

## SR-248 Corridor Plan Update

### TECHNICAL MEMORANDUM

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Date: November 19, 2015

From: Lynn Jacobs, P.E. PTOE, Fehr & Peers  
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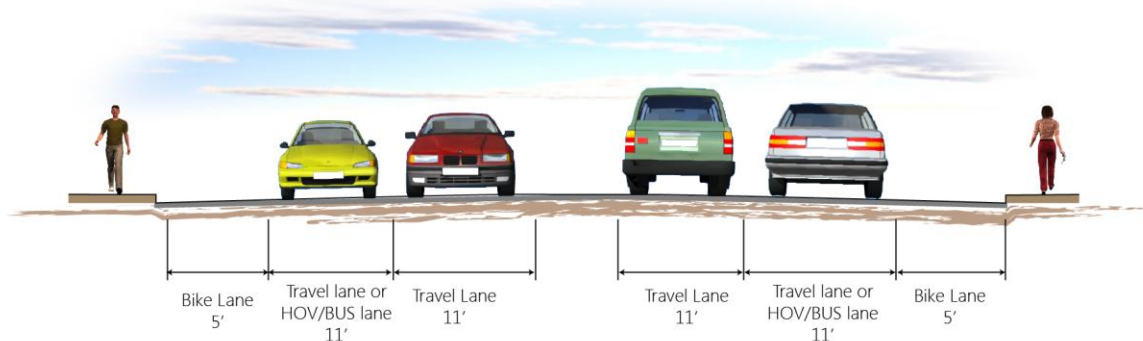
**Subject: SR-248 Analysis**

UT15-1059

#### Executive Summary

A study was completed in 2009 by H.W. Lochner, Inc. on SR-248 in which several alternatives were developed and evaluated. The study identifies Alternative 3 as the preferred alternative which proposes widening SR-248 to a 4-lane cross-section from Sidwinder Drive to Richardson Flats within the existing footprint (as shown below).

Typical 4-lane cross-section



The added lane would be a HOV/Bus only lane during peak hours of the day from Wyatt Earp Way to Richardson Flats. These peak hours would be defined by Park City and UDOT staff, but would likely be from 7:00 – 9:00 AM and from 4:00 -6:00 PM. Fehr & Peers has revisited the findings of that study with updated traffic count information and micro-simulation analysis to ensure the viability of this and the other concepts that were evaluated in the 2009 study (as shown in the body of this report).

The analysis presented within this document is based on traditional traffic engineering principles. Many of the metrics chosen for evaluation (delay, Level of Service, travel time) are focused on quantifying the performance of the roadway based on the typical Single Occupancy Vehicle (SOV) user experience. Park City has stated goals within their 2011 Traffic and Transportation Master Plan to discourage additional SOV trips and encourage High-Occupancy Vehicle (HOV) trips and trips using transit, walking and/or biking.

This updated existing conditions analysis, however, found that the overall corridor is generally operating acceptably (Level Of Service (LOS) D or better at most locations) during seasonal peak conditions (March, 2015). There is a traffic bottleneck at the Bonanza Road intersection. Specifically, the northbound right turn from Bonanza Road onto SR-248 is experiencing high levels of delay, resulting in overall intersection LOS E/F during PM peak hours. A potential capacity improvement at this location would be to eliminate an eastbound through lane at the intersection and convert the northbound right turn into a channelized free-right, or to acquire ROW on the SE corner of the intersection to accommodate a receiving lane for the new NB free right turn, resulting in a section of SR248 that has three EB travel lanes. This concepts have not been further evaluated as part of this study due to study constraints (scope,budget). Fehr & Peers recommends further consideration and evaluation of this concept as preliminary analysis indicates that it could provide minor operational benefits at the intersection and hence, the corridor. As the rest of the corridor was operating acceptably under existing conditions, the preferred alternative did not show any significant traffic benefits under existing traffic volumes.

The updated future (2040) conditions analysis found that traffic will be constrained getting onto SR-248 at the intersections at SR-248/SR-224, SR-248/Bonanza and SR-248/ US-40. This produces a metering effect on traffic using SR-248. The result of this metering effect is that traffic is unable to access the portion of SR-248 where the proposed widening is located. This in turn renders the proposed widening ineffective from the traditional SOV user experience perspective. However, if capacity improvements are made at the SR-248/SR-224 and SR-248/US-40 intersections, the 2040 demand volumes on the corridor would justify the widening. The intersection at SR-248/SR-224 was previously studied and a multi-lane roundabout was recommended. These projects could be pursued in conjunction or separately.

The proposed widening did not show a substantial auto travel time or LOS benefit under existing conditions or future conditions. The future unconstrained demand is large enough to justify this widening, but only if the external constraints or meters (SR-224, Bonanza, US-40) are improved such that traffic is able to follow less constrained and access SR-248. Should the widening occur in conjunction with previously mentioned improvements on Bonanza, SR 224/SR 248, and US-40, the project would provide a a number of public benefits including:

- If the new lane is a HOV/Bus facility, it would enhance bus service visibility and reliability to the park-and-ride lot at Richardson Flats, encouraging a mode shift from SOV automobile traffic. This in turn has the potential to reduce the demand at the congested intersections at SR-224/SR-248, Bonanza Drive/ SR-248 and US-40/SR-248. This reduction in demand could delay the need to make capacity improvements at these locations.
- When the external constraints at SR-224, Bonanza, and/or US 40 are removed, the projected demand will need the extra lane in this area to operate efficiently.

- Construction of these additional lanes as HOV/Bus facility is consistent with local plans and policies that discourage road widening or the addition of significant increases in lane mileage for Single Occupancy Vehicles (SOV).
- Construction of these lanes will also provide a consistent cross-section (in terms of number of travel lanes) from US-40 to SR-248. This is a desirable outcome as it reduces conflicts where the current lane drops exist.

Therefore, Fehr & Peers recommends that the widening be completed and that the following other improvements are made before or within 3-5 years after the widening:

- The intersection at SR-224/SR-248 is improved (potentially by constructing the multi-lane roundabout as previously recommended),
- The intersection at Bonanza/SR-248 is improved (potentially by adding a free northbound right turn lane),
- The interchange at US-40/SR-248 is improved,
- Highway access and Transit frequency to the park-and-ride lot on Richardson's Flat is improved.

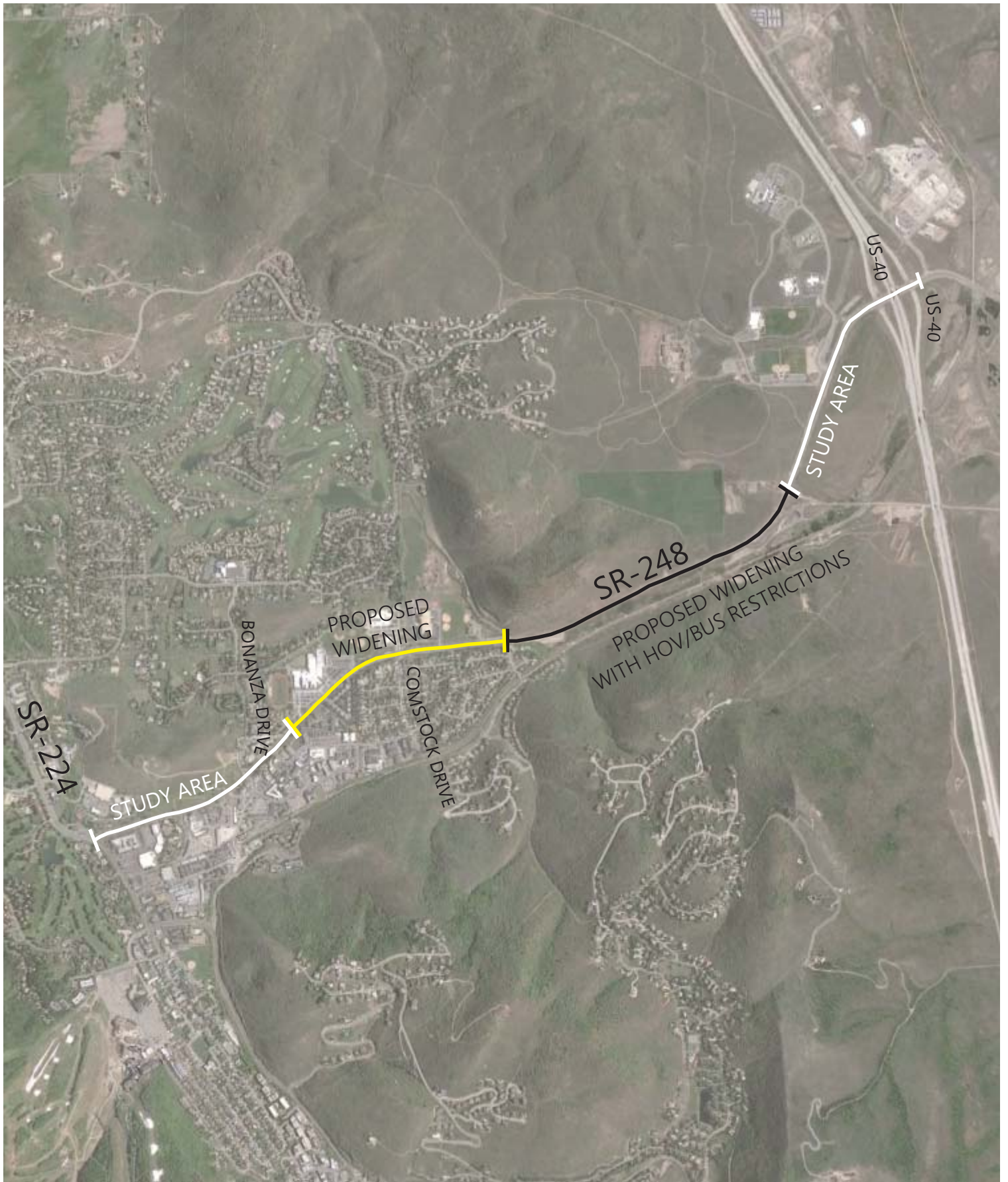
### **Background**

The study area consists of SR-248 from the intersection at SR-224 to the interchange at US-40 as shown in Figure 1. SR-248 currently serves between 15,000 and 18,000 vehicle trips per day (*Traffic on Utah Highways*, UDOT 2014) and serves as one of the primary access points to downtown Park City for traffic from US-40 and beyond. There is a substantial directional split to traffic during the peak periods. During the AM peak the directional split is approximately 70% WB / 30% EB. This split reverses in the PM peak period. Several Park City schools and associated administrative and sports facilities are located on the north side of SR-248 between Bonanza Drive and Comstock Drive. There is consistent traffic congestion in this area during school loading and un-loading periods. The the City and Park City School District are currently working cooperatively to develop potential modifications to accesses as part of a separate effort that could help to reduce this congestion and improve safety. These improvements were not analyzed as part of this study, however any reduction or consolidation of access on SR-248 would be beneficial to overall mobility along the corridor.

The SR-248 corridor has been previously studied in 2007 and again in 2009. The 2009 study identified a number of potential alternatives to meet the transportation needs of this corridor including:

1. Full widening of SR-248 to have a consistent two travel lanes in each direction and a center turn lane from SR-224 to US-40.
2. Constructing a reversible lane from Wyatt Earp Way to Richardson Flats. The reversible lane would fit within the existing right-of-way (ROW), but would require the installation of traffic control gantries.
3. Either of the above two options with the extra lane functioning as a HOV/Bus lane during peak periods.

The preferred alternative identified in the study was to complete the full widening with the HOV/Bus restrictions in place.



Not to Scale

The purpose of this current effort is to revisit the analysis that was previously performed to confirm that the preferred alternative is still a viable option given any changes in traffic volumes since the previous studies were completed.

### Existing Conditions Analysis

To update the traffic operations analysis, new turning movement counts (as shown on figure 2) were collected on March 18, 2015 at the following locations:

- SR-248 / SR-224
- SR-248 / Bonanza Drive
- SR-248 / Comstock
  
- SR-248 / US-40

These four intersections represent the study intersections for this analysis. The intersection of Round Valley Drive is represented in the model to reproduce platooning on SR-248. The volumes in the model at that location are based on previous data collection and modeling efforts that have been completed by Fehr & Peers. No metrics will be reported for that intersection.

An updated traffic simulation model was prepared using the micro-simulation software VISSIM. The model was calibrated and validated to the observed volumes, queue lengths and travel time from SR-224 to US-40.

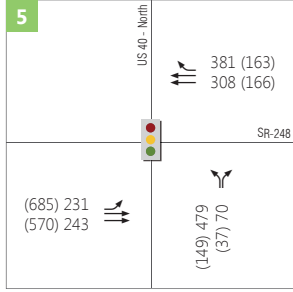
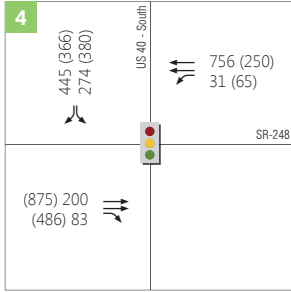
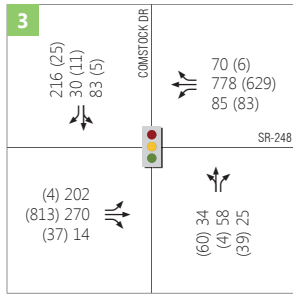
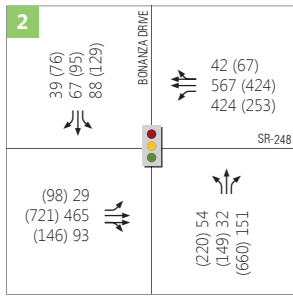
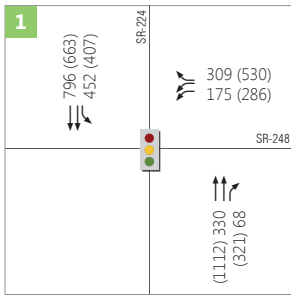
Upon completion of the updated existing conditions model, the four build alternatives (Full widen, reversible, with and without HOV) were then analyzed for the AM and PM peak hours under 2015 traffic volume conditions. The updated 2015 results are shown in Tables 1 through 4 below.

**Table 1. 2015 AM Peak Hour Delay (seconds) and Level of Service (LOS)**

Intersection	Existing		Reversible		Reversible HOV		Full Widen		Full Widen HOV	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1 SR-224/SR-248 Monitor Drive-Bonanza	11	B	11	B	10	B	10	B	10	B
2 Drive/SR-248	28	C	28	C	29	C	29	C	25	C
3 Comstock Drive/SR-248	30	C	30	C	17	B	16	B	17	B
4 US-40 SB Ramp/SR-248	15	B	15	B	16	B	16	B	16	B
5 US-40 NB Ramp/SR-248	20	C	20	C	19	c	19	C	19	C

**Table 4. 2015 AM Peak Hour Travel Time (minutes)**

Travel Time (min)	Existing	Reversible	Reversible HOV	Full Widen	Full Widen HOV
1 EB SR-248 (US 40 to SR-224)	5	5	5	5	5
2 WB SR-248 (SR-224 to US 40)	6	6	6	6	6



Legend

XX (XX) AM (PM) Volumes



Signal



Not to Scale

**Table 3. 2015 PM Peak Hour Delay (seconds) and LOS**

Intersection	Existing		Reversible		Reversible HOV		Full Widen		Full Widen HOV	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1 SR-224/SR-248 Monitor Drive-Bonanza	40	D	37	D	38	D	38	D	42	D
2 Drive/SR-248	77	E/F	80+	E/F	80+	E/F	80+	E/F	80+	E/F
3 Comstock Drive/SR-248	13	B	11	B	11	B	10	B	10	B
4 US-40 SB Ramp/SR-248	37	D	37	D	41	D	32	C	39	D
5 US-40 NB Ramp/SR-248	13	B	13	B	12	B	13	B	13	B

**Table 4. 2015 PM Peak Hour Travel Time (minutes)**

Travel Time (min)	Existing	Reversible	Reversible HOV	Full Widen	Full Widen HOV
1 EB SR-248 (US 40 to SR-224)	6	6	6	5	6
2 WB SR-248 (SR-224 to US 40)	6	6	6	6	6

As shown in tables 1 through 4, the existing traffic conditions on SR-248 operate generally within an acceptable range of delay/LOS (LOS D or better) with the exception of the SR-248/Bonanza Drive intersection during the PM peak hour. At this location the volume of northbound to eastbound right turning vehicles is high, as well as the eastbound through movement on SR-248 (both movements headed from Park City to US-40). The volumes for these two movements are the main contributing factors to the LOS E/F during this peak hour. The threshold between LOS E and F is defined as a delay of greater than 80 seconds, since each scenario produced results close to 80 seconds of delay, they are reported as being right on the LOS E/F threshold. Traffic conditions at the LOS E/F threshold tend to be very volatile, so differences in delay at this location under the various scenarios is attributable to the random nature of the simulation model.

An intersection modification has been proposed for the intersection at SR-248/Bonanza to mitigate the LOS E/F conditions. The modification would be to:

- Convert the northbound right turn to a free right, making one of the existing eastbound exit lanes from Bonanza the receiving lane for the free right.
- Dropping an eastbound through lane to free up an exit lane as described above.

A cursory analysis of the turning movement volumes at this location indicated that this could result in an overall benefit to the operations at Bonanza/SR-248 and to the SR-248 corridor as a whole since this movement acts as a chokepoint for vehicles accessing SR-248. Further analysis is recommended to evaluate the concept, as the cursory analysis conducted as part of this effort is of inadequate detail for decision making.

The build scenarios generally don't show significant difference from the existing conditions scenario for 2015 conditions. This is due to lack of existing congestion in the area that would be widened.

### 2040 Conditions Analysis

Upon completion of the updated existing conditions model, the four build alternatives (Full widen, reversible, with and without HOV) were then analyzed for the AM and PM peak hours under 2040 traffic volume conditions (shown on Figure 3).

Proposed growth rates for the 2040 analysis were developed based on the WFRC/MAG travel demand model prepared for the Mountain Accord project and consist of the following:

- 2.8% annual growth for SR-248 west of Wyatt Earp and for N/S on SR-224
- 4.0% annual growth for SR-248 east of Wyatt Earp and for N/S on US-40
- 0.5% annual growth for all other side street approaches to SR-248

The 2040 results are shown in Tables 5 through 8 below.

**Table 5. 2040 AM Peak Hour Delay (seconds) and Level of Service (LOS)**

Intersection	Future		Reversible		Reversible HOV		Full Widen		Full Widen HOV	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1 SR-224/SR-248 Monitor Drive-Bonanza	79	E/F	80+	E/F	80	E/F	80+	E/F	76	E/F
2 Drive/SR-248	25	C	28	C	29	C	28	C	26	C
3 Comstock Drive/SR-248	28	C	18	B	17	B	19	B	17	B
4 US-40 SB Ramp/SR-248	100+	F	100+	F	100+	F	98	F	100+	F
5 US-40 NB Ramp/SR-248	100+	F	100+	F	100+	F	100+	F	100+	F

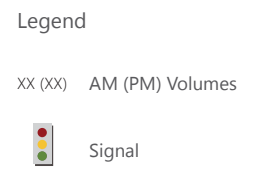
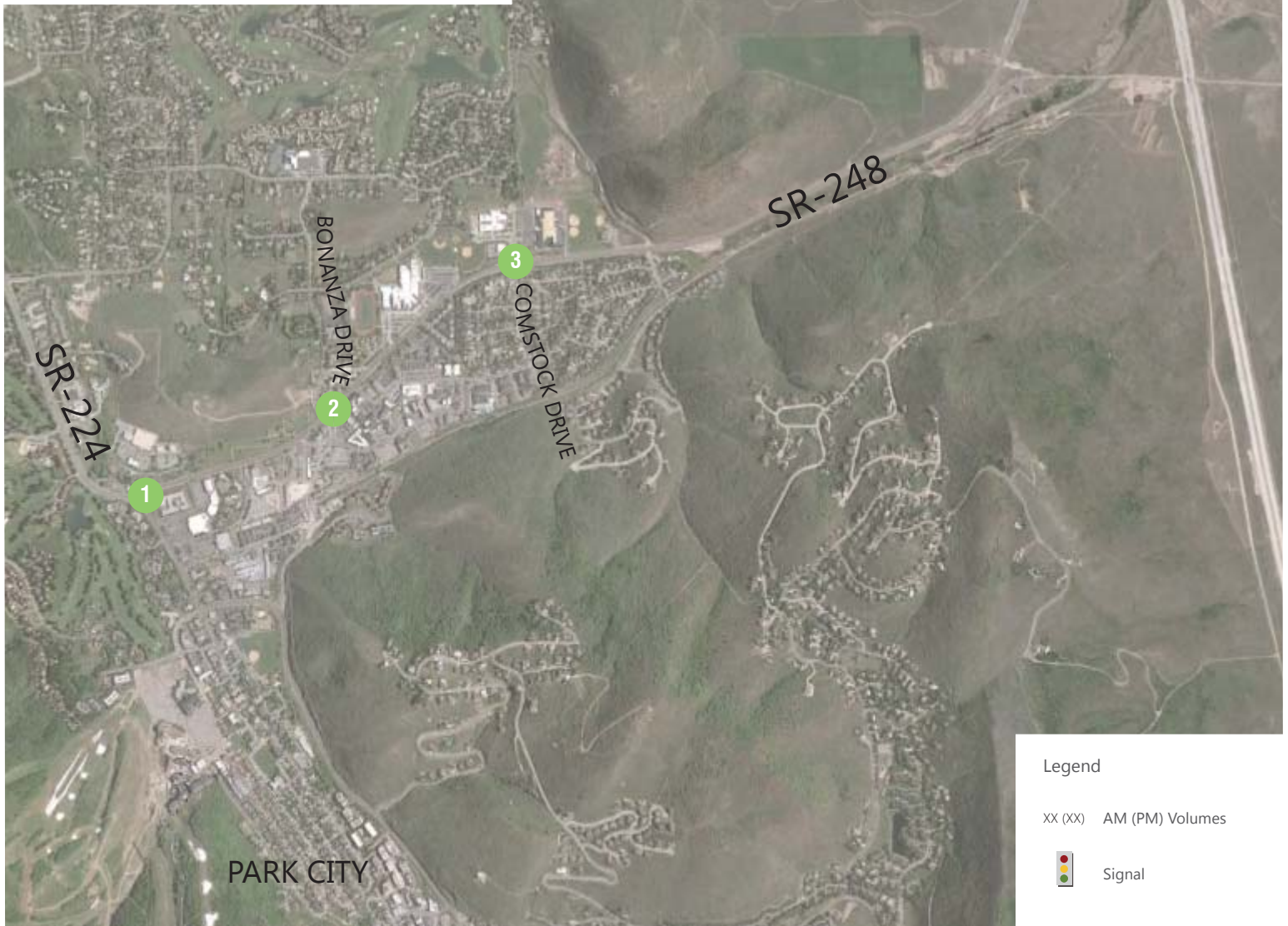
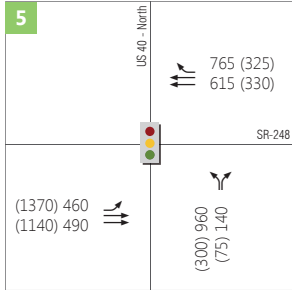
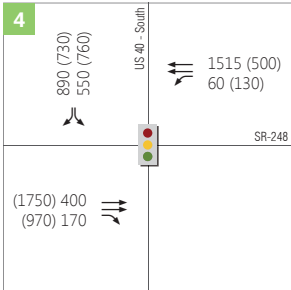
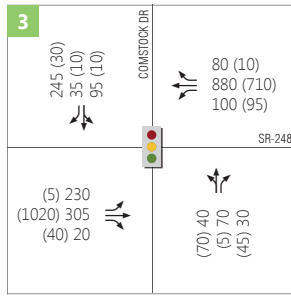
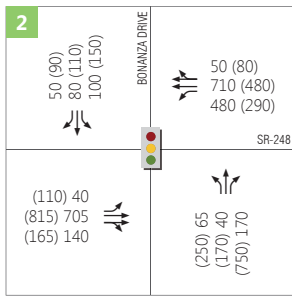
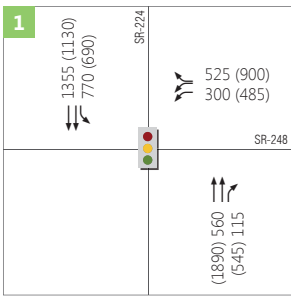
**Table 6. 2040 AM Peak Hour Travel Time (minutes)**

Travel Time (min)	Future	Reversible	Reversible HOV	Full Widen	Full Widen HOV
1 EB SR-248 (US 40 to SR-224)	5	5	5	5	5
2 WB SR-248 (SR-224 to US 40)	6	6	6	6	6

**Table 7. 2040 PM Peak Hour Delay (seconds) and LOS**

Intersection	Future		Reversible		Reversible HOV		Full Widen		Full Widen HOV	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1 SR-224/SR-248 Monitor Drive-Bonanza	120+	F	120+	F	120+	F	120+	F	120+	F
2 Drive/SR-248	80+	F	80+	F	80+	F	80+	F	80+	F
3 Comstock Drive/SR-248	14	B	11	B	11	B	11	B	10	B
4 US-40 SB Ramp/SR-248	80+	F	80+	F	80+	F	80+	F	80+	F
5 US-40 NB Ramp/SR-248	64	E	68	E	69	E	65	E	67	E





**Table 8. 2040 PM Peak Hour Travel Time (minutes)**

Travel Time (min)	Future	Reversible	Reversible HOV	Full Widen	Full Widen HOV
1 EB SR-248 (US 40 to SR-224)	6	6	6	6	6
2 WB SR-248 (SR-224 to US 40)	7	7	7	7	7

As shown in tables 5 through 8 the future (2040) traffic conditions on SR-248 operate generally over capacity (LOS E or worse) with the exceptions of the SR-248/Bonanza Drive intersection during the AM peak hour and the SR-248 Comstock Drive intersection during both AM and PM peak hours. The reason for this result is that volume demands are bottlenecked at the SR-224/SR-248 and US-40/SR-248 intersections. The turning movements originating from SR-224 and US-40 keep most of the traffic demand from flowing into SR-248. Once operations at these external nodes break down, traffic entering SR-248 is metered, and only 60% of the 2040 calculated demand is able to reach the Bonanza/SR-248 and Comstock/SR-248 intersections. UDOT currently does not have any plans or projects that address the conjection at US-40/SR-248.

There is no significant difference between the no-build and the build scenarios. This is largely due to the same phenomena: traffic is externally constrained. Congestion within the model is focused around the external nodes and is unable to build in the center of the corridor, where the proposed projects are located. No significant traffic benefit is expected as a result of constructing any of these options without improving the capacity of the system entering SR-248.

If capacity improvements were made at the SR-224/SR-248, Bonanza/SR-248 and US-40/SR-248 intersections, delay at Comstock and Bonanza would be expected to increase. It would also be expected that congestion within the project area would also increase. The unconstrained 2040 demand volumes are projected to be high enough to justify the widening, if the external constraints were improved. Under those conditions, the project scenarios would likely have a travel time benefit over the no-project scenarios.

For the SR-224/SR-248 intersection, a previous study recommended construction of a multi-lane roundabout. This capacity improvement could relieve this bottleneck, and reduce metering onto SR-248.

For the Bonanza/SR-248 intersection, adding a free-right turn either by eliminating an EB through lane or acquiring ROW on the SE corner of the intersection would help relieving this bottleneck, thereby reducing this metering effect onto SR-248. Further analysis of this concept is recommended.

For the US-40/SR-248 interchange, further analysis of interchange modifications is also recommended. Some preliminary ideas include modifying the interchange to a higher capacity configuration (SPUI, DDI, etc..) or to add a second SBR and/or a second EBL lane. These concepts have not been evaluated or programmed by UDOT.

## Conclusions and Recommendations

The existing traffic conditions on SR-248 operate generally within an acceptable range of delay/LOS (LOS D or better) with the exception of the Bonanza Drive intersection during the PM peak hour. At this location the volume of northbound to eastbound right turning vehicles is high, as well as the eastbound through movement on SR-248 (both movements headed from Park City to US-40). The volumes for these two movements are the main contributing factors to the LOS E/F during this peak hour.

The future scenarios show a significant worsening compared to the existing conditions scenarios, especially at the SR-224/SR-248 and US-40/SR-248 intersections. Other locations within the model actually show improvement due to the metering effect of these intersections failing. If capacity improvements are made at these two locations, it would be anticipated that the delay at Comstock and Bonanza would increase, as well as congestion throughout the SR-248 corridor.

There are a number of reasons why the proposed project will provide public benefit including:

- If the new lane is a HOV/Bus facility, it would enhance bus service visibility and reliability to the park-and-ride lot at Richardson Flats, encouraging a mode shift from SOV trips. This in turn has the potential to reduce the demand at the congested intersections at SR-224/SR-248, Bonanza Drive/ SR-248 and US-40/SR-248. This reduction in demand could delay the need to make capacity improvements at these locations.
- When the external constraints at SR-224, Bonanza, and/or US 40 are removed, the projected demand will need the extra lane in this area to operate efficiently.
- Construction of these additional lanes as HOV/Bus facility is consistent with local plans and policies that discourage road widening or the addition of significant increases in lane mileage for Single Occupancy Vehicles (SOV).
- Construction of these lanes will also provide a consistent cross-section (in terms of number of travel lanes) from US-40 to SR-224. This is a desirable outcome as it reduces conflicts where the current lane drops exist.

Fehr & Peers recommends that the proposed widening be completed, and as part of that widening project, additional analysis is needed as follows:

1. Further evaluate the proposed intersection modification concept at Bonanza Drive,
2. Identify potential capacity improvements at the US-40/SR-248 and SR-224/SR-248 intersections,
3. Quantify the benefits of these alternatives if those capacity improvements were completed
4. Access removal or consolidation at the school would benefit overall mobility on SR-248, and should be evaluated further.