

**Flagstaff
Metropolitan Planning Organization**

U.S. 180 Winter Traffic Study

**Working Paper #2
Problem Identification and Needs Analysis**

Draft

**Prepared by:
HDR Engineering, Inc.**

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1.0 Introduction

While the future of Arizona Snowbowl is debated by some, U.S. 180 winter weekend traffic congestion is a real problem for neighborhoods, emergency responders, and winter visitors that must be addressed. For this study it is a given that this historic use will continue operation for the foreseeable future. The purpose of this study is to identify strategies to reduce the duration of peak winter weekend traffic congestion. This second working paper builds on the data and analysis presented in *Working Paper #1: Existing Conditions and Data Report*.

It provides a discussion of the growth potential for Arizona Snowbowl and other winter recreation sites in the U.S. 180 corridor. It discusses peak winter weekend travel demand and provides traffic forecasts for 2020 and 2030. It looks at the causes of peak winter weekend traffic congestion and identifies potential immediate, mid- and long-term solutions. Successful resolution of the traffic congestion will likely depend on implementation of various strategies by multiple stakeholders sometimes independently and sometimes in partnership.

Finally, this working paper uses six qualitative evaluation criteria to evaluate alternative strategies. A subset of these alternatives will be selected by the Flagstaff Metropolitan Planning Organization (FMPO) Technical Advisory Committee and the Winter Advisory Task Force (WATF) for more detailed evaluation.

1.1 Public Outreach

The FMPO has undertaken an extensive public outreach effort to identify the community's issues and concerns related to U.S. 180 winter weekend traffic congestions. One element of this outreach is an online public forum powered by MindMixer. FMPO is also using traditional outreach techniques and hosted a public meeting at Sechrist Elementary School to solicit public comment.

The MindMixer tool gives the community the opportunity to add ideas and comment on four predetermined topics: community impacts; traffic solutions; economic development; and the winter recreation experience. To date more than 1,100 unique visitors have viewed the site. The site has been visited over 2,300 times resulting in nearly 17,000 page views. Over 121 ideas have been submitted by the online community with numerous additional comments. The site will close for comment on September 30. It will reopen on October 14 for public input on solution prioritization based on the recommendations of the public, FMPO TAC and WATF.

Approximately 110 attended an open house held at Sechrist Elementary School on Tuesday, September 13. The FMPO provided an overview of the study and answered audience questions. Numerous comments were received and will be incorporated into the comments received on the MindMixer site. A second, final, open house is planned for November to present the preferred solutions.

2.0 Future Conditions

This section provides peak winter weekend activity forecasts for recreation sites in the U.S. 180 corridor. This includes planned improvements to ski and snow play areas in the corridor, as well as overall increases in winter recreation activity expected from population growth.

2.1 Arizona Snowbowl

The planned Arizona Snowbowl upgrades will add snowmaking equipment, update antiquated chairlifts, and add a snow play area with up to 400 new parking spaces.¹ This will increase attendance and vehicular traffic on Snowbowl Road and U.S. 180.

Skiing / Snowboarding

The purpose of these snowmaking and chairlift upgrades is to provide a more consistent and reliable operating season and bring Snowbowl terrain and infrastructure into balance with current use levels. The Final Environmental Impact Statement (FEIS) states that average peak day attendance levels are not anticipated to increase with the planned upgrades, however frequency of the peak days is expected to increase.

Over the four winter seasons starting December 2007 and ending in April 2011, Snowbowl recorded attendance on 427 days. Average daily attendance was over 1,500 guests. Snowbowl recorded 48 peak days over this period where attendance was more than 3,000 guests. Average attendance for these peak days was 3,500. The busiest day had nearly 4,000 guests. With manmade snow providing more consistent snow conditions, the number of peak skier days is expected to increase.

The FMPO collected traffic count data during the 2010-2011 winter season on U.S. 180 both north and south of Snowbowl Road. Using this traffic count data together with daily attendance records, the study team estimated that on average Snowbowl generated 0.83 daily vehicle trips per guest on U.S. 180. On a daily basis 50 percent of the trips enter and 50 percent exit.

During the AM peak hour between 8:30 a.m. and 9:30 a.m. on U.S. 180, Snowbowl generated 0.17 trips per guest with five percent exiting and 95 percent entering. For the PM peak hour between the 4:30 p.m. and 5:30 p.m., Snowbowl generated 0.18 hourly trips per guest with 96 percent exiting and four percent entering.

Snow Play

In response to a growing demand for snow play, Snowbowl will develop a new eight-acre facility for snow play and snow tubing. To service the snow play facility, a new 400-space parking area will be constructed. The FEIS estimates that this will increase Snowbowl's attendance by 34,000 to 42,000 annual users. Over these past four seasons, more than 25 percent of Snowbowl attendance has come on peak days. Assuming the most optimistic snow play forecast and an average of 12 peak days per winter season, this could increase Snowbowl's peak day attendance by 800 to 900 guests. Table 1 shows the existing and forecast Arizona Snowbowl attendance.

Table 1 Arizona Snowbowl Existing and Forecast Attendance

Description	Existing (2007 to 2011) Attendance		Forecast Attendance	
	Average day	Average peak day	Average day	Average peak day
Ski and snowboard	1,500	3,500	1,500	3,500
Snow play / snow tubing	-	-	350	900
Total attendance	1,500	3,500	1,850	4,400

¹ United States Department of Agriculture, Forest Service, Peaks Ranger District, Coconino National Forest (February 2005). Record of Decision: Arizona Snowbowl Facilities Improvements Final EIS and Forest Plan Amendment #21. Retrieved from <http://www.fs.fed.us/r3/coconino/nepa/2005/feis-snowbowl/snowbowl-rod.pdf>.

2.2 Wing Mountain

Traffic to the Wing Mountain Snow Play Area depends on local snow conditions. Over the four winter seasons starting December 2007 and ending in April 2011, Wing Mountain recorded attendance on 280 days. Average daily attendance was over 250 vehicles. Wing Mountain recorded 31 peak days over this period where attendance was more than 700 vehicles. Average attendance for these peak days was 860 vehicles. The busiest day in 2011 recorded an attendance of 1,100 vehicles. This converts to an estimated 2,200 daily vehicle trips. Attendance is limited by parking lot size, and the area has no current plans to expand.

2.3 Flagstaff Nordic Center

The Coconino National Forest supplied monthly attendance data and trip generation estimates for the Flagstaff Nordic Center for three winter seasons from November 2008 to April 2011. Peak weekend day attendance is over 200 guests. Coconino National Forest estimates up to 300 vehicle trips to and from the Nordic Center on peak days. While the Flagstaff Nordic Center has no plans to expand, attendance could increase with overall Arizona population growth.

2.4 Snow Play

Designated snow play areas include the Walker Lake Parking Area/Kendrick Park, Crowley Pit and the Peak View Parking Area. As these areas fill up on peak winter holiday weekends, snow play occurs all along U.S. 180 wherever vehicles can park. Traffic count data on U.S. 180 west of Snowbowl Road suggests that on peak winter holiday weekends additional snow play traffic to these locations may amount to an additional 2,000 daily vehicle trips. A recent survey of Maricopa County residents interested in winter showed that demand for snow play is strong in Arizona's largest population center. This means that the U.S. 180 corridor will see continued demand for snow play that may increase with Arizona population growth.

3.0 Problem Identification

The peak winter weekend traffic problem on U.S. 180 is well known. On ten to 12 peak winter weekend afternoons each year traffic leaving Snowbowl and snow play areas including Wing Mountain converge into a perfect storm of traffic congestion. In simple terms there is too much traffic and not enough road system capacity. Without improvement, the duration of congestion on typical peak winter weekends could increase from three to four hours by 2030. Congestion could last longer on some days. This section discusses the issues behind the peak winter weekend travel demand and the capacity of Flagstaff transportation system to move winter traffic along the corridor.

3.1 U.S. 180 Peak Winter Weekend Travel Demand

The question of winter traffic congestion is one of both time and space. Flagstaff winter recreation opportunities are focused on the slopes of the San Francisco Peaks. The high elevation and abundant snowfall makes the area ideal for snow play. This geographic concentration of winter recreation opportunities focuses this travel demand on the U.S. 180 corridor.

U.S. 180 is also primary route between Flagstaff and the Tusayan entrance to the Grand Canyon National Park. In the winter time, weekend ambient traffic on the U.S. 180 corridor north of Snowbowl Road is generally 2,500 vehicles per day. A portion of this ambient traffic is generated by approximately 270 homes in the Fort Valley area. An additional portion of the ambient traffic is activity related to Tusayan and the entrance to the Grand Canyon National Park. Winter visitor surveys have shown that some combine a visit to a snow play area with a visit to the Grand Canyon. On a typical winter weekend, the Tusayan entrance to the Grand Canyon records 2,000 entering vehicles.

In addition to the ambient traffic, Table 2 shows the projected increase in Snowbowl traffic with the snow play area expansion together with peak winter weekend day traffic forecasts for Wing Mountain Snow Play Area, Flagstaff Nordic Center and other snow play areas. Table 2 shows the total peak winter weekend daily traffic forecasts for U.S. 180 south of Snowbowl Road for 2020 and 2030.

Table 2 U.S. 180 Peak Winter Weekend Daily Traffic Forecasts

Traffic Source	2011 ^a	2020	2030
Arizona Snowbowl	3,000	3,700	3,700
Wing Mountain Snow Play Area	2,200	2,200	2,200
Flagstaff Nordic Center	300	350	400
Other snow play activity	2,000	2,400	2,900
Fort Valley residential activity	1,500	2,000	2,500
Other ambient traffic (Tusayan, Grand Canyon)	1,300	1,400	1,500
Total Traffic	10,300	12,050	13,200

Source: HDR Engineering, Inc., September 2011.

Note: * - estimated based on January 16, 2011 traffic count data and FMPO travel demand model trip generation estimates.

3.2 Corridor Congestion

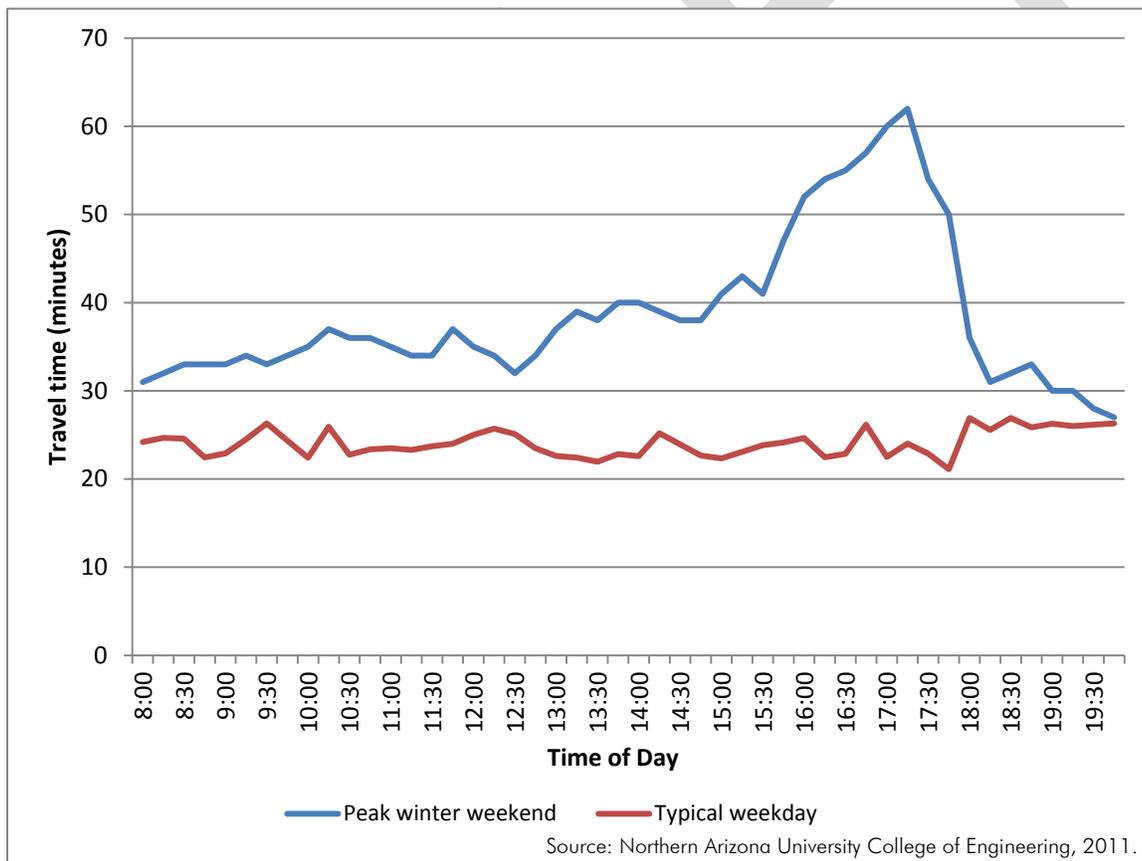
Winter traffic congestion is also a temporal problem. From 3 p.m. to 6 p.m. up to 1,000 vehicles per hour head eastbound on U.S. 180. This three hour rush of visitors leaving recreation sites on peak winter

weekend afternoons is more volume than the system can process. Corridor travel time data collected by the Northern Arizona University (NAU) College of Engineering confirms the delay that occurs during peak winter weekend afternoons.

Figure 1 shows 2011 travel times on the U.S. 180 corridor from the Snowbowl parking lot to the Milton Road/Butler Avenue intersection for both a typical weekday and a peak winter weekend. A traffic microsimulation model prepared for the U.S. 180 corridor confirms this travel time data. Under peak winter weekend peak traffic conditions, the VISSIM model shows queues building at the Milton Road/Butler Avenue intersection.

As the congestion builds over the three hour afternoon peak, the simulation shows traffic backing up through the Humphreys Street/Route 66 intersection. This simulation reports travel times similar to those shown in Figure 1 for peak winter weekend traffic. Based on the peak winter weekend traffic forecasts shown in Table 2, projected growth could add up to 1,000 additional vehicles to the eastbound afternoon peak period. This could increase the duration of the afternoon congestion shown in Figure 1 by up to 30 percent or by an additional hour.

Figure 1 U.S. 180 Travel Times: Snowbowl Parking Lot to Milton Road/Butler Avenue



3.3 U.S. 180/Snowbowl Road Intersection

When the afternoon rush begins, the winter traffic congestion problem starts at the U.S. 180/Snowbowl Road intersection where returning Snowbowl traffic meets snow play traffic. Snowbowl Road traffic is controlled by a stop sign at U.S. 180. Approximately 470 vehicles an hour from Snowbowl wait to turn left onto U.S. 180 during the afternoon peak. U.S. 180 traffic has the right-of-way and does not stop. Eastbound on U.S. 180 the combined snow play and ambient traffic volume is over 650 vehicles per hour. The high traffic volumes combined with the higher travel speeds leave few gaps for Snowbowl traffic to enter the U.S. 180 traffic stream. The trip from the Snowbowl parking lot to U.S. 180 can take more than 30 minutes as a result of the wait to make the southbound left turn from Snowbowl Road to eastbound U.S. 180.

Sunday, January 16, 2011 was a peak day for both Snowbowl and Wing Mountain Snow Play Area. Travel time data collected by the Northern Arizona University College of Engineering suggests that the 10 minute trip from the Snowbowl parking lots required up to 30 minutes during this afternoon peak hour. On peak winter weekends, a Coconino County Sheriff's deputy stops traffic on U.S. 180 to allow Snowbowl traffic to turn. The wait for Snowbowl patrons would be even longer without the officer directing traffic.

3.4 Snowbowl Road to Route 66

Eastbound on U.S. 180 from Snowbowl Road to Route 66 traffic generally flows smoothly. While there are several congested areas that can cause traffic to slow, there are few constrictions. The posted speed limit ranges from 55 miles per hour (mph) at Snowbowl Road to 25 mph on Humphreys Street.

The first congested area eastbound travelers on U.S. 180 encounter is the Peak View Parking Area. Here winter activity traffic will spill out of the parking lot to the shoulder of U.S. 180. The parked vehicles and resulting pedestrian activity cause U.S. 180 traffic to slow.

Further east, activity from the service station west of the Fremont Boulevard intersection also introduces friction into the traffic stream. At the Fremont Boulevard intersection itself, traffic from the Cheshire neighborhood and Schultz Pass areas joins U.S. 180. ADOT has studied this intersection for a traffic signal several times; however, it does not meet the engineering traffic signal warrants.

Side friction increases east of Fremont Boulevard. Activity centers include the Museum of Northern Arizona, the Pioneer Museum, the Coconino Center for the Arts, the City of Flagstaff fire station, and the Sechrist Elementary School. At Forest Avenue, traffic begins to divert from U.S. 180. Additional diversion occurs on Columbus Avenue. While most Snowbowl and snow play traffic turns onto Humphreys Street, some continues on Columbus Avenue to Beaver Street or Switzer Canyon Drive. A City of Flagstaff police officer directs traffic and operates the traffic signal at the Columbus Avenue / Humphreys Street intersection on peak weekends.

Traffic slows on Humphreys Street due to the reduced speed limit and interaction with the Flagstaff surface streets. The main source of delay on Humphreys Street during peak winter weekend afternoons is the traffic signal at Route 66. Building queues on Milton Road can prevent the southbound right turn from Humphreys Street. This causes traffic to back up Humphreys Street.

3.5 Milton Road: Humphreys Street to Route 66

While friction from winter recreation and other activity centers on the U.S. 180 corridor may cause some slowing, there are few constrictions in the traffic stream between Snowbowl Road and Route 66. The primary source of the peak winter weekend afternoon congestion can be found on Milton Road. With numerous restaurants, hotels, service stations, and other activity located on the corridor, Milton Road has long been a source of Flagstaff congestion. For visitors from the Phoenix area, Milton Road is the natural gateway to Flagstaff with access to I-17 and I-40.

Overall winter weekend peak hour Milton Road traffic volumes are less than on an average weekday. However, the southbound volume winter traffic combines with ambient traffic to overwhelm the Route 66 and Butler Avenue intersections. The high traffic volumes at these key intersections create the delay that ripples upstream to Humphreys Street.

3.6 Safety

While traffic accidents cannot be ruled out as a contributing factor to peak winter weekend traffic congestion, the crash data provided by the Arizona Department of Transportation (ADOT) does not provide a definitive answer. The data shows that more accidents occur on weekends in the corridor; however it is unclear whether these contribute to additional delays during peak periods. Most crashes are limited to property damage; between 25 and 30 percent of vehicle crashes resulted in injury during the three-year period between 2007 and 2010. One fatality was reported west of Snowbowl Road in 2010.

3.7 Summary/Conclusions

The peak winter weekend traffic problem on U.S. 180 is well known. On ten to 12 peak winter weekend afternoons each year traffic leaving Snowbowl and the snow play areas, including Wing Mountain, converge into a perfect storm of traffic congestion. The primary causes of this congestion are lack of alternative snow play sites, significant peak period traffic volume, a common destination, namely Milton Road, and key pinch points in the Flagstaff road system:

- Snowbowl and Wing Mountain Snow Play Area both close at 4 p.m. putting up to 2,500 vehicles onto U.S. 180 at the same time.
- The U.S. 180/Snowbowl Road intersection is a bottleneck that can generate delays 30 minutes and longer for exiting Snowbowl traffic.
- East of Snowbowl Road, key pinch points for the winter traffic are at the Humphreys Street/Route 66 intersection and the Milton Road/Butler Avenue intersection. Queues from these congested intersections ripple upstream along U.S. 180.
- Out of town visitors who are spending the night in Flagstaff are attracted to Milton Road for restaurants and lodging.
- Visitors returning to the Phoenix area want to travel via Milton Road. While locals will use Forest Avenue or Switzer Canyon Drive to avoid the congestion, many visitors are unfamiliar with the Flagstaff street system and resist efforts to divert to alternate routes.

While the possible affect of traffic accidents cannot be ruled out, the data does not suggest a direct connection between crashes and peak winter weekend traffic congestion.

4.0 Solution Identification

The purpose of this section is to identify immediate, mid-term, and long-term solutions to winter traffic congestion. Spatial and temporal concentrations of traffic are primary cause of the congestion. Significant winter recreation activity is focused on the U.S. 180 corridor; at the end of each day both ski and snow play areas close at the same time putting many of their guests on the road at the same time. A secondary cause of congestion is transportation system pinch points. The solutions identified here address travel demand management, corridor optimization, transit, and adding new capacity to the U.S. 180 corridor.

Input from both the MindMixer outreach effort and the public open house have informed the solution identification process. Not all ideas presented by the public are identified here. Input was first screened using the study's purpose which is to identify strategies reduce the duration of peak winter weekend traffic congestion on U.S. 180. A comprehensive list of comments and ideas from the outreach effort will be included in the final report.

4.1 Near-Term Strategies

These are strategies where implementation could begin in the 2011-2012 winter season. These strategies include travel demand management solutions that focus on shifting traveler behavior to reduce peak period travel. Optimizing the existing road network with more intensive traffic management and traffic signal timing coordination could also reduce the duration of peak winter weekend congestion. These options include a travel information system, a Snowbowl morning half-day lift ticket, traffic management and traffic signal timing strategies.

Alternative 1: Traveler Information System

Initial deployment of a traveler information system would provide guests at winter recreation sites estimates of travel time to Flagstaff based on departure time. Longer term investments in real time traffic monitoring technology could bring actual travel time estimates to electronic message boards at chairlifts and warming huts. For travelers arriving via I-17 from the Phoenix area, AM 1610 radio broadcasts could provide regular updates on snow play and traffic conditions on U.S. 180.

The initial deployment of signs showing travel time estimates to Flagstaff by time of departure could be implemented at Snowbowl, Wing Mountain, and other winter recreation sites for the 2011-2012 winter season. This would be a low cost strategy to shift travel demand from the busy afternoon peak to less congested times earlier in the day. It could be implemented by the Coconino National Forest.

Alternative 2: Morning Half-Day Lift Tickets

By offering a morning half-day lift ticket that ended at 12 or 1 p.m., Arizona Snowbowl guests could be encouraged to leave before the resort closes and avoid the worst afternoon peak travel. This strategy would be coupled with a traveler information system that provides travel time estimates to Flagstaff based on departure time. This is a low cost strategy that could be implemented by Snowbowl for the 2011-2012 winter season.

Alternative 3: Traffic Management Plan

Currently City of Flagstaff police officers and Coconino County Sheriff's deputies manage traffic at the Snowbowl Road/U.S. 180 intersection and the Columbus Avenue/Humphreys Street intersection. A

temporary traffic signal could be used at the Snowbowl Road/U.S. 180 intersection during peak winter weekends. This would include a traffic control plan with advance warning signs on U.S. 180 to facilitate the merge between Snowbowl and snow play traffic. This is an immediate term solution that could be implemented for the 2011-2012 winter season that would reduce delays on Snowbowl Road. It could be funded by multiple public and private partners.

The City of Flagstaff is using a variable message sign to encourage travelers to use the Switzer Canyon Drive route to I-40. This intersection could be configured for winter traffic events with clearer signing and lane delineation to make the bypass more attractive. Implement a detour around the most congested areas. This is an immediate term solution that could be implemented for the 2011-2012 winter season to reduce traffic on Humphreys Street and Milton Road. It could be funded by multiple public and private partners.

Alternative 4: Traffic Signal Timing

Traffic signal delay on Milton Road is one cause for the peak winter weekend backup on U.S. 180. While eastbound U.S. 180 and southbound Milton Road experience long delays, other movements at these intersections have lower traffic volumes than on a typical weekday peak hour. By retiming and coordinating traffic signals in the corridor to move platoons of traffic more efficiently, delays can be reduced on U.S. 180.

In the immediate term, a winter weekend traffic signal plan could be implemented for the 2011-2012 season. This would require coordination between ADOT and the City of Flagstaff which both maintain traffic signals on the U.S. 180/Route 66/Milton Road corridor. This initial optimization of traffic signals would shift green time to the peak southbound traffic movement during peak periods.

Over the longer term, Flagstaff and ADOT could link their signals together using a modern traffic management system that could optimize traffic signals in real time adjusting to changing traffic conditions. This system could also be used to provide winter visitors real time travel time information via electronic message boards at winter recreation sites.

4.2 Mid-Term Strategies

These are strategies that could be implemented within five years. They include a U.S. 180 Winter Recreation Pass, dispersed snow play sites, transit services, and managed lanes.

Alternative 5: U.S. 180 Winter Recreation Pass

Similar in concept to the Red Rock Pass program in the Sedona area, a winter recreation parking pass could provide a funding and management tool for traffic on the U.S. 180 corridor. These passes would be required during winter months to park along U.S. 180 including the Crowley Pit Snow Play Area, the Peak View Parking Area, and the Walker Lake Parking Area/Kendrick Park. Requiring the pass to park may reduce casual snow play activity. Revenue from these passes could be used to implement a traveler information system and other enhancements to the U.S. 180 corridor. This is a mid-term strategy that could be implemented within five years by the Coconino National Forest and ADOT. A similar "Sno-Park" permit program is administered by the Oregon Department of Transportation.

Alternative 6: Dispersed Snow Play Sites

A longer term strategy for managing winter weekend travel demand on the U.S. 180 corridor is developing new snow play sites elsewhere on the Mogollon Rim. Coconino County opened a new snow play site at

Fort Tuthill in 2011. The City of Flagstaff is considering a new snow play site at McMillan Mesa for the 2011-2012 season. Other potential snow play sites include the Cinch Hook area north of Strawberry.

Analysis by NAU's Arizona Hospitality Research & Resource Center in the W.A. Franke College of Business Center for Business Outreach shows an unmet demand for snow play in the Phoenix metropolitan area. While alternative snow play sites may initially divert traffic from U.S. 180, over the longer term these visitors may return if alternative sites become congested. Also, variable snow conditions may close alternative sites while U.S. 180 sites remain open.

This is a mid-term strategy that could be implemented within five years as a public-private partnership. Key public agencies include Coconino National Forest, Coconino County, and the City of Flagstaff.

Alternative 7: Managed Lane

Additional capacity could be added to portions of the corridor by using the center two-way left turn lane as an eastbound lane during the winter weekend afternoon peak. Paired with updates to traffic signal timing and better utilization of alternative routes to I-40 this additional capacity could reduce the duration of congestion. This would be a low cost improvement that could be implemented by the City of Flagstaff and ADOT within the next five years.

Alternative 8: Transit

Historically, transit played a role at Snowbowl where guests parked at the base near U.S. 180 and rode a shuttle bus to the resort. As snow making at Snowbowl provides more consistent snow conditions with a more reliable revenue stream, transit could again become part of the mobility solution. Numerous ideas have emerged for using transit in the U.S. 180 corridor:

- Implement winter weekend park-and-ride lots using NAU parking lots at Milton Road and McConnell Drive with transit service to Snowbowl and Wing Mountain Snow Play Area
- Implement a transit-only bypass lane on the shoulder or in the center two-way left turn lane of U.S. 180
- Require vehicles to give the right-of-way to transit vehicles at bottlenecks
- Make access to Wing Mountain Snow Play Area transit only
- Vans and shuttles used for Colorado River trips are idle in the winter time and could be repurposed for transit

Transit is a potential long term solution to relieve U.S. 180 traffic that would require a sound business model to justify the investment. Development of winter transit service in the U.S. 180 corridor may require a partnership between winter recreation concessionaires and local transit providers.

4.3 Long-Term Strategies

While making the most of the existing U.S. 180 corridor with travel demand management strategies, intelligent transportation system technology, and potential transit service is one option to reduce peak winter weekend traffic delays in the shorter term. Longer term strategies focus on adding road capacity either through improvement of existing intersections or adding new traffic lanes in the corridor. This could mean widening U.S. 180 itself or improving an existing forest road that links to I-40 west of Flagstaff.

Alternative 9: Intersection Improvements

While temporary traffic control measures may improve operations during peak winter traffic periods, a long term solution may be to improve the U.S. 180/Snowbowl Road intersection with a modern roundabout. This improvement would reduce delays for Snowbowl traffic entering U.S. 180. ADOT would be the lead agency to conduct an additional study is needed to determine the feasibility of a roundabout in this location.

ADOT together with the City of Flagstaff and the FMPO should continue to monitor the intersections at Fremont Boulevard, Meade Lane, and Forest Avenue. Improvements to these intersections should be implemented as warranted by safety and traffic engineering studies.

Alternative 10: Widen U.S. 180

In the past, ADOT and the City of Flagstaff have looked at potential widening of the corridor. As the state owns only 66-feet of right-of-way in the corridor, additional travel lanes would incur a significant right-of-way cost. In addition, widening would impact numerous commercial and residential businesses in the corridor.

ADOT's current plan for US 180 is provide a three-line cross section with one travel lane in each direction and a center two-way left turn lane for the portion of the corridor within City of Flagstaff limits. Right turn lanes would be provided a high volume turning locations. A four-foot shoulder would also serve as bicycle lane.

Adding new travel lanes may not solve the congestion problem. The primary source of congestion and delay in this corridor is Milton Road. Unless winter traffic will reroute via Switzer Canyon Drive, the bottleneck at Milton Road and Butler Avenue will continue to create delays along the corridor during busy winter weekends.

While the Snowbowl expansion is expected to increase the number of peak days in the winter season, average daily traffic on the corridor will remain low. Under average weekday traffic conditions, U.S. 180 operates at LOS B and C. Funding for corridor widening may be difficult to justify because U.S. 180 only experiences winter traffic congestion on a limited number of days each year.

Adding new travel lanes to U.S. 180 is a long term solution that will involve ADOT, the City of Flagstaff, Coconino County, and the Flagstaff Metropolitan Planning Organization. It is a high cost alternative that would potentially impact neighborhoods, schools, museums and trails.

Alternative 11: Forest Road Winter Bypass

Improvement of an existing forest road that provides a connection between U.S. 180 and I-40 could also add new capacity to the corridor. One possible route would begin west of Snowbowl Road in Fort Valley at Bader Road which becomes Forest Road 518. Forest Road 518 connects to A-1 Mountain Road near Exit 190 on I-40 five miles west of Flagstaff. Another option is to improve A-1 Mountain Road and Snowbowl Road between U.S. 180 and I-40. The bypass would be plowed and maintained to accommodate travel on peak winter weekends. This is a long term solution that would require coordination with Coconino County and the Coconino National Forest. Funding sources for road improvements and maintenance remains a question.

Alternative 12: High Speed Gondola between Flagstaff and Snowbowl

Some ski resorts, including Telluride in Colorado, use high speed gondola service as part of their winter resort transportation solution. This is a potential long term solution for the U.S. 180 corridor. More detailed study will be needed to explore its cost effectiveness. In addition to a business plan, any new gondola corridor would have to navigate the environmentally and culturally sensitive Kachina Peaks Wilderness Area. An appropriate terminus in Flagstaff with adequate parking and good access would also be required.

4.4 Summary/Conclusions

A number of immediate, mid- and long-term solutions exist for mitigating peak winter weekend traffic congestion on U.S. 180. Some of these solutions can be readily implemented while others will require longer term planning and coordination among multiple agencies. While this study will use available planning tools to evaluate the potential reduction in congestion for selected, longer term monitoring of winter traffic conditions will be needed to measure improvements as solutions are implemented. The next step in this study is a Tier 1 fatal flaw analysis to identify a subset of these 12 initial alternatives for more detailed evaluation.

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5.0 Tier 1 Evaluation

The U.S. 180 Winter Traffic Study Team will evaluate congestion mitigation strategies through a three-tiered process. Tier 1 evaluation is a qualitative fatal flaw analysis that compares the relative merits of proposed alternatives against evaluation criteria. Based on this analysis, some alternatives will be selected for more detailed Tier 2 analysis. In this second stage, alternatives are developed to the point that cost estimates can be prepared and the system performance of the alternative can be evaluated. A final assessment will include implementation recommendations. Table 3 provides the initial Tier 1 evaluation of the 12 alternatives listed in Section 4.0 for further consideration by the FMPO TAC and the WATF.

Most of these strategies will require cooperation between multiple agencies and stakeholders. Only a few recommendations such as the morning half-day lift ticket and travel time information signs could be implemented unilaterally. In addition to cooperation, successful reduction in the duration of peak winter weekend afternoon traffic congestion will require iterations where strategies are applied, evaluated, and refined. If initial measures do not produce necessary results other more intensive strategies can be applied.

5.1 Evaluation Criteria

Seven qualitative planning level criteria were selected for the Tier 1 fatal flaw analysis. Each alternative is ranked based by its relative merits on a scale ranging from excellent to poor. The Tier 1 evaluation criteria include:

Implementation Cost

This evaluation measure compares relative implementation costs across all alternatives. For example, in terms of cost, road widening would score poorly compared to the implementation cost of a Snowbowl morning half-day ticket which would score well. For alternatives selected by the FMPO TAC and the WATF more detailed cost estimates and implementation plans will be prepared.

Safety/emergency response

This measure evaluates how improvement alternatives would improve safety. This includes emergency response times across the corridor. Adding additional capacity to the corridor would provide more room for emergency vehicles to maneuver allow faster emergency response times. It also includes pedestrian and traffic safety.

Transportation system performance / community impact

Transportation system performance is a qualitative assessment of how well a proposed alternative would reduce the duration of peak winter weekend traffic congestion. Do intersection improvements improve accessibility for local community.

Optimize existing infrastructure

This is a qualitative assessment of how well a proposed alternative would make the best use of the existing transportation infrastructure. New alignments or widening of existing roads would score lower because of potential impacts to neighborhoods and environmental resources.

Ease of implementation or shovel readiness

This measure assesses how readily the community could implement an alternative. Alternatives that could be implemented for the 2011-2012 winter season are the best; longer term solutions such as transit and physical improvements score the worst. Timing may depend on how quickly intergovernmental agreements can be fashioned.

Community support

This measure is based on input from stakeholders such as the Winter Advisory Task Force and comments provided from the public via the U.S. 180 Winter Traffic Study MindMixer site or the September 13 public open house.

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Table 3: Tier 1 Alternatives Evaluation

EVALUATION CRITERIA	Near-Term (2011-2012 Winter Season)			
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	ALTERNATIVE 4
	Traveler Information System	Morning Half-Day Lift Ticket	Traffic Management Plan	Traffic Signal Timing
Cost				
Safety / Emergency Response				
System Performance / Community Impacts				
Optimize Existing Infrastructure				
Shovel Ready?				
Community Support				

EVALUATION CRITERIA	Mid-Term (1-5 years)			
	ALTERNATIVE 5	ALTERNATIVE 6	ALTERNATIVE 7	ALTERNATIVE 8
	U.S. 180 Winter Recreation Pass	Dispersed Snow Play Sites	Managed Lane	Transit
Cost				
Safety / Emergency Response				
System Performance / Community Impacts				
Optimize Existing Infrastructure				
Shovel Ready?				
Community Support				

EVALUATION CRITERIA	Long-Term (more than 5 years)			
	ALTERNATIVE 9	ALTERNATIVE 10	ALTERNATIVE 11	ALTERNATIVE 12
	Intersection Improvements	Widen U.S. 180	Forest Road Winter Bypass	High Speed Gondola
Cost				
Safety / Emergency Response				
System Performance / Community Impacts				
Optimize Existing Infrastructure				
Shovel Ready?				
Community Support				

RANKING CRITERIA

	EXCELLENT		GOOD		MODERATE / NEUTRAL		FAIR		POOR
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