Two-way Westerly Connection				6.9 min.	
	S.R. 36 Connection w/ Two-way Easterly Connection					7.5 min.
	New I-80 Interchange and S.R. 201 Couplet			10 min.		

Table 20. Combined Solution Wetland Impacts

		Area 1 Solutions (I-80 between S.R. 201 and S.R. 36)				
		Additional Lanes on I-80	Barrier Separated Lanes on I-80	S.R. 201 Bypass	S.R. 201 Extension between I-80 & SE Railroad Tracks	S.R. 201 Extension East of SE Railroad Tracks
Area 2 Solutions (S.R. 36 between S.R. 138 and I-80)	Direct S.R. 36 Connection	7-9 acres	11-14 acres	14-18 acres	11-13 acres	
	S.R. 36 Connection w/ One-way Split				15-19 acres	
	S.R. 201 Bypass w/ One-way S.R. 36 Connection			17-22 acres		
	S.R. 36 Connection w/ Two-way Westerly Connection				22-27 acres	
	S.R. 36 Connection w/ Two-way Easterly Connection					1-2 acres
	New I-80 Interchange and S.R. 201 Couplet			22-27 acres		

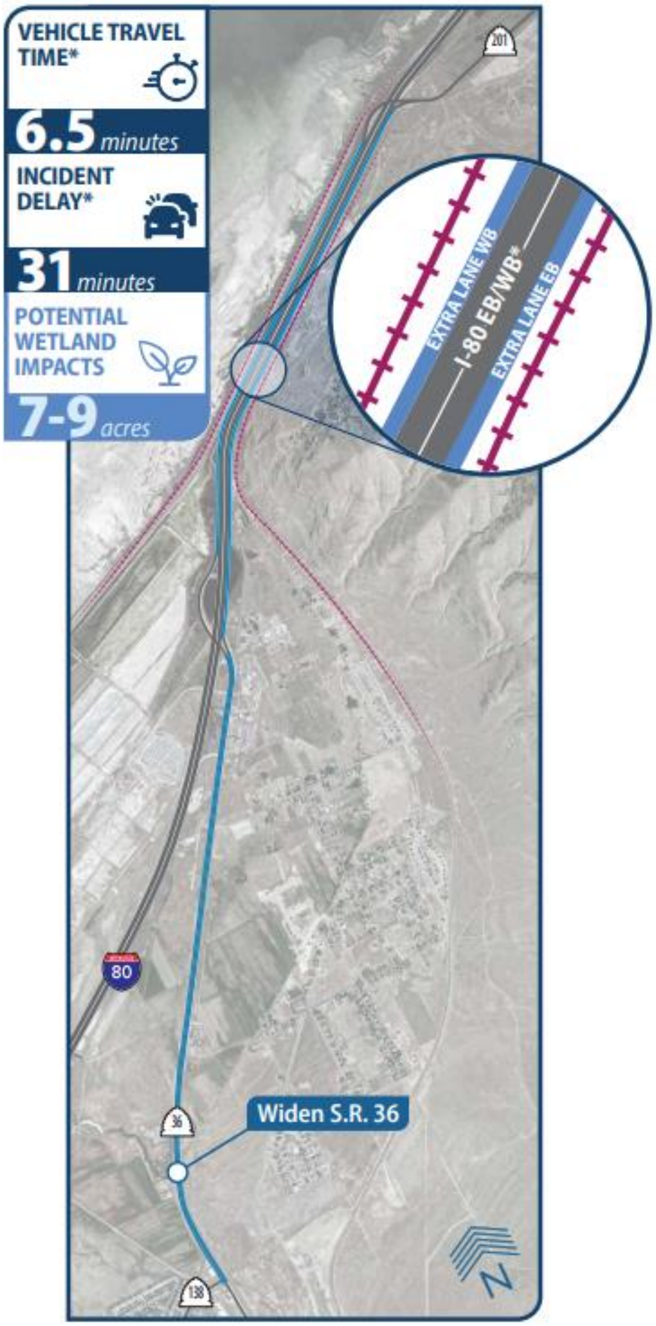
5.4 Recommended Potential Solutions

After completion of the screening process, the study team recommended four primary potential solutions with two of them having a sub-option or two based on how they could connect to S.R. 36. The four primary solutions are:

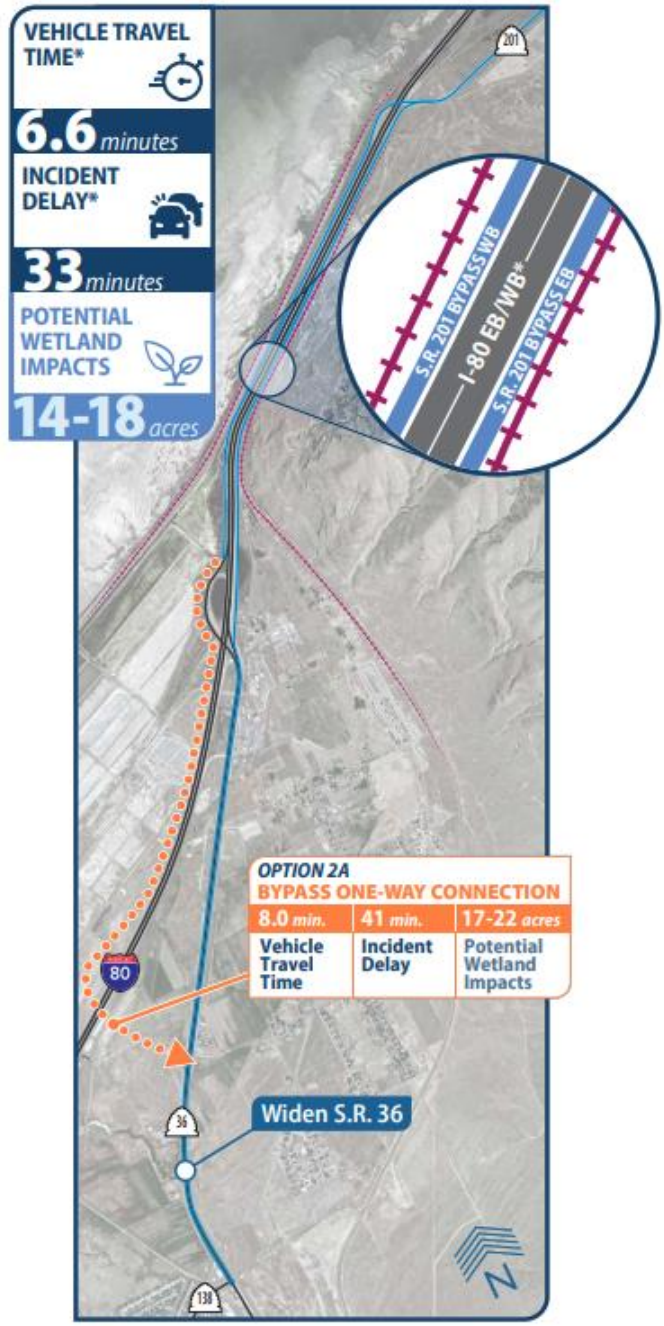
1. **Additional Lanes on I-80** – Combination of Additional Lanes on I-80 and Barrier Separated Lanes on I-80 with Direct S.R. 36 Connection
2. **S.R. 201 Bypass** (includes one sub-option) – Combination of S.R. 201 Bypass with Direction S.R. 36 Connection and an option of S.R. 201 Bypass w/ One-way S.R. 36 Connection
3. **S.R. 201 Extension between I-80 & Railroad** (includes two sub-options) – Combination of S.R. 201 Extension between I-80 & SE Railroad Tracks and Direct S.R. 36 Connection and options with S.R. 36 Connection w/ One-way Split and with S.R. 36 Connection w/ Two-way Westerly Connection
4. **S.R. 201 Extension East of Railroad Tracks** – Combination of S.R. 201 Extension East of SE Railroad Tracks and S.R. 36 Connection w/ Two-way Easterly Connection

All four of the primary potential solutions would meet the study goals and objectives by improving mobility and reducing vehicle travel times while minimizing property and environmental impacts. All four would also require widening of S.R. 36 between Village Boulevard and I-80 to achieve an acceptable level of service on S.R. 36. **Figure 9** on the following two pages presents concept alignments and key analysis results for the four recommended solutions and the sub-options. These recommended potential solutions would be studied and evaluated in more detail via the environmental process which would result in the selection of either a no-action alternative or a preferred solution.

While not specifically evaluated as part of this study, an idea was suggested to make use of wide roadway shoulders to provide additional capacity that could be used during incidents to reduce delay and drive frustration. The study team felt that the idea had merit and could potentially be implemented more quickly than any of the recommended solutions or could be incorporated into any of the recommended solutions. Implementation of such a system would likely require electronic signs to let drivers know when the shoulder lanes would be accessible.

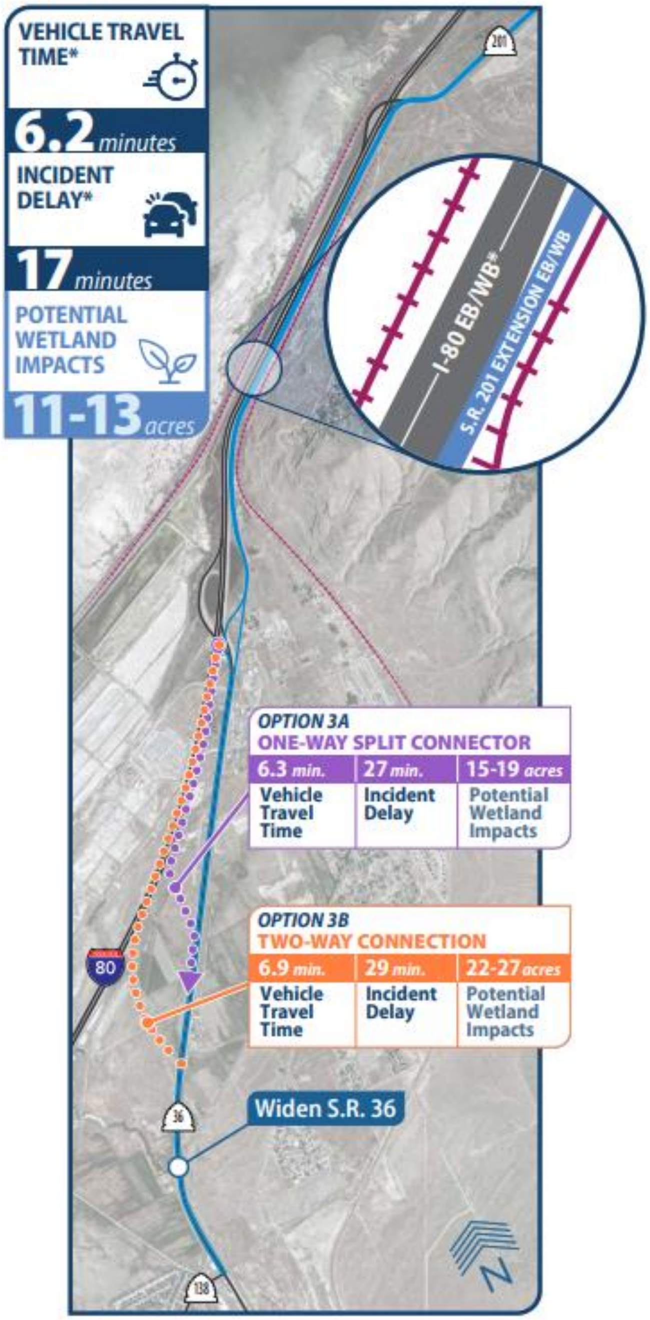


1 ADDITIONAL LANES ON I-80

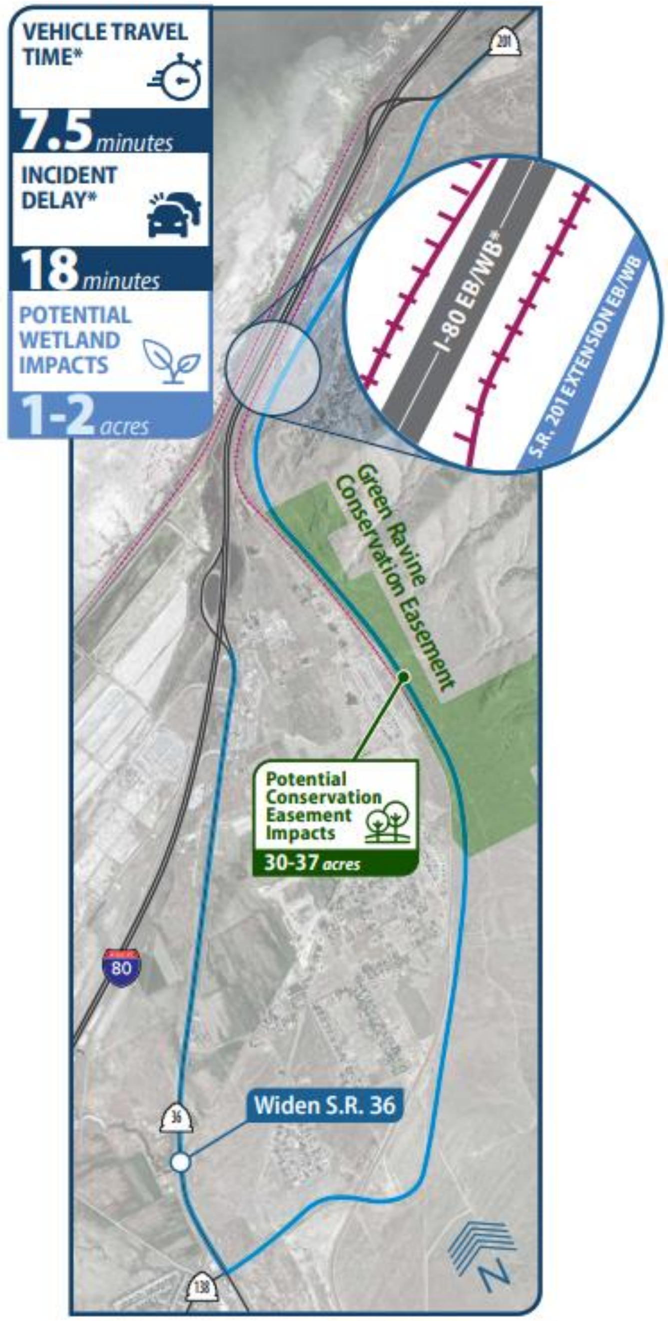


2 S.R. 201 BYPASS

Figure 9: Recommended Potential Solutions



3 S.R. 201 EXTENSION
Between I-80 & Railroad



4 S.R. 201 EXTENSION
East of railroad tracks

Figure 9: Recommended Potential Solutions (cont'd)

After selection of the recommended potential solutions another public outreach effort was undertaken. A virtual open house website was developed with a video introduction and display boards that walked visitors through the study process, findings, and recommended potential solutions. (**Figure 10** is a screenshot of the virtual open house.) **Appendix I: Virtual Open House Boards** contains the "display boards" that were presented to the public.

Figure 10: Virtual Open House

A survey form was provided where guests could provide feedback on each of the recommended potential solutions and rank each of the four primary solutions in order of their preference. Over 100 visitors provided comments which can be found in **Appendix J: Final Public Outreach Comments.** For each potential solution guests were asked what they like about and how they would improve each one. A sample of those comments are shown in **Table 21**.

Table 21. Summary of Public Comments Regarding Each Potential Solution

1: Additional Lanes on I-15	
What Do You Like?	**What Would You Change?**
Simple	Not a long-term solution
Cost effective	Will create future bottlenecks
Builds on existing infrastructure	Doesn't provide an alternative to I-80
2: S.R. 201 Bypass	
What Do You Like?	**What Would You Change?**
Provides an alternate to I-80	Impacts to wetlands
Lessens bottlenecks at Lake Point	Seems like a temporary solution
Less disruption to community	Move it closer to Mills Junction
3: S.R. 201 Extension (Between I-80 & Railroad)	
What Do You Like?	**What Would You Change?**
Provides an alternate to I-80	Too much impact to wetlands
Reduces congestion at Lake Point	Doesn't solve issues on S.R. 36
Lessens impacts to homeowners	
4: S.R. 201 Extension (East of Railroad Tracks)	
What Do You Like?	**What Would You Change?**
Moves traffic away from I-80	Impacts to nearby residents
Bypasses Lake Point	Extend it to Droubay Road
Nothing	Concerned about wildlife impacts

Overall, the results of the comments were mixed. In the preference ranking exercise from 1 to 4 with a perfect average being 2.5, the potential solution with the highest average rank (S.R. 201 Bypass) had a value of 2.37, while the potential solution with the lowest average score (S.R. 201 Extension between I-80 & Railroad) had a value of 2.66. Thus, the average rank of the most popular and the least popular potential solutions were only separated by 0.29, which is very flat and makes it difficult to draw any conclusions regarding preference.

However, digging a little deeper by looking at the distribution of ranks among each solutions shows some interesting results. **Table 22** shows that distribution by the number of respondents and the percentage for each rank.

Table 22. Public Feedback Ranking of Recommended Solutions

Potential Solution		Rank				Total	Average Rank
		1	2	3	4		
1	Additional Lanes on I-80	26 (27%)	22 (23%)	27 (28%)	21 (22%)	96	2.55
2	S.R. 201 Bypass	6 (6%)	37 (39%)	38 (40%)	14 (15%)	95	2.37
3	S.R. 201 Extension Between I-80 & Railroad	24 (25%)	31 (33%)	24 (25%)	16 (17%)	95	2.66
4	S.R. 201 Extension East of Railroad	40 (43%)	5 (5%)	5 (5%)	42 (46%)	92	2.47

Potential Solution 1: Additional Lanes on I-80 has the most even distribution with a nearly equal number of respondents ranking it in each position. It is followed closely by Potential Solution 3: S.R. 201 Extension Between I-80 & Railroad. The most polarizing is Potential Solution 4: S.R. 201 Extension East of Railroad which had the most people ranking it number 1 and the most ranking it number 4. Very few people ranked it 2 or 3, suggesting strong feelings on both sides. Potential Solution 2: S.R. 201 Bypass was just the opposite with few people ranking it 1 or 4, but many ranking it 2 or 3. People are generally accepting of it without feeling too strongly one way or the other. These results highlight the importance of public outreach during the environmental phase to better understand the public's concerns related to each potential solution.

5.5 Concept Designs & Cost Estimates

Initial concept designs and rough cost estimates were produced for the following potential solutions:

- S.R. 36 Widening (common to all potential solutions)
- Potential Solution 1: Additional Lanes on I-80
- Potential Solution 2A: S.R. 201 Bypass w/ One-way S.R. 36 Connection
- Potential Solution 3: S.R. 201 Extension Between I-80 & Railroad
- Potential Solution 3A: S.R. 201 Extension Between I-80 & Railroad w/ One-way Split
- Potential Solution 4: S.R. 201 Extension East of Railroad (three and five-lane cross-section options

The concept designs for potential solutions 2 and 3 were prepared by others independently of this study with Google Earth KMZs and cost estimates being provided to the study team.

Unit prices and other assumptions were updated to be generally by consistent with the cost estimates created by the study team. Scroll plots of the various concept designs can be found in **Appendix K: Concept Design Scroll Plots**. **Table 23** shows the cost estimates for the potential solutions listed above in both 2021 and 2026 dollars. Year 2021 estimates were increased by approximately 23 percent to estimate project costs in 2026 dollars. Cost estimate details can be found in **Appendix L: Concept Cost Estimates**.

Because the concept design was prepared independently of this study, there was an inconsistency between the provided design and the analysis performed for potential solutions 2 and 2A, for which the concept design did not include an additional westbound lane between I-80 and S.R. 36. Because the design did not include this lane, the concept estimate didn't either. To account for this discrepancy, the concept cost for potential solution 2 was assumed to be 75% larger than the cost estimate for potential solution 1 due to the extra width required to separate the lanes with a barrier. Half of that cost (representing the cost for the westbound lane) was then added to the original cost estimate for potential solution 2A to obtain the values shown in the table. Including the S.R. 36 widening, the rough concept costs range from $116 million for the Additional Lanes on I-80 to $363 million for S.R. Extension East of Railroad with a five-lane cross-section. Note that these cost estimate were developed prior to substantial construction cost inflation in 2022.

Table 23. Summary Concept Cost Estimates

Potential Solution	2021 Cost Estimate	2026 Cost Estimate
S.R. 36 Widening	$20.3 million	$24.8 million
1: Additional Lanes on I-80	$74.3 million	$90.7 million
2: S.R. 201 Bypass[1]	$130 million	$159 million
2A: S.R. 201 Bypass w/ One-way S.R. 36 Connection[1]	$165 million	$201 million
3: S.R. 201 Extension Between I-80 & Railroad	$188 million	$228 million
3A: S.R. 201 Extension Between I-80 & Railroad w/ One-way Split	$218 million	$265 million
4-3: S.R. 201 Extension East of Railroad (three-lane cross-section)	$235 million	$286 million
4-5: S.R. 201 Extension East of Railroad (five-lane cross-section)	$298 million	$363 million

1. Cost estimates based on a partial design

During the development of the concept designs a sight distance concern was identified with potential solutions that would place a road in between I-80 and the southeast railroad tracks, namely potential solutions 2 and 3. Due the constraints with the freeway and the railroad the maximum possible radius is less than what is needed for inside curve sight distance with mitigation via design exception or a reduced design speed. These issues and others will need to be further evaluated in the environmental study phase.