



Big Sky Town Center Traffic Calming Project

SUMMER 2022 & 2023

A PROJECT IN PARTNERSHIP WITH:



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Disclaimer

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Availability of Dataset

The dataset for this report is available upon request.

*Video data is available upon request from the Western Transportation Institute (WTI)

Table of Contents

Project Background	1
Pop-Up Project Process	2
Project Timeline.....	3
Community Engagement.....	3
Design	4
Data Collection	5
Data Collection Process & Dates	5
Speed and Volume Data	5
Driver Yielding Rates.....	7
Public Comment/Survey Results	8
Discussion	11
Next Steps.....	12
Limitations & Challenges	15
Resources	16
Appendix A – Final Summary Report for the Walk Audit	A-1
Appendix B – Final Sketches and Materials Lists.....	B-1
Appendix C – Outreach Materials	C-1
Appendix D – Survey Monkey Results	D-1

Table of Tables

Table 1. Ousel Falls & Lone Peak Dr, north bound and south bound speed & volume. Negative values (green boxes) in the Difference column indicate traffic changes that are beneficial for pedestrians.	6
Table 2. Ousel Falls midblock between Aspen Leaf & Trotwood Circle, north bound and south bound speed & volume counts. Negative values (green boxes) in the Difference column indicate traffic changes that are beneficial for pedestrians.....	6
Table 3. Pedestrian counts and driver yielding rates at the crosswalk north of Ousel Falls and Lone Peak Dr north intersection.....	7
Table 4. Pedestrian counts and driver yielding rates at the crosswalk on Ousel Falls Road at the transit center stop.....	8

Table of Figures

Figure 1. Map of Montana with Gallatin County and the Town of Big Sky highlighted.	1
Figure 2. Ariel view of Big Sky Town Center. Yellow circles indicate marked pedestrian crossings.	1
Figure 3. Pop-up Project Process.....	2
Figure 4. Traffic Calming Timeline beginning in January 2022, and ending in November 2023.	3
Figure 5. The Community Engagement Model used by WTI staff.....	3
Figure 6. A sketch of a curb extension that decreases the overall width of the roadway for pedestrians.....	4
Figure 7. A sketch of a gateway curb extension.	4
Figure 8. Data collection site locations: cameras denoted by red stars, and radar units by blue circles.	5
Figure 9. Pie Charts of Driver Yielding Rates at Ousel Falls Rd and Lone Peak Drive north intersection.....	7
Figure 10. Pie Charts of Driver Yielding Rates at Ousel Falls Rd. Transit Center Stop.....	8
Figure 11. Perceptions of visibility amongst different road users at Ousel Falls traffic calming installations.	9
Figure 12. Driver perceptions of speed (left) and pedestrian perceptions of safety at crossings (right).	9
Figure 13. Word cloud of common responses from the Big Sky Pop-up Project open ended question.....	11
Figure 14. Comparing vehicle speeds with a pedestrian's risk of severe injury or death (Tefft 2011)	11
Figure 15. Gateway curb extensions on Ousel Falls Rd.....	13
Figure 16. Transit stop curb extension on Ousel Falls Rd.....	13
Figure 17. Proposed curb extension at Ousel Falls Rd & Aspen Leaf.	14
Figure 18. Bus stop (left) and roundabout (right) street art - WTI.....	14
Figure 19. Areas of needed safe connection identified through community conversations.	15

Project Background

The Town of Big Sky is located in southwestern Montana, approximately 45 miles south of Bozeman and 45 miles north of West Yellowstone (Figure 1). Big Sky lies in the center of Gallatin County in the Gallatin River Basin, just northwest of Yellowstone National Park. A vibrant mountain community of approximately 1,500 year-round residents, Big Sky features year-round outdoor recreation and an authentic mountain town atmosphere (visitbigsky.com, 2023).

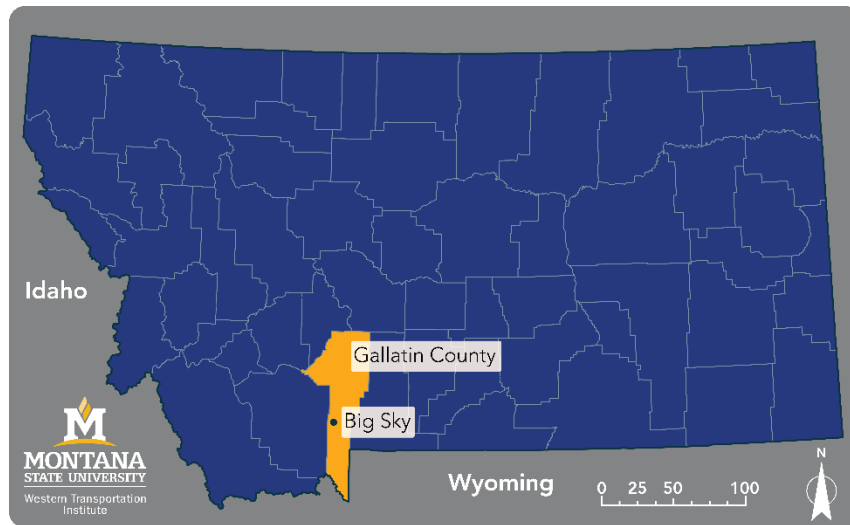


Figure 1. Map of Montana with Gallatin County and the Town of Big Sky highlighted.

Staff from the Big Sky Community Organization (BSCO) reached out to the Western Transportation Institute (WTI) to discuss a potential collaboration around exploring vehicle speed and pedestrian visibility and safety in the Town Center area and adjoining neighborhoods. Ousel Falls Road was a primary focus, as it goes through the Town Center with high pedestrian use, and it sees significant heavy vehicle and construction traffic because it is the main connecting road between Highway 64 and the Yellowstone Club. Since Big Sky is unincorporated, the project had to be approved through Gallatin County. See Figure 2 for the initial scoped area of the project.



Figure 2. Ariel view of Big Sky Town Center. Yellow circles indicate marked pedestrian crossings.

WTI is part of Montana State University-Bozeman (MSU) and is the largest research institute in the Nation focusing on rural transportation issues. For this project, WTI provided technical assistance to BSCO for a demonstration (often called a “pop-up”) project aimed at lowering traffic speeds and increasing pedestrian

safety. WTI assistance included planning, installation and removal of infrastructure, data collection and analysis, and final reporting.

WTI has been involved in the implementation of pop-up projects in Bozeman, Big Sky, Ennis, Hamilton, and Helena, Montana since 2017. During this time, staff from WTI have worked with multiple municipal, organizational, and business partners. Standards for the pop-up installations were crafted with guidance from the [Burlington, VT Quick Build Guide](#) and the [Tactical Urbanism Toolkit](#). All projects follow the standards laid out in the Manual on Uniform Traffic Control Devices (MUTCD).

Pop-Up Project Process

Pop-up traffic calming projects work to slow traffic and increase pedestrian/cyclist safety. A temporary pop-up traffic calming project uses low-cost, temporary materials for the testing of different strategies to see their impact on driver and pedestrian behaviors. The goals of pop-up traffic calming projects are defined by the community and allow for community input on design and implementation before construction begins on a long-term project. Data are collected throughout the process to determine the effectiveness of the installation. Figure 3 shows a representation of the pop-up process utilized by WTI.

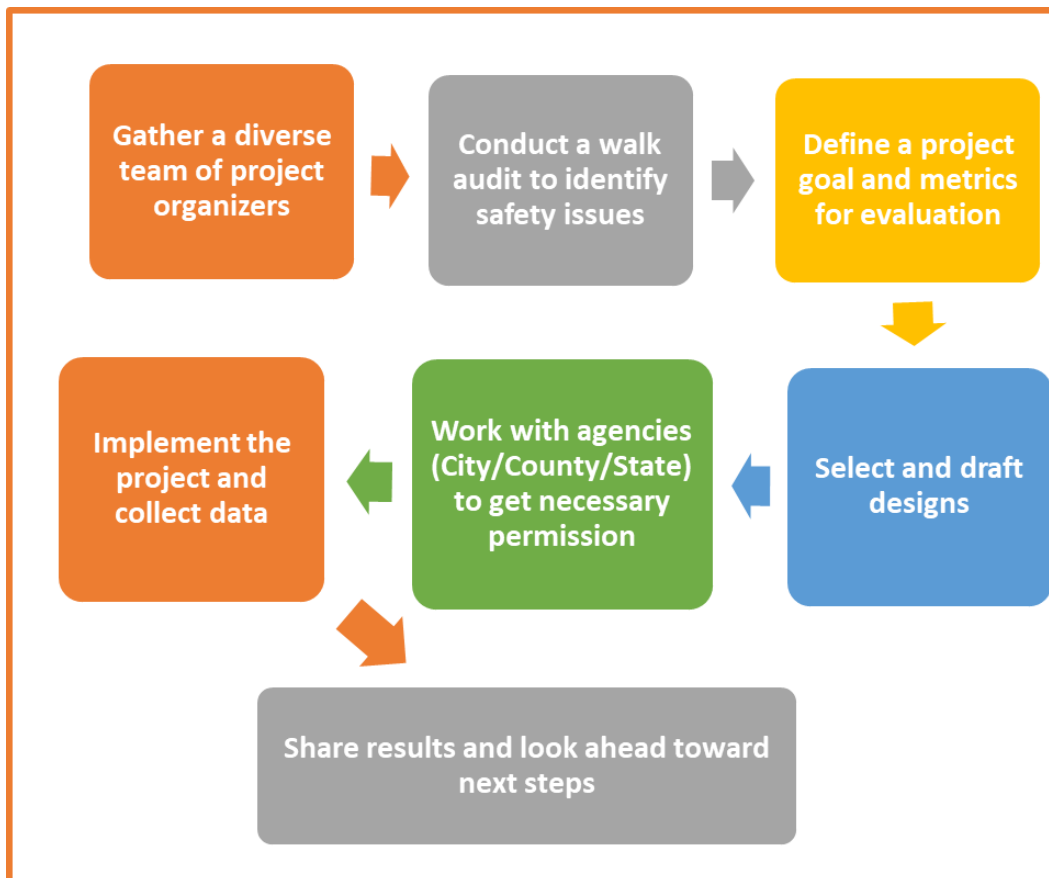


Figure 3. Pop-up Project Process

Pop-up projects also provide an opportunity to test out different uses for a street’s public space. For example, extending the curb further into the street not only helps increase the visibility of pedestrians to motorists, it also creates space for other uses, such as parklets (small in road parks or cafes) or street art.

Project Timeline

The overall timeline includes everything from the initial meetings to delivery of the final product by WTI staff. This project experienced slight deviation from the original planned timeline due to circumstances outside the control of WTI or BSCO staff. Those issues will be discussed more in the Limitations & Challenges section at the end of the report.

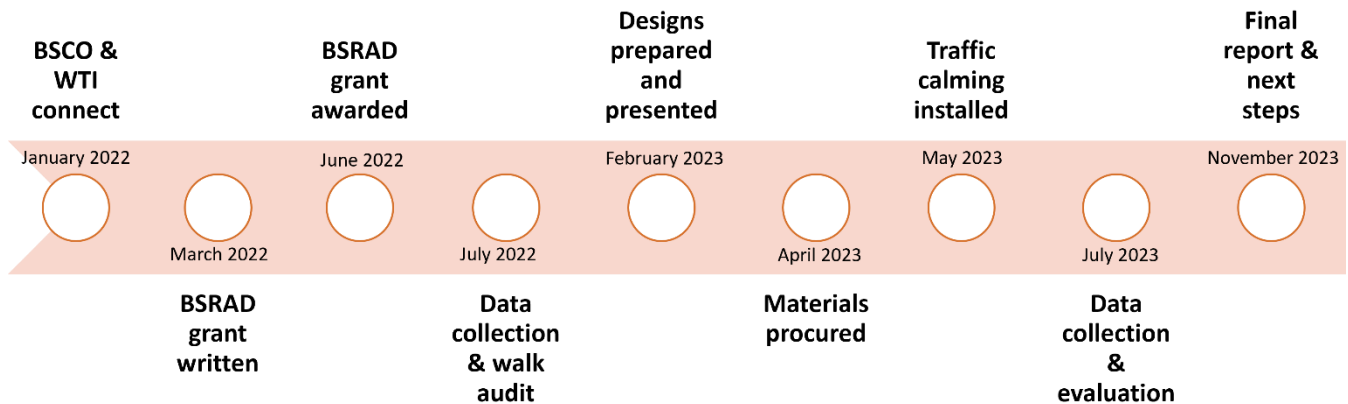


Figure 4. Traffic Calming Timeline beginning in January 2022, and ending in November 2023.

Community Engagement

Throughout the process, there were multiple opportunities and avenues for community engagement. From a community walk audit that was conducted in October of 2022 (the final report can be found in Appendix A –) to multiple community meetings held throughout the fall and winter of 2022-23. WTI staff worked with BSCO staff and other community partners to solicit input and feedback on the process.



Figure 5. The Community Engagement Model used by WTI staff.

Design

After the data collection phase was completed, staff from WTI worked with staff from BSCO, as well as other community partners, to begin the process of recommended design. Based on the data, as well as configuration of the vehicular travel and current roadway features, it was decided that curb extensions (Figure 6) would be the best fit at the three main town center crossings. In addition, a gateway treatment (Figure 7) along Ousel Falls Rd south of Town Center was recommended to help slow vehicles as they approach the Town Center area.



Figure 6. A sketch of a curb extension that decreases the overall width of the roadway for pedestrians.

Once the design ideas were presented and approved by the partners, materials procurement occurred and the project began moving into the installation phase. Due to the nature of Ousel Falls Rd, and since the road maintenance falls to a Rural Improvement District (RID), the encroachment permit was different from those in other municipalities. WTI and BSCO worked with Morrison Maierle, the firm that manages the RID for the roadway, to obtain the encroachment permit.



Figure 7. A sketch of a gateway curb extension.

Data Collection

Data Collection Process & Dates

WTI conducted both the pre- and post-installation data collection and analysis on the pop-up traffic calming project. Each of the different data sets were collected with different tools and parameters. The following data collection tools were utilized for this project:

1. Speed & Volume Data – Houston Radar Armadillo Unit and Houston Radar Analysis Software
2. Driver Yielding Rates – Spack Industries CountCam2 Traffic Cameras & City of Milwaukee Pedestrian County Analysis Parameters (Milwaukee 2019).
3. Community Survey – Survey Monkey Online Platform and Analysis Software.

The collection sites for the project are identified in Figure 8. The red stars indicate the camera locations, and the blue circles indicate the location of the radar units.



Figure 8. Data collection site locations: cameras denoted by red stars, and radar units by blue circles.

Data were collected on the same days of the week for both pre- and post-installation. The dates coincided with a Wednesday to Tuesday data collection period. For the sake of clarity, the following dates were used for data collection:

1. Pre-Installation - August 18th to September 6th, 2022
2. Post (during) installation - July 20th to August 3rd, 2023

It is important to note that post-installation data collection was completed after an initial desensitization period of 30 days from the date of installation.

Speed and Volume Data

Speed and volume data were collected in two locations along Ousel Falls Rd, where the speed limit is 25 miles per hour (mph). They included midblock between both intersections of Lone Peak Dr and midblock between Aspen Leaf & Trotwood Circle. Table 1 shows vehicle speed and volume data at Ousel Falls and Lone Peak Dr separated into northbound and southbound directions. Initial analysis of the data from the northern portion of the Ousel Falls Rd traffic calming project shows that there were relatively small changes in driver speeds pre- and post- (during) project.

Table 1. Ousel Falls & Lone Peak Dr northbound and southbound traffic speed & volume. Negative values (green boxes) in the Difference column indicate traffic changes that are beneficial for pedestrians.

Metric	North Bound (pre-)	North Bound (post-)	Difference	Metric	South Bound (pre-)	South Bound (post-)	Difference
Average Speed	20.4 mph	19.4 mph	- 1.0 mph	Average Speed	20.9 mph	21.3 mph	+ 0.4 mph
Average Daily Traffic	2663	2677	N/A	Average Daily Traffic	2693	3122	N/A
85 th Percentile	24.0 mph	23.0 mph	- 1.0 mph	85 th Percentile	25.0 mph	26.0 mph	+ 1.0 mph
% Speeding	6.1%	5.8%	- 0.3%	% Speeding	13.3%	16.6%	+ 3.3%
Max Speed	61 mph	52 mph	- 9.0 mph	Max Speed	70.0 mph	71.0 mph	+ 1.0 mph

Table 2 shows vehicle speed and volume data at the Ousel Falls midblock location south of Aspen Leaf Drive separated into northbound and southbound directions. Notably, the percentage of speeding drivers decreased by almost 10% in both directions at this location.

Table 2. Northbound and southbound traffic speed & volume counts at Ousel Falls midblock between Aspen Leaf & Trotwood Circle. Negative values (green boxes) in the Difference column indicate traffic changes that are beneficial for pedestrians.

Metric	North Bound (pre-)	North Bound (post-)	Difference	Metric	South Bound (pre-)	South Bound (post-)	Difference
Average Speed	26.1 mph	25.2 mph	- 0.91 mph	Average Speed	28.0 mph	27.2 mph	- 0.8 mph
Average Daily Traffic	2681	2735	N/A	Average Daily Traffic	2689	3278	N/A
85 th Percentile	31.0 mph	30.0 mph	- 1.0 mph	85 th Percentile	32.0 mph	32.0 mph	No Change
% Speeding	58.6%	49.6%	- 9.0%	% Speeding	75.5%	63.6%	- 11.9%
Max Speed	60 mph	64 mph	+ 4.0 mph	Max Speed	69.0 mph	66.0 mph	- 3.0 mph

Driver Yielding Rates

Driver yielding rates measure how often drivers yield to a pedestrian that has approached and is attempting to cross the street at a marked crossing. Data are collected via camera and then analyzed using the City of Milwaukee driver yielding methodology used by WTI in previous pop-up projects. Table 3 displays the total observed number of pedestrians, driver yielding opportunities, and driver yielding rates at the crosswalk at the north intersection of Ousel Falls Rd & Lone Peak Dr. Based on the data collected and analyzed from this location, driver yielding rates improved by 17.6% after the installation of curb extensions. Figure 9 shows the data as a visual pie chart.

Table 3. Pedestrian counts and driver yielding rates at the crosswalk north of Ousel Falls and Lone Peak Dr north intersection.

Curb Extensions	# of pedestrians	Driver Yielding Opportunities	# of Drivers who yielded	% yielding
Without Curb Extensions	426	104	63	60.6%
With Curb Extensions	663	193	151	78.2%
% Change in Yielding Rates with Curb Extensions				+ 17.6%

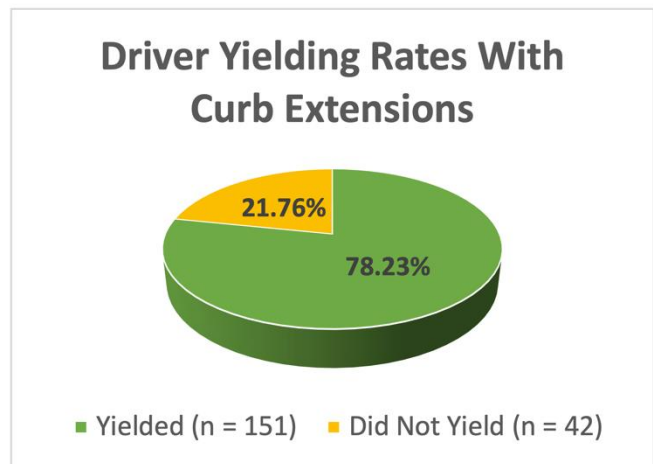
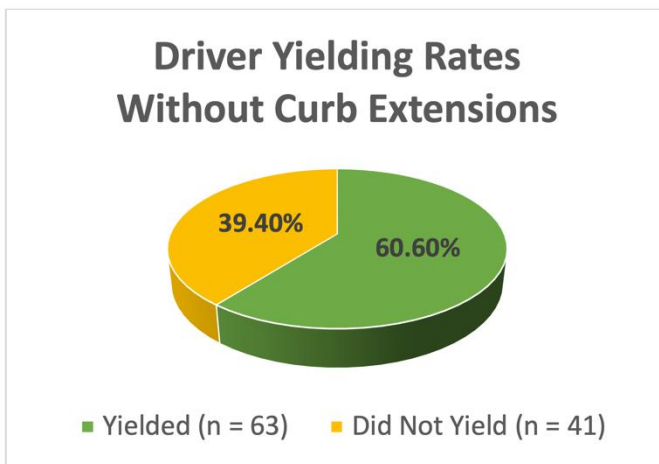


Figure 9. Pie Charts of Driver Yielding Rates at Ousel Falls Rd and Lone Peak Drive north intersection.

Table 4 displays the observed total number of pedestrians, driver yielding opportunities, and driver yielding rates at the crosswalk at the south intersection of Ousel Falls Rd & Lone Peak Dr. Based on the data collected and analyzed from this location, driver yielding rates improved by 7.6%. Figure 10 shows the data as a pie chart.

Table 4. Pedestrian counts and driver yielding rates at the crosswalk on Ousel Falls Road at the transit center stop.

Curb Extensions	# of pedestrians	Driver Yielding Opportunities	# of Drivers who yielded	% yielding
Without Curb Extensions	419	46	34	73.9%
With Curb Extensions	972	112	91	81.3%
% Change in Yielding Rates with Curb Extensions				+ 7.6%

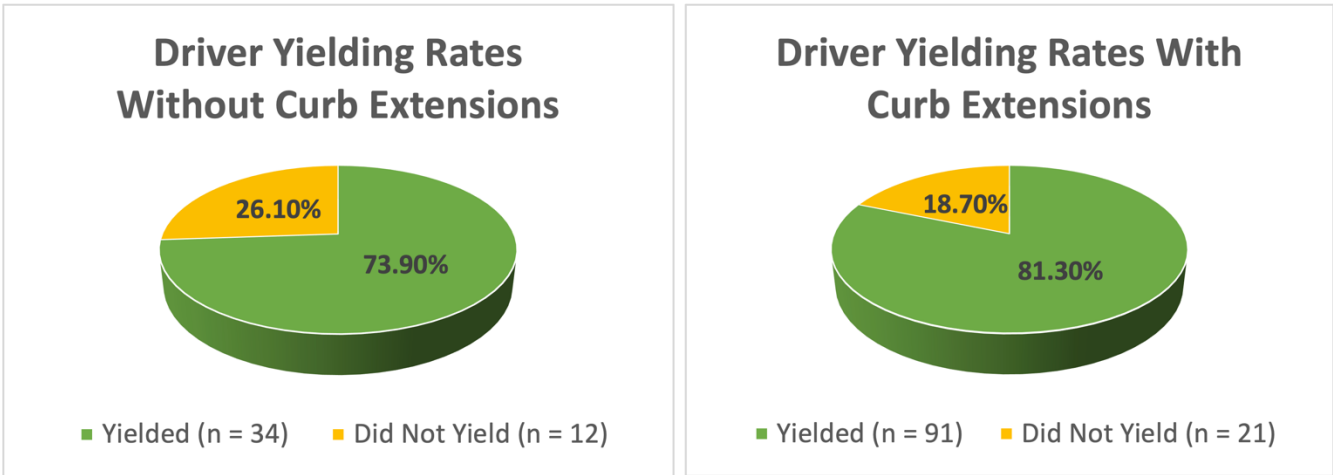


Figure 10. Pie Charts of Driver Yielding Rates at Ousel Falls Rd. Transit Center Stop

Public Comment/Survey Results

More than 100 people responded to the community survey conducted after the installation of the pop-up traffic calming project in Big Sky. This feedback is an important part of the pop-up project process and can be used by BSCO and partners as they move forward with future planning. The survey tool was created in partnership with staff at BSCO and met all the requirements set forth by the Institutional Review Board (IRB) at MSU. The survey asked respondents for their opinion of the temporary traffic calming features, its safety and visual appearance, their support of future projects, as well as where they lived. Key takeaways from the survey included the following (full survey responses and analysis can be found in Appendix D – Survey Monkey Results):

1. More than 80% of respondents live in the Big Sky area year-round; people living in Town Center (37%) and Meadow Village (33%) make up most of them. Seventeen percent of respondents live either in Bozeman or somewhere else and traveled through the project area.

2. Sixty percent of respondents traveled through the project area driving or riding in a personal vehicle, while approximately 19% of respondents traveled on foot and 17% traveled through on bike. This is important to note as drivers often have different perceptions than people walking or biking.
3. Respondents were asked about pedestrian visibility and safety for those who were on foot, as well as those driving cars, based on their reported mode of travel. The overall response rate, as well as the responses broken down by travel mode, are shown in Figure 11. Figure 12 shows crossing safety perceptions for pedestrians only.

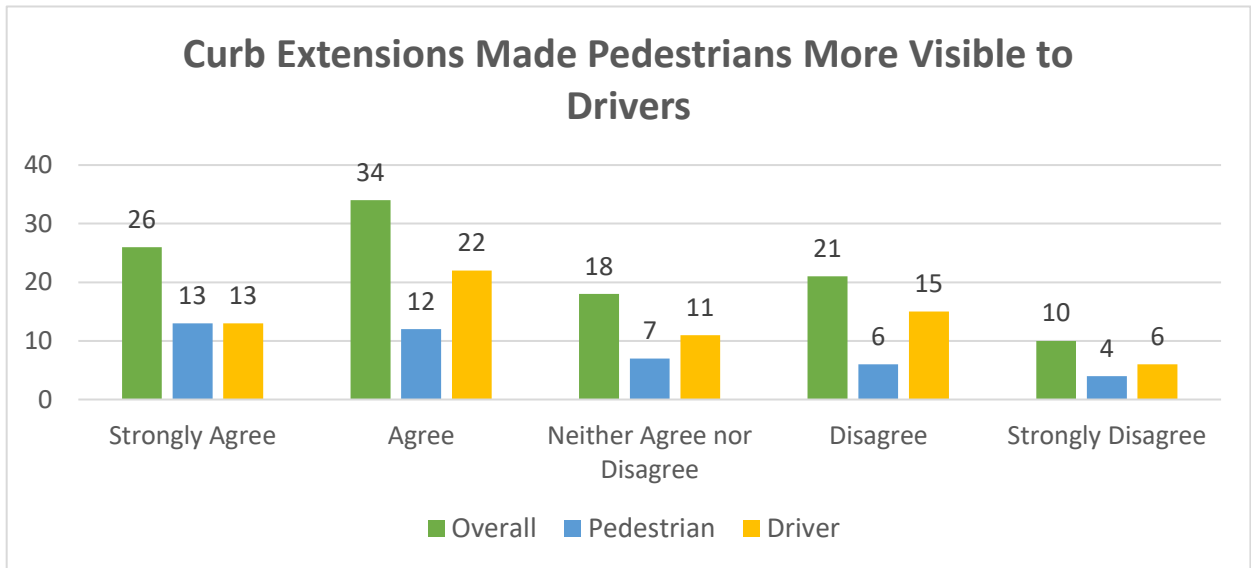


Figure 11. Perceptions of visibility amongst different road users at Ousel Falls traffic calming installations.

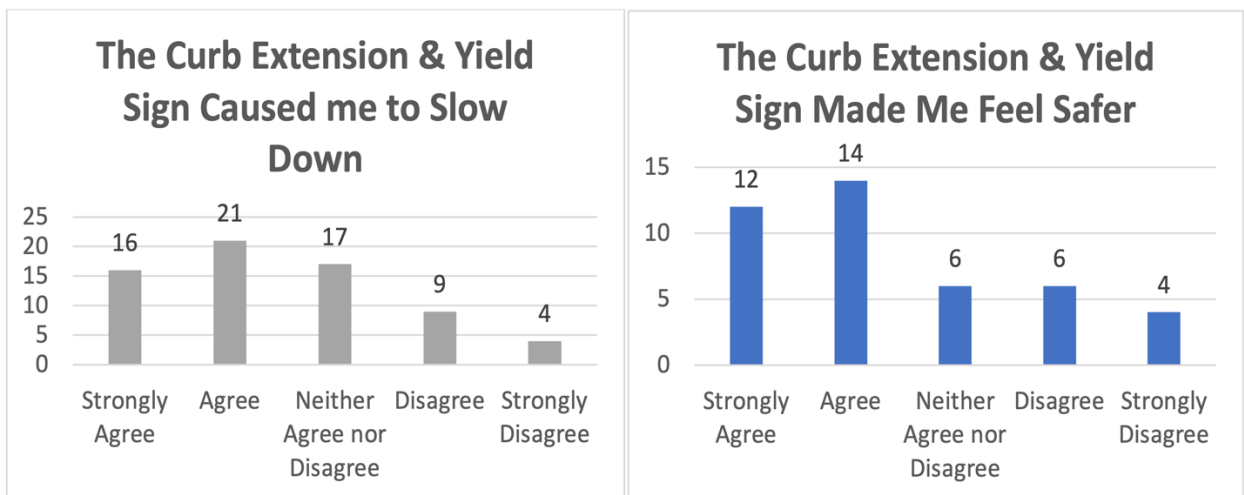


Figure 12. Driver perceptions of speed (left) and pedestrian perceptions of safety at crossings (right).

4. All user groups in the survey were asked for their perceptions of the overall project as well as any recommendations that they may have for how it could be improved. Common themes that occurred were:
 - a. Safety
 - b. Heavy traffic volume and high speeds
 - c. Road noise
 - d. Construction traffic and the noise and other issues associated with it
 - e. Smart Place-making including street art, planters, or other aesthetic enhancements.
5. Survey respondents had the opportunity to provide comments on all of the questions on the survey. Examples of two comments that provided constructive and direct feedback, one in favor of the project and one opposed, are included here to show differing opinions amongst residents.
 - a. **Opposed to the project:**
 - i. *I don't think this project can be successful unless the amount of traffic in big sky is either reduced or somehow staggered or limited. People in cars are often frustrated and aggressive in cars in Big Sky. The traffic is very frustrating in Big Sky so I don't blame them. Ousel falls road should really be avoided by bikers and pedestrians. I avoid it as much as possible.*
 - ii. *I am all for effective management of the traffic through my town and neighborhood, but the planters created a hazard and an obstruction when traveling on a bike because it requires the rider to thread the needle between the planter and the curb or swerve around it into traffic. Bike lanes or something like them with some kind of bollard/reflective post protection would have accomplished the same visibility without the obstruction.*
 - b. **In favor of the project:**
 - i. *I would support them at as many primary cross streets as possible. Near/around the Fire Department, and the three commercial buildings in West Fork. Install them as far down as possible on Ousel Falls Road. What would also help is having the corners on Ousel Falls heading North mowed or somehow cut back. The high mounds and tall grasses, although pretty and a good example of natural landscaping, make it extremely difficult to "look both ways" for vehicles or pedestrians. Work with the HOAs that have condos on those corners. Thank you for doing this survey!*
 - ii. *I think this was a good start, but more could be done. It's too bad a major through street was designed into the middle of town center when it was built but if that can't be changed at this point, I think we should have more permanent traffic calming installations. Permanent crosswalk bump-outs with curbs should be built and flashing light crosswalk markers should be installed. If this can't be done, then the proposed future steps of additional temporary crosswalk markers would still help. I also think the sheriff could sit there more often during rush hour to get people and especially the dirt haulers to slow down.*

This was only a summary of the community survey results (Figure 13). The complete survey results including all responses can be found in Appendix D – Survey Monkey Results.

pedestrian crossing Little Coyote Rd still increase traffic also worse light vehicles
 Little Coyote start town center sign road ousel falls road slow seen
 crossing work people big pedestrians areas
 traffic Cars crosswalks helps going stop light speed
 truck need s Big Sky already ousel falls think Better created Walk
 trying cross around around town center stop used

Figure 13. Word cloud of common responses from the Big Sky Pop-up Project open ended question

Discussion

The Big Sky pop-up project gave the community an opportunity to test out different traffic calming designs at significantly lower cost than an actual construction project. The pop-up project was designed through an iterative process that required collaboration among multiple partners before installation. Once the installation was complete, community input and other data were collected to determine attitudes and the effectiveness of the traffic calming. This feedback and data are intended to help decision makers develop a long-term plan for managing the safety of all road users along Ousel Falls Rd and in other areas of Town Center in Big Sky.

One success of the project was the collaboration between the WTI, BSCO, BSRAD, TCOA, the Big Sky Chamber, and Lone Mountain Land Company.

Community engagement, input, and feedback is an important component of a successful pop-up project. This project utilized multiple opportunities and formats to get the word out, engage with partners, and outreach into the community. Through these processes, it was determined that the issues of safety and noise along the Ousel Falls Rd corridor of Town Center were a priority. From there, vehicle speed and volume data and driver yielding data were collected. Speed is a very important factor when it comes to overall pedestrian safety because crashes that occur at lower speeds result in less serious injury and fewer deaths, as is illustrated in Figure 14 (Tefft, 2011).

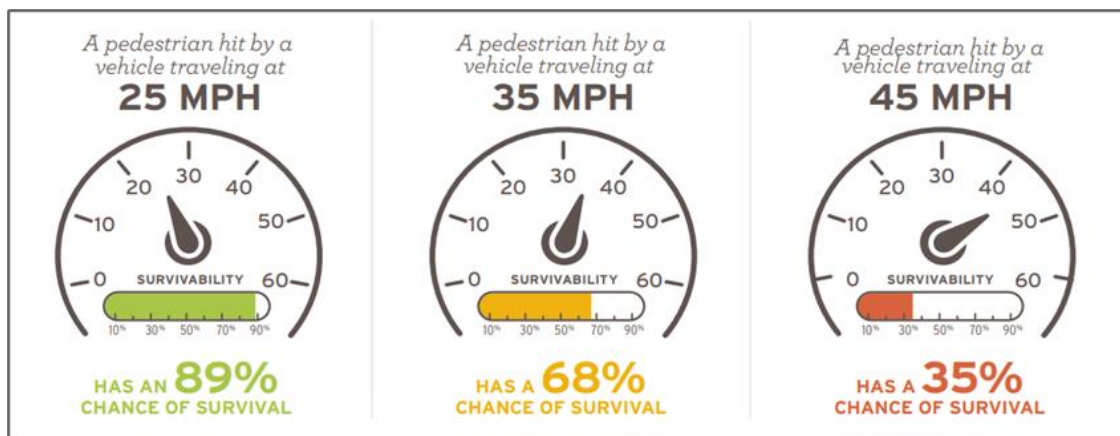


Figure 14. Comparing vehicle speeds with a pedestrian's risk of severe injury or death (Tefft 2011)

Data indicates that the project helped make some progress toward the community goal. Two curb extensions were installed at main East/West crossings along Ousel Falls Rd. Based on data from the crosswalk studied at the north end of the project site, driver yielding rates increased by 17% after the installation of the curb extensions, which means that 17% more drivers yielded for pedestrians who were waiting to cross. At the curb extension near the Town Center transit stop, driver yielding rates increased by 7%, meaning that 7% more drivers yielded to pedestrian waiting to cross. Factors that may improve driver yielding rates include increased pedestrian visibility, slower vehicle speeds, and narrower roadways. All these factors can be addressed through the installation of curb extensions.

Speed data collected along the entire Ousel Falls corridor from Lone Peak Dr to Simkins Dr showed a 1 mph decrease of 85th percentile speed in the northbound direction while southbound traffic saw an increase of 1 mph and no change respectively (Table 1). The only other notable data point in the speed and volume data was that, at the data collection point south of Town Center between Aspen Leaf and Simkins Dr, the percentage of drivers speeding decreased by 10%.

Community input is another important component of the pop-up process. This project had more than 100 respondents to the community survey - over 80% of them were year-round Big Sky residents. Based on the results, many respondents agreed that this project improved perceived safety and visibility of pedestrians. Respondents shared that they would like the community to continue doing more to improve overall safety, decrease vehicle speed, and make Big Sky the livable community that residents want to see.

The placemaking portion of the project was not successfully completed before the pop-up's removal in October. Placemaking in the form of street art could have occurred in the space created within the curb extensions. Now that the process has been installed for one year, it will be easier to reach out and make connections with possible partners over the winter to plan and design street art. It is also another opportunity to participate in community engagement around the project.

Next Steps

The data collected, neighborhood engagement, and public input during this project lay an important foundation for continued traffic calming efforts in the Big Sky area. These traffic calming projects are iterative and can result in multi-year temporary traffic calming measures until street reconstruction occurs and permanent traffic calming solutions can be installed. Based on the fact that driver yielding rates increased at both project locations, as well as other quantitative and qualitative data collected and analyzed for the project, WTI makes the following recommendations for next steps.

1. Data showed a high percentage of drivers speeding as they exited or approached south of the Town Center area. Additional traffic calming, in the form of gateway treatments, can be tested to see if more changes to roadway features will slow traffic. If this approach is chosen, it is recommended that more community conversation is held around the perception of the parking lane being a bike lane. It is also recommended that more wayfinding signage and markings are installed to indicate the safest and recommended routes for people riding bikes as they enter and exit town center.

2. Based on the improved driver yielding rates, BSCO should re-install the temporary curb extension north of the northern intersection of Ousel Falls Rd & Lone Peak Dr (Figure 15). The curb extension on Ousel Falls Rd right at the Town Center transit stop (Figure 16) should also be reinstalled but it should be extended an additional 12 inches into the roadway to provide more roadway narrowing.



Figure 15. Gateway curb extensions on Ousel Falls Rd.



Figure 16. Transit stop curb extension on Ousel Falls Rd.

3. The original plan was to install curb extensions at the intersection of Ousel Falls Rd and Aspen Leaf (Figure 17) but, due to construction constraints, that part of the project was not completed. See the Limitations & Challenges section for more explanation. Next year, it is recommended that BSCO install the originally recommended curb extensions at the intersection of Ousel Falls Rd and Aspen Leaf.



Figure 17. Proposed curb extension at Ousel Falls Rd & Aspen Leaf.

4. When curb extensions are installed, the space created can be used for street art (Figure 18). WTI recommends a partnership with the Big Sky Arts Council, Big Sky High School, and/or other community organizations to design and install art features that capture the culture and style of Big Sky.



Figure 18. Bus stop (left) and roundabout (right) street art - WTI

5. Lone Mountain Land Company has been working on a master plan for the Town of Big Sky. It is important to include traffic calming designs for the main pedestrian crossings along Ousel Falls Rd in the final recommendations/planning process. Information and evidence from this project and report can be cited as justification for the installations.

6. WTI recommends annual restriping of the existing crosswalks and side street crosswalks throughout Town Center. Given the nature of winter street maintenance in a location like Big Sky, roadway surface paint is generally worn thin by spring and has resulted in faint-to-not-visible crosswalks in previous summers. This will ensure that the crosswalks maintain high retro reflectivity to improve visibility.
7. Finally, this project included the creation of a traffic calming toolkit. BSCO and its community partners can use it to expand the initial scope of the project to include neighborhoods and areas that are connected via periphery to Town Center. Creating connections to and from Town Center will allow for the continued improvement of an overall bikeable and walkable community. The figure below shows other areas identified on the periphery of Town Center.

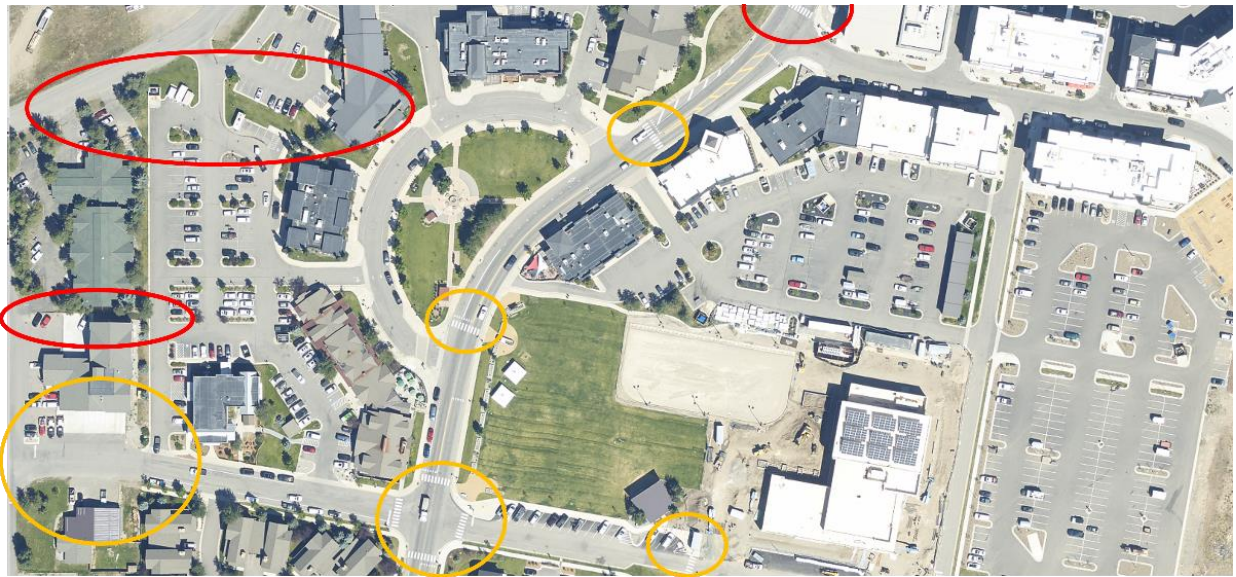


Figure 19. Areas of needed safe connection identified through community conversations.

Limitations & Challenges

Limitations in a project are important to note and are anything that may impact the outcome of the overall project. In addition, limitations provide an opportunity to identify additional areas of need and come up with creative solutions, so projects move forward in a positive way. For this project, a few limitations were identified:

1. The original recommendation for traffic calming included curb extensions at the intersection of Ousel Falls Rd and Aspen Leaf Dr. However, due to a large housing construction project, Ousel Falls Rd needed to remain clear at the intersection for the delivery and installation of modular units. This did not allow for the full installation.
2. The TIGER grant construction project along Highway 64 occurred at the same time as the traffic calming project. This was good for visibility and the ability to collaborate with other partners who are doing construction in the area. However, as shown by survey results, many people confused this project with the TIGER grant, which did not allow for the best community perception and survey results.
3. Big Sky is a year-round recreational destination known for skiing in the winter, which means that there is still high-volume pedestrian traffic during the winter. Due to the seasonality of road maintenance in Montana, the installations need to be removed in mid-October so the streets are free for plowing and snow storage. This means the removal of traffic calming at a time when it could still be beneficial.

Resources

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Appendix A – Big Sky Town Center/BSCO Project Walk Audit Summary

Big Sky Town Center/BSCO Project Walk Audit Summary

The Big Sky Community Organization (BSCO), partnered with the Western Transportation Institute (WTI), was awarded a grant from the Big Sky Resort Area District to collect bicycle, pedestrian, and vehicular usage data and develop pop-up traffic calming solutions for the Town Center with connectivity to adjacent neighborhoods. A walk audit was conducted on Thursday August 25th from 2 to 6pm as one part of the data collection process. Big Sky residents, business owners, and local employees participated in the walk audit to observe traffic and share their perspectives on safety in the Town Center area (Figure A-1).

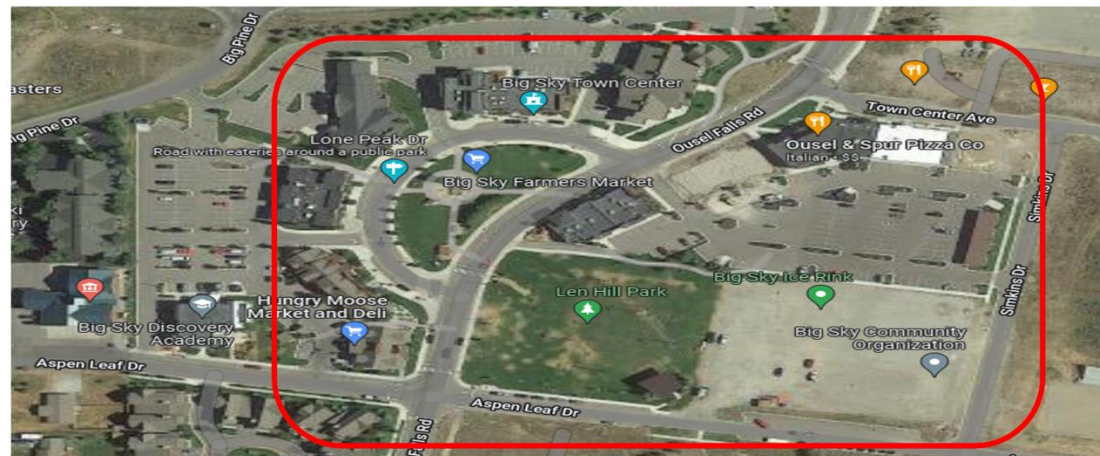


Figure A-20: Aerial view of Big Sky Town Center. The red square indicates the walk audit focus area.

Walk Audit Attendees and Affiliations

Facilitator: Matthew Madsen – Western Transportation Institute

Participants: Darren Brugmann – Big Sky Transportation District (BSTD), John Bowersox – Lone Mountain Land Company (LMLC)/Town Center Owners Association, Ashley Wilson – Big Sky Community Organization (BSCO), Adam Johnson – BSCO, Daniel BierSchwale – Big Sky Resort Area District, Tammy Estensen – Big Sky Owners Association, Brad Niva – Big Sky Chamber, Bayard Dominick – LMLC & BSTD, Katie Alvin – Arts Council of Big Sky

Background

WTI took the lead in facilitating walk audits in the areas that were identified in the proposal. The purpose of these notes is to summarize the observations and perspectives shared during the walk audit.

Big Sky Town Center – Ousel Falls Rd

- Ousel Falls Rd runs south from Hwy 64, eventually leading to the entrance of the Yellowstone Club. It is on the Skyline Bus Route; the current transit center is on the west side of the road along the Fire Pit Park in the Town Center. It is also the main connecting road between Hwy 64 and the Yellowstone Club, so it sees heavy vehicle and construction traffic.
- The roadway surface width of Ousel Falls Rd is 40 feet curb to curb from Lone Peak Dr to Simkins Dr, and is 45 feet curb to curb from Hwy 64 to Town Center Dr.
- The speed limit on this stretch of road is 25 MPH.
- There are currently four striped pedestrian crossing at the following Ousel Falls Rd intersections:
 - Ousel Falls Rd and Aspen Leaf
 - Ousel Falls Rd and Lone Peak Drive South
 - Ousel Falls Rd and Lone Peak Drive North
 - Ousel Falls Rd and Town Center Dr
- WTI has received vehicle traffic and volume data from the planning and design firm Sanderson Stewart and will also collect more data relevant to the project to use a pre-installation data.

Big Sky Town Center – Aspen Leaf Dr

- Aspen Leaf Dr runs East/West from Spruce Cone Dr to Grey Drake Rd along the south edge of the Big Sky Town Center.
- The roadway surface width of Aspen Leaf Dr is 31 feet' when a parking lane is present and 23 feet at all intersections and midblock crossings.
- There is currently one midblock crossing striped at the Big Sky Town Center Park.
- The speed limit along this stretch of road is 25 MPH.

Criteria to Consider During a Walk Audit (adapted from Mark Fenton’s “Tips on Leading a Walk Audit” and Dan Burden)

1. **Land use/destinations:** Mixed use areas create a variety of amenities and attractions that allow pedestrians to make multiple stops for multiple purposes during an outing.
2. **Network connectivity:** Pedestrian facilities (sidewalks, crosswalks, paths) are continuous and consistent allowing people to get where they need and want to go without having to alter their route.
3. **Safety and accessibility:** Travel by any mode is safe, comfortable, and inclusive of people of all ages and abilities.
4. **Design:** Pedestrian facilities are functional and inviting. Human-scale design rewards pedestrians by incorporating:
 - a) **Transparency** at ground level creates a sense of being seen, watched over (storefronts optimally are 70-90% glass at ground level in more urban areas)
 - b) **Sense of enclosure** comes from separation from traffic by parking lane, greenspace, street trees - as well as from vertical boundaries such as awnings, string lights, hanging baskets, banners on light posts etc.
 - c) **Visual complexity** (as well as auditory and olfactory) and viewsheds reward those moving at slower speeds and create a unique sense of place.



Figure A-2: Ousel Falls and Aspen Leaf crossing looking east (left). Ousel Falls & Lone Peak Drive Crossing at the Skyline Transit Station (right).

Walk Audit Participants' Observations & Discussions

Town Center Plaza/Ousel Falls Rd

- Heavy volume and speed of traffic throughout the day, especially at “rush hour” times.
- The blind curve makes it difficult to see the crosswalks and pedestrians.
- The speed of the vehicles is very high along Ousel Falls Rd.
- There are lots of inattentive drivers.
- How do commuters work their way from Town Center back through the community and to the neighborhoods?
- The crosswalks at Hungry Moose and the Bus Stop (Figure A-3) are the busiest crosswalks, especially on Thursdays when there is live music and events in town.
- The crosswalk at Grizzly Outfitters is the busiest on Wednesday evenings when the farmers market is going on.
- Pedestrian flow at crossings can create issues for vehicle traffic due to lots of stopped cars.
- There is a lot of space for buses and when they are parked, it is difficult to see pedestrians trying to cross; walk auditors have seen many people play chicken with the cars while getting off the bus and crossing in front of or behind without going to the crosswalk.
- There is a constant stream of traffic coming from the Yellowstone Club.
- There is no lighting at nighttime. It is dark for sure, but there is less traffic.
- There are very few parks in Big Sky, and Fire Pit Park is important to the town center. It is like the town plaza; a hub/meeting place where the fire is going year-round and there is a place to gather.
- The Transit Center at Fire Pit Park exaggerates what is going on. In most towns, transit centers are not located right in the heart but a little on the periphery and then connected via walk, bike, other options. This might change but would still remain a stop.
- Sound is a major issue with constant noise – 87 decibels recorded in the short term.
- Not easy to park – there is no signage for folks who don’t already know where to go. Google maps doesn’t work well.
- Drivers can’t figure out how to get out of the area. People drive wrong way on Lone Peak Dr.
 - Simkins Dr – narrow roadway, hard to turn left or right during busy times.
 - The narrow roads do slow traffic down.
- The Chamber is currently collecting and analyzing cell phone data in the Big Sky area and is also in the process of doing a wayfinding project on Highway 64 through a state grant. It is a 2-3 year project that will focus on awareness of parking & space.

- Lots of complaints about construction life – noise and volume of traffic as well as uncovered loads being a safety issue.
- It's hard to turn left from Two Moons during periods of high traffic volume.
- The town center area is a community center with art and sculptures that needs to be utilized and connected.



Figure A-3: Skyline buses lined up at the transit center along Ousel Falls Road.

Town Center Drive

- Town Center Ave (figure A-3) – there are people parking in front of businesses, parking in accessible parking areas, and people parking in front of fire hydrants.
- Drivers stop in the drive lane and leave the car parked, especially seasonally.
- Only road that has a centerline, which helps people stay on their side of the road.
- Narrow lane widths, some of the turn radii might not work.
- Reduction of cars & usage.



Figure A-3: The intersection of Town Center Ave and Simkins Dr looking south.

Aspen Leaf

- Speed is a big issue on Aspen Leaf (Figure A-4).
- Why is there rear entry parking on this street?
 - People don't know what or how to do it so if this stays, there should be signage on usage and regulations.
- There is heavy bike/ped traffic on this road with folks accessing trails outside of town as well as commuting in the area.
- No signage or marking of it being a "bike/ped route."
- Folks use it to avoid the traffic of Ousel Falls Rd and it has become a bypass for truck traffic.
- It is currently the most painted road in Big Sky and the crosswalks have helped.
- Large parking lot adjacent to BASE could be the skier parking lot.



Figure A-4: Where the sidewalk ends on Aspen Leaf west of Ousel Falls Road (left). Aspen Leaf Road looking east towards BASE.

Participants' Suggested Solution

- Possible stop signs as a 4-way stop.
- Parking lot next to BASE utilized as the skier parking lot.
- Sidewalk connectivity from Town Center west towards Spruce Cone.
- Install RRFB's at the crosswalks on Ousel Falls Rd (Figure A-5).
- Repaint the crosswalks to increase visibility for drivers and pedestrians.
- Curb extensions to help with visibility and slowing traffic on Ousel Falls Rd.
- Build a Transit Center & move the transit center off the main road to reduce bus traffic.
- Connectivity throughout the community utilizing key points in town.
- Change the direction of Lone Peak Dr to put bus drop off on existing side of park.
- Better one way signage.



Figure A-5: RRFB Image from:
<https://xwalk.com/rrfb-flashing-beacons/>

Culture of Big Sky as a Community



Figure A-6: Music in the Mountains Big Sky, Photo from:
<https://bigskyarts.org/programs/musicinthemountains/>

- Dogs
- Recreation
- Want to walk and bike
- Connecting community (Figure A-6)
- Green Space
- Natural Elements
- Trees
- Aesthetically Pleasing
- It's a cute town
- Modern
- Wednesday, Thursday nights are key
- Fire Pit & Len Hill Park
- The mountain hub is down here

Other Comments/Thoughts

- The resort is getting more & more visitors and they are looking to utilize the town space to park and take transit.
- Sidewalks on the do not extend West or North of town center and into BSOA territory.
 - Creates disconnection and puts peds onto the roadway.
- How do Spruce Cone & Little Coyote fit into the overall connectivity of the community?
- Phase 2 & 3 of the project
- Connecting with the BSOA to discuss how to move the Morrison Maierle plans for traffic calming forward.

Next Steps

- The participants will receive the walk audit report and after final approval, it will be made public to be shared with the community and other partner organizations. The report will become a part of the data for the project.
- Data will continue to be collected by WTI to include the following:
 - Traffic Volume & Speed – utilizing a Houston Radar unit and analysis software.
 - Driver Yielding Rates – utilizing CountCam cameras and Milwaukee Driver Yielding Standards.
 - Pedestrian & Bicyclist Counts – utilizing EcoCounter portable bike/ped counters.
 - Community perception – utilizing SurveyMonkey online survey and data tools.
- Traffic calming sketches will be provided to partners for iteration and approval before being submitted to Gallatin County for approval through the encroachment permit process.
- Installation of interim traffic calming measures will occur in early to Mid-May and will remain in place through early fall for initial data collection.
- Removal will occur before winter maintenance in the fall of 2023
- WTI staff will create a toolkit for bicycle and pedestrian infrastructure within the Town Center and outward into residential areas and other HOAs.
- Possible traffic calming within the HOA managed areas of Big Sky.

Appendix B – Final Sketches and Paint Estimates

Yellow Curb Paint: two stretches of 20' (Figure 1) with no parking strip. Identified on Figure 2 in yellow and at same locations as curb extensions at the Ousel Falls & Aspen Leaf intersection.

White Lines: painted 4-6" wide with retroreflective beads. Left, right, and bottom of trapezoid on Figure 1 and in white on Figure 2.

Curb Extensions:

Ousel Falls Road & Aspen Leaf: 2 curb extensions, 1 on the southeast and northwest sides of the intersections (Figure 2 right).

Ousel Falls Road & Lone Peak Dr (South End – Transit Center): 1 curb extension on the southwest corner of intersection (Figure 2 left).

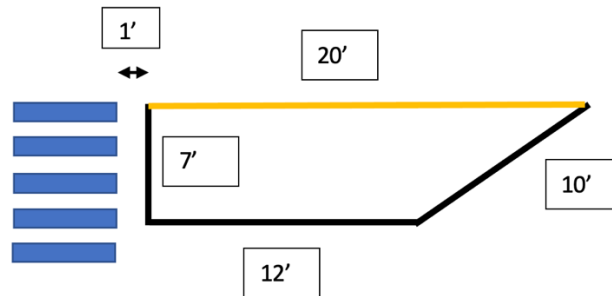


Figure B-1: Sketch of curb extensions for Ousel Falls Road.



Figure B-2: Ousel Falls & Aspen Leaf (right) with two curb extensions, one on the southeast and one on the northwest side of the intersection. Ousel Falls & Lone Peak Dr (left; South End – Transit Center) southwest corner of intersection.

Gateway Curb Extensions

Ousel Falls Road: gateway curb extensions (Figure B-3) on both the east and west side of the road (Figure B-4).

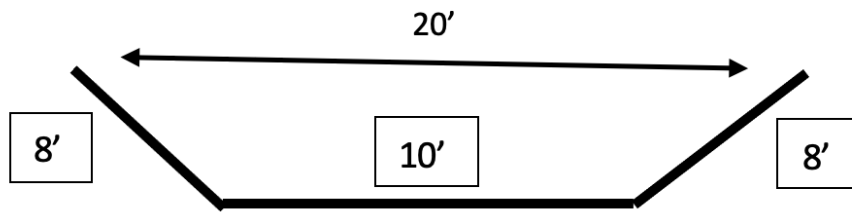


Figure B-3: Sketch of curb extension for Ousel Falls Road.



Figure B-4: Gateway curb extension on Ousel Falls Road.

Total Line distances:

White Paint – 142 linear feet total:

- 30' per curb extension x 3 = **90 linear feet**
- 26' per midblock curb extension x 2 = **52 linear feet**

Yellow Paint – 80 linear feet total:

- 20' per no parking zone x 2 = 40' yellow traffic paint on curb x 2 = **80 linear feet**

POP-UP TRAFFIC CALMING PROJECT

The curb extensions, planters and crosswalks installed along Ousel Falls Road are an effort to slow drivers and bring more visibility to pedestrian crossings.



This pop-up project allows designs to be tested and your input to be heard before investing in long-term solutions - let us know what you think!

SHARE YOUR INPUT

go to this link: surveymonkey.com/r/BigSkyPopUp

PROJECT MADE POSSIBLE BY



IRB PROTOCOL #: 2023-922-EXEMPT

Figure C-1: Big Sky community outreach materials example 1.

POP-UP TRAFFIC CALMING PROJECT

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PROJECT MADE POSSIBLE BY



IRB PROTOCOL #: 2023-922-EXEMPT

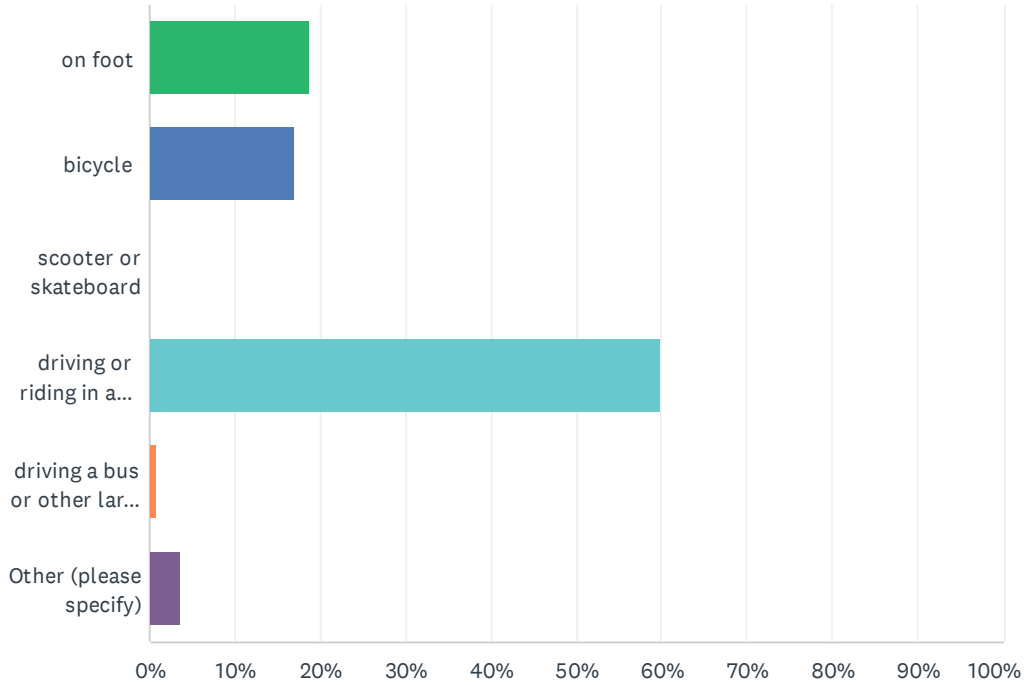
Figure C-2: Big Sky community outreach materials example 1.

Appendix D – Survey Monkey Results

Visualized survey results from the Big Sky Pop-up Traffic Calming Project Community Survey.

Q1 How did you travel through the Ousel Falls Road traffic calming project?

Answered: 112 Skipped: 0

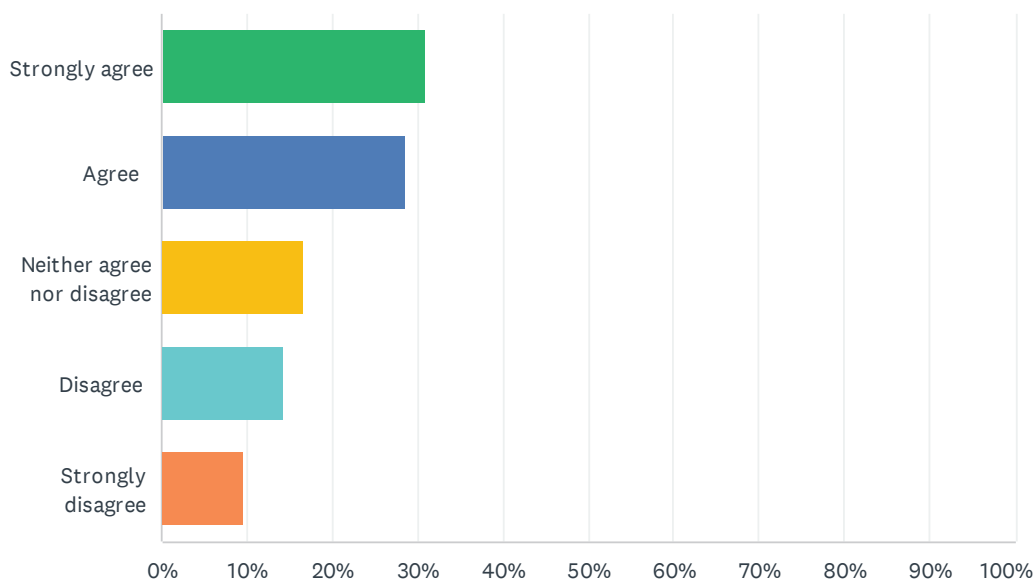


ANSWER CHOICES	RESPONSES	
on foot	18.75%	21
bicycle	16.96%	19
scooter or skateboard	0.00%	0
driving or riding in a passenger vehicle (car/truck/van)	59.82%	67
driving a bus or other larger vehicle (bus/RV/semi)	0.89%	1
Other (please specify)	3.57%	4
TOTAL		112

#	OTHER (PLEASE SPECIFY)
1	Foot, bike, and car
2	on foot, bike, and driving in my truck
3	both on foot and driving
4	Foot, bicycle and driving

Q2 The curb extensions made me feel more visible to drivers.

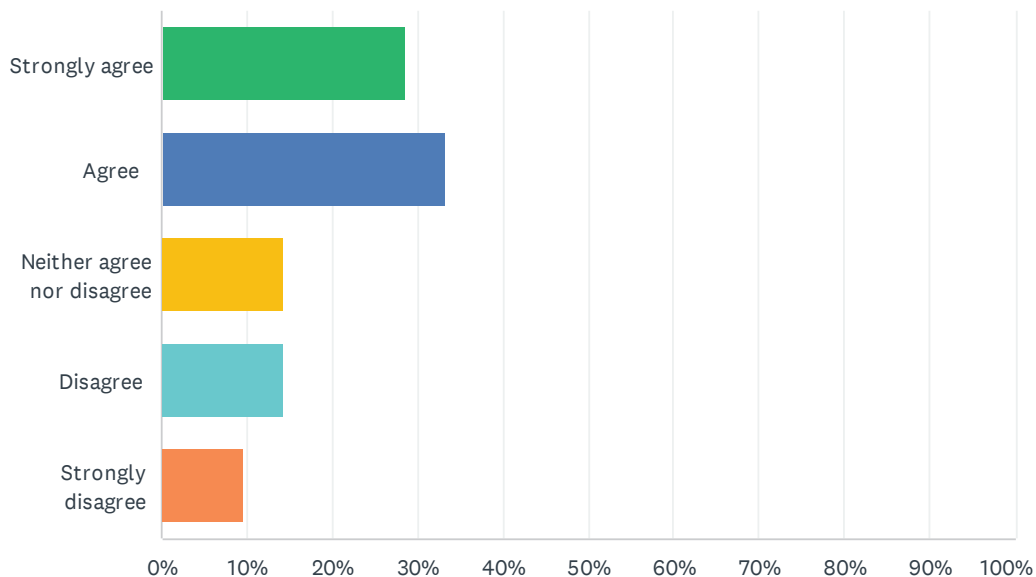
Answered: 42 Skipped: 70



ANSWER CHOICES	RESPONSES	
Strongly agree	30.95%	13
Agree	28.57%	12
Neither agree nor disagree	16.67%	7
Disagree	14.29%	6
Strongly disagree	9.52%	4
TOTAL		42

Q3 The curb extensions and pedestrian yield sign made me feel safer while crossing.

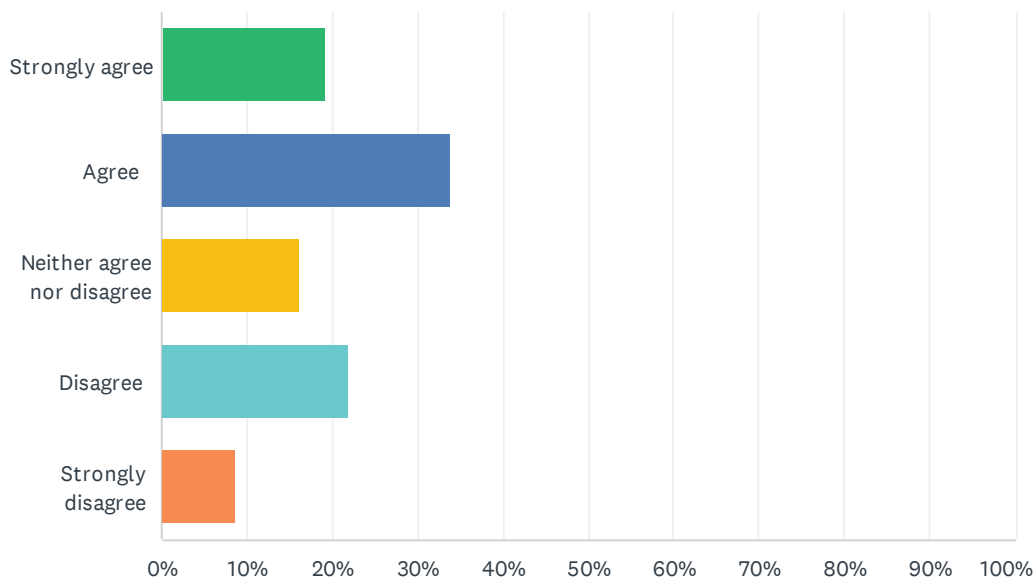
Answered: 42 Skipped: 70



ANSWER CHOICES	RESPONSES	
Strongly agree	28.57%	12
Agree	33.33%	14
Neither agree nor disagree	14.29%	6
Disagree	14.29%	6
Strongly disagree	9.52%	4
TOTAL		42

Q4 The curb extensions made pedestrians more visible to me as a driver.

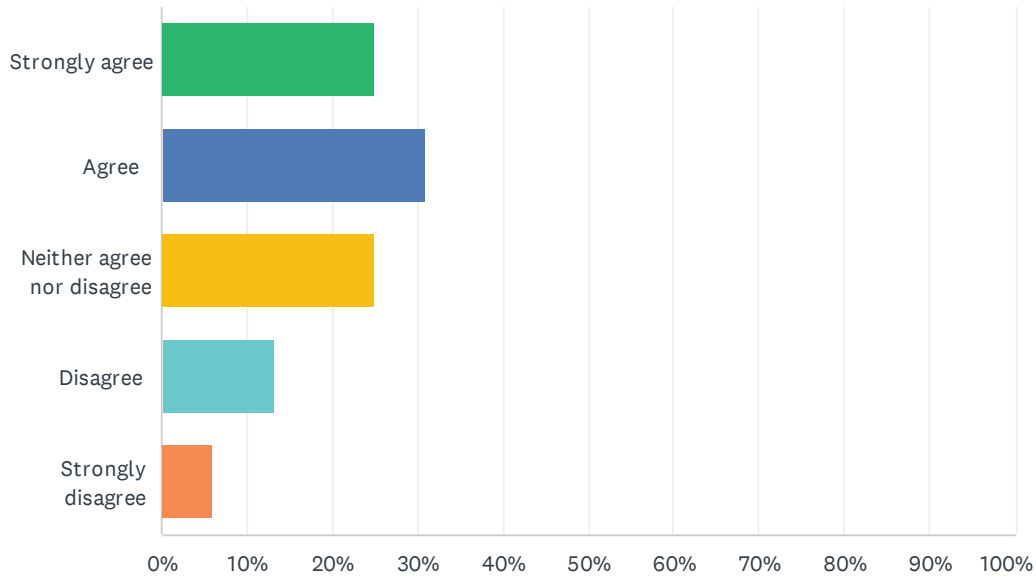
Answered: 68 Skipped: 44



ANSWER CHOICES	RESPONSES	
Strongly agree	19.12%	13
Agree	33.82%	23
Neither agree nor disagree	16.18%	11
Disagree	22.06%	15
Strongly disagree	8.82%	6
TOTAL		68

Q5 The curb extensions and yield sign caused me to slow down when approaching the crossing.

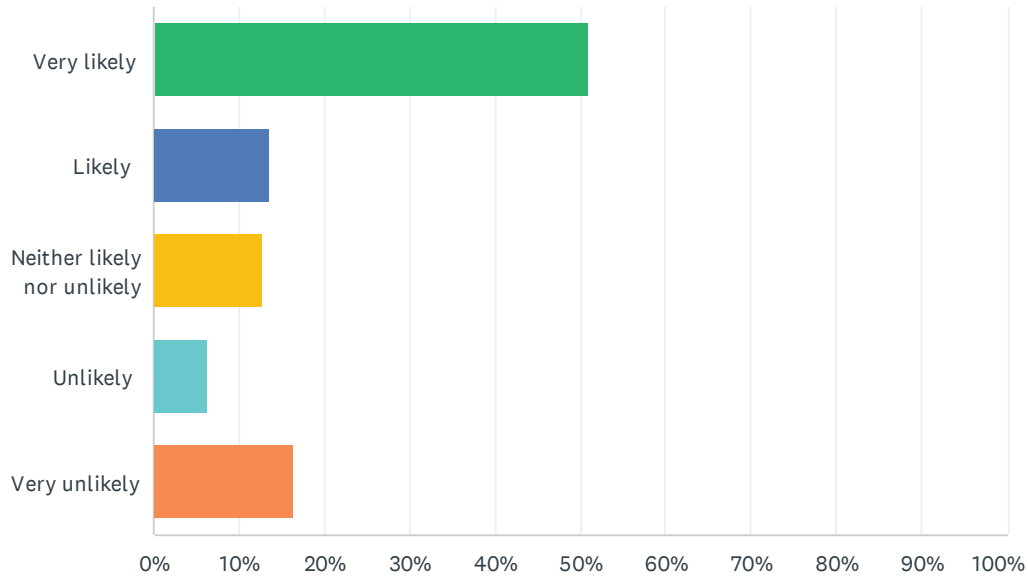
Answered: 68 Skipped: 44



ANSWER CHOICES	RESPONSES	
Strongly agree	25.00%	17
Agree	30.88%	21
Neither agree nor disagree	25.00%	17
Disagree	13.24%	9
Strongly disagree	5.88%	4
TOTAL		68

Q6 How likely would you be to support be more traffic calming projects in the Big Sky area?

Answered: 110 Skipped: 2



ANSWER CHOICES	RESPONSES	
Very likely	50.91%	56
Likely	13.64%	15
Neither likely nor unlikely	12.73%	14
Unlikely	6.36%	7
Very unlikely	16.36%	18
TOTAL		110

Q7 How can this project be improved?

Answered: 64 Skipped: 48

#	RESPONSES
1	No Rush hour times
2	Best solution--build a road behind the hospital! it is insane and lacks so much insight into public safety and the noise pollution is so not what any of us came here for!!!
3	It can be used at other areas in Big Sky where increased traffic has become a problem. Little Coyote Road is a big concern.
4	Get rid of all the heavy truck traffic going thru our town center
5	First of all, figure out what you are really trying to do. "Traffic calming" means nothing. Are you trying to make it easier for pedestrians to cross? If so, a button operated light would make much more sense.
6	Maintain the paint on roadways at crosswalks. They were non existent last summer. Consider installing the flashing lights at cross walks in town center.
7	The project should be extended through the entire 25 MPH zone, or at least for all crosswalks in that area. Using a sign to show drivers their speed where it slows coming down into town, between firelight's and limber pine could also be beneficial
8	In more locations
9	We need to go back to 45mph going up Lone Mountain Trail and 35 mph starting at the first "15mph" turn before the resort and continue that up to Moonlight. We also need enforcement of the speed limits. I'll gladly volunteer to sit along LMT, clock the traffic, and issue tickets. Cars were already going 50, but now they go 60 and can't manage to stay in their own lane around corners as a result. It is no mystery why we had so many head-on collisions last winter. The Ousel Falls work was wonderful and greatly impacted my daily walk across that street: I've felt so much safer crossing that road. In addition to other project items we need to pave turn outs both up and down the mountain. Smaller cars that are typically going slower can not use many of the turnouts because their cars do not have clearance to get into the turnout. We also need to pave the "edges" off the road so if oncoming traffic is in your lane there is some wiggle room: we need a shoulder all the way up the mountain.
10	It's frickin wild how many heavy vehicles blow throw town center with little regard to anything else. This project helps a lot, but it's still terrifying at rush hour
11	Having flashing pedestrian crossing signs would be very helpful and add safety to all crosswalks
12	I think this was a good start but more could be done. It's too bad a major through street was designed into the middle of town center when it was built but if that can't be changed at this point I think we should have more permanent traffic calming installations. Permanent crosswalk bump-outs with curbs should be built and flashing light crosswalk markers should be installed. If this can't be done then the proposed future steps of additional temporary crosswalk markers would still help. I also think the sheriff could sit there more often during rush hour to get people and especially the dirt haulers to slow down.
13	Streamline the crosswalks
14	This was not a good use of funds.
15	It can be expanded to include Little Coyote Rd. Little Coyote Rd is now the second most busiest road in Big Sky after Ousel. Not including, of course, Lone Mt Trail.
16	Because they are so unusual I saw more people crossing the center line to avoid them (witnessed repeatedly - I live at Firelights). Also , it's a distraction because they are big and

Big Sky Traffic Calming Survey

surprising and don't make sense - caused far more distracted driving . Took up valuable parking spaces . I think you can do better !!!!

17	Pedestrian bridge across Ouse Falls, or alternatively a pedestrian stoplight. During Farmer's Market and Music in the Mountains, traffic backups are severe due to multiple pedestrians crossing sporadically. Funneling pedestrians over a bridge or at a stop light could greatly increase traffic flow during rush hour and major events.
18	I think this is a great idea and complements the efforts Bozeman has made to make pedestrians more visible. It would be great to see more of these around town as the ski season kicks into gear whether they have flowers or not. Great idea!
19	Ask the community before you start.
20	Better flowers and boxes. But overall I loved them!!
21	Get through traffic off Little Coyote Rd, and get people to obey the posted speed limit there. Speed tables? Enforcement? Signs?
22	The big construction trucks did not slow down or stop for pedestrians crossing. I have still seen many pedestrians waiting or almost getting hit trying to cross.
23	I am all for effective management of the traffic through my town and neighborhood, but the planters created a hazard and an obstruction when traveling on a bike because it requires the rider to thread the needle between the planter and the curb or swerve around it into traffic. Bike lanes or something like them with some kind of bollard/reflective post protection would have accomplished the same visibility without the obstruction.
24	Have people work at night. As someone who commutes to big sky everyday all year it was insane the amount of traffic that was caused by this absurd project. I couldn't even tell what was being done. All I know is half an hour most days was added on to my already long commute. During the very obvious busy times for all the commuters maybe have night construction instead.
25	Vehicles still speed down ousel falls road and run the red light at ousel falls and lone mountain trail. Once when crossing ousel falls road this summer a truck almost hit my dog and yelled at me to "stay out of the road" while I was in a cross walk.
26	Little Coyote needs a calming in speeding-traffic is ridiculous and will only get worse with the stop light and people cutting through as a short cut from the Mtn.
27	Reduce speed on Little Coyote to 20mph and prevent through traffic. The speeding before and after work hours/during commute times is out of control daily.
28	Speed reduction. Vehicles regularly travel too fast, even through Towne Center. Drivers also don't seem cognizant of pedestrians when driving regardless of signs and other traffic calming measures.
29	We need traffic calming around little coyote AND speed humps. People are driving WAY too fast around town and pedestrians are at risk. My kids have had close calls in little coyote as have I when walking with my skis multiple times. It needs to stop. We need to take care of our community members!
30	Pedestrians didn't seem to use these any more carefully than straight off the sidewalk.
31	Waste of \$ and distraction
32	The pedestrian tunnel was the most ridiculous waste of money I have ever seen in the 18 years of living here.
33	Roundabouts instead of lights.
34	It needs to be extended to ALL LONG little coyote not just by the pond. We have a lot of pedestrians & cyclists With the new bike path that will increase traffic congestion
35	I would support them at as many primary cross streets as possible. Near/around the Fire Department, and the three commercial buildings in West Fork. Install them as far down as possible on Ousel Falls Road. What would also help is having the corners on Ousel Falls heading North mowed or some how cut back. The high mounds and tall grasses, although pretty and a good example of natural landscaping, make it extremely difficult to "look both

Big Sky Traffic Calming Survey

ways" for vehicles or pedestrians. Work with the HOAs that have condos on those corners. Thank you for doing this survey!!

36	I don't think this project can be successful unless the amount of traffic in big sky is either reduced or somehow staggered or limited. People in cars are often frustrated and aggressive in cars in Big Sky. The traffic is very frustrating in big sky so I don't blame them. Ousel falls road should really be avoided by bikers and pedestrians. I avoid it as much as possible.
37	I commend you for their visibility and attractiveness
38	Please don't paint polka dots on our road. Keep it classy, like the flower pots and reflective posts.
39	Probably...more color or height but they were pretty good as is.
40	Reroute the traffic around town center. Especially the work trucks and Yellowstone Club traffic.
41	More roads and intersections included
42	Larger planters and dont put them in the middle of the bike lane.
43	Never even noticed it, sorry
44	Remove them. Pedestrians who jaywalk are the danger
45	Stop it
46	This is the ONLY traffic route through town center for a ton of people. And you want to slow it down!! Are you nuts. Build a road that goes around town center but don't make traffic worse than it already is
47	Install more at every intersection. It really helps slow the construction workers when they are speeding to work.
48	Place more planter boxes in areas were cars and buses stop preventing a clear line of sight to pedestrians trying to cross.
49	Waste of money. Redirect all construction traffic off Ousel falls
50	Not only did it create high visual awareness for the crosswalk with flower boxes, it also beautified the section of Town Center in a way that highlights our "Nature" brand promise. Such a small effort and expense for such high impact.
51	A flower pot and high vis markers doesn't count as traffic calming. All it did was narrow up the road and cause more of a headache for heavy equipment moving past. When I seen the flower pot on the road I thought typical big sky doing more worthless stuff. If you want to have traffic calming how about more stop signs and stop lights. Lower the speed limit. Have more patrol officers in the problem zones. Don't stick a flower pot on the edge of the road and say ohh this will slow people down...
52	More locations around Big Sky, not just Town Center. And the street art would be really cool.
53	Take out the curb extensions. They are a huge hazard to bicyclist, trying to stay on the shoulder.
54	Re-route construction traffic around town center. Station the sheriff to give out speeding tickets. Add an additional stop light beyond Hungry Moose.
55	The snowbanks will render most of these ineffective. Need some speed bumps. Especially at the 25 Mph sign coming from YC going down oussel falls. Most vehicles don't slow down until they get to limber pine. Witnessed 3 vehicles illegally pass a truck in front of the fire lights going 45/50+
56	The area on oussel falls outside hungry moose should be blocked to parking. It creates a dangerous blind spot for both drivers and pedestrians.
57	More of what's been done on the crosswalks further south. Speed humps!!! Vehicles drive way too fast coming down from Spanish peaks and carry that speed past the Cadis Fly apartments into town. These include concrete and large dump trucks that will kill people using the crosswalks. Much of the west fork residents use the southern crosswalks to get to the open

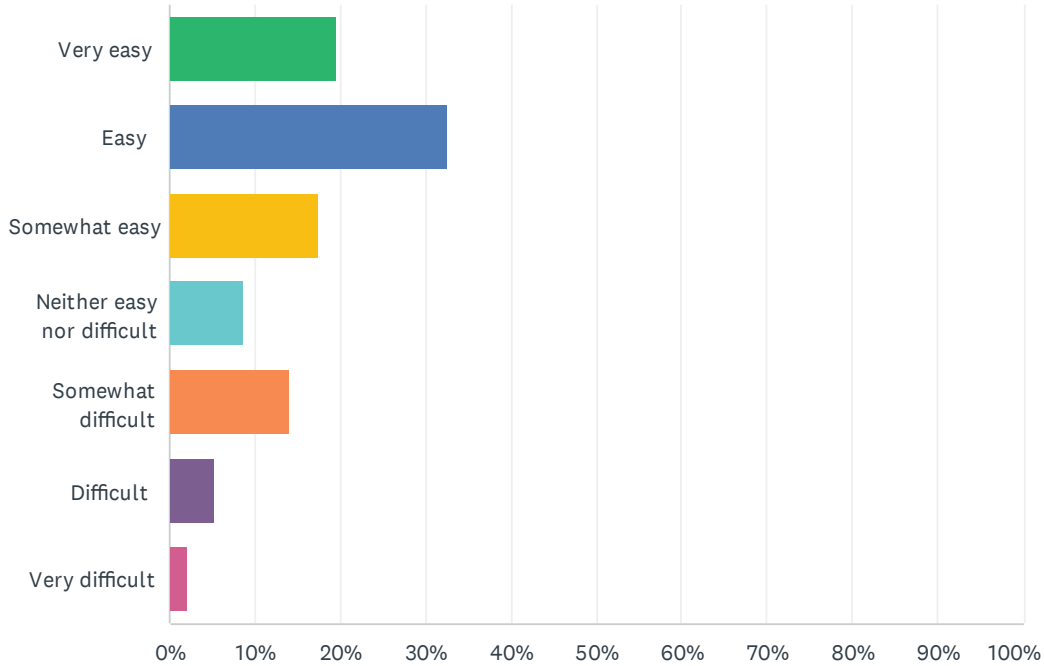
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field to walk their dogs, bike, and run. It is terrifying to cross Ousal Falls road even with crosswalks

58	There's enough room for cars to park in front of and behind the planters, which effectively hid the pedestrians trying to cross there instead of at the intersection/crosswalk where I was expecting them. I parked and walked through the intersection myself and it was confusing. There shouldn't be space to park at all if the purpose is high visibility, at the same time, we should be encouraging pedestrians to use the crosswalk vs nearish to the intersection.
59	Speed bumps as you enter the 25 zone on ousel falls.
60	Turning mirrors. Turning from Aspen leaf onto Ousel is very difficult as a driver. You have to creep out past the crosswalk to safely check both directions.
61	Something that doesn't block as much parking spaces. Better pedestrian crossing painted lines
62	You took out a left turn lane and this backs up traffic in both directions. Creating bigger problem. The crossing flags work or a crossing light would be better.
63	Remove it
64	Cars are still driving fast and now slowing down for walkers

Q8 During the warmer season, how easy is it for you to travel around the Big Sky Town Center and Meadow Village areas by biking, walking or rolling (skateboard, scooter)?

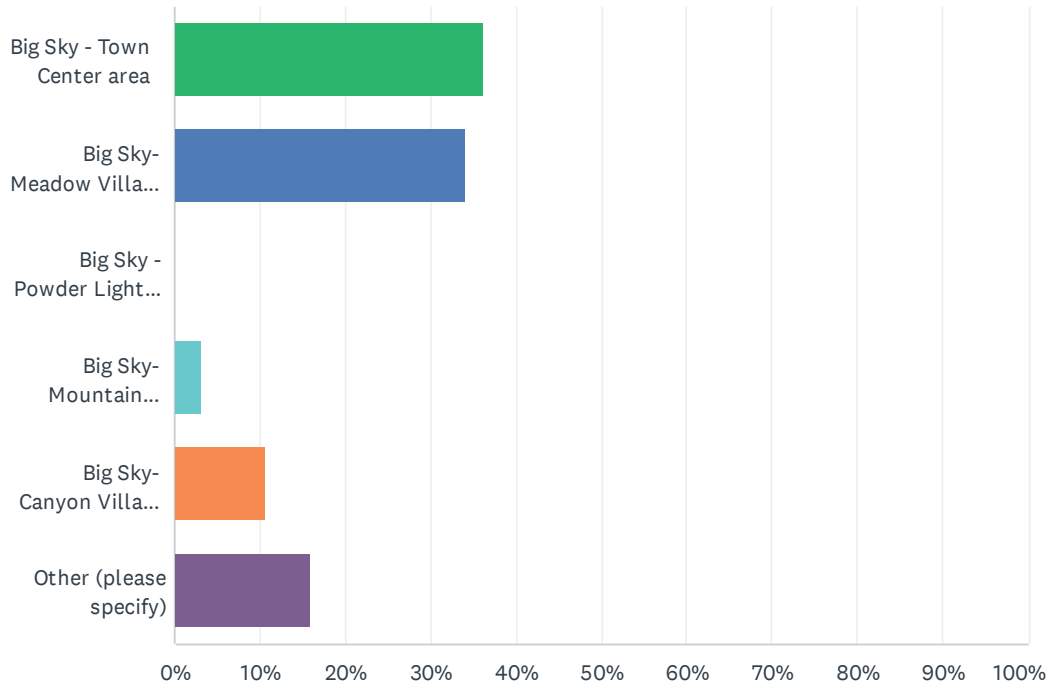
Answered: 92 Skipped: 20



ANSWER CHOICES	RESPONSES	
Very easy	19.57%	18
Easy	32.61%	30
Somewhat easy	17.39%	16
Neither easy nor difficult	8.70%	8
Somewhat difficult	14.13%	13
Difficult	5.43%	5
Very difficult	2.17%	2
TOTAL		92

Q9 What community do you live in?

Answered: 94 Skipped: 18



ANSWER CHOICES	RESPONSES	
Big Sky - Town Center area	36.17%	34
Big Sky- Meadow Village area	34.04%	32
Big Sky - Powder Light area	0.00%	0
Big Sky- Mountain Village/resort area	3.19%	3
Big Sky- Canyon Village (near MT 64 & Hwy 191)	10.64%	10
Other (please specify)	15.96%	15
TOTAL		94

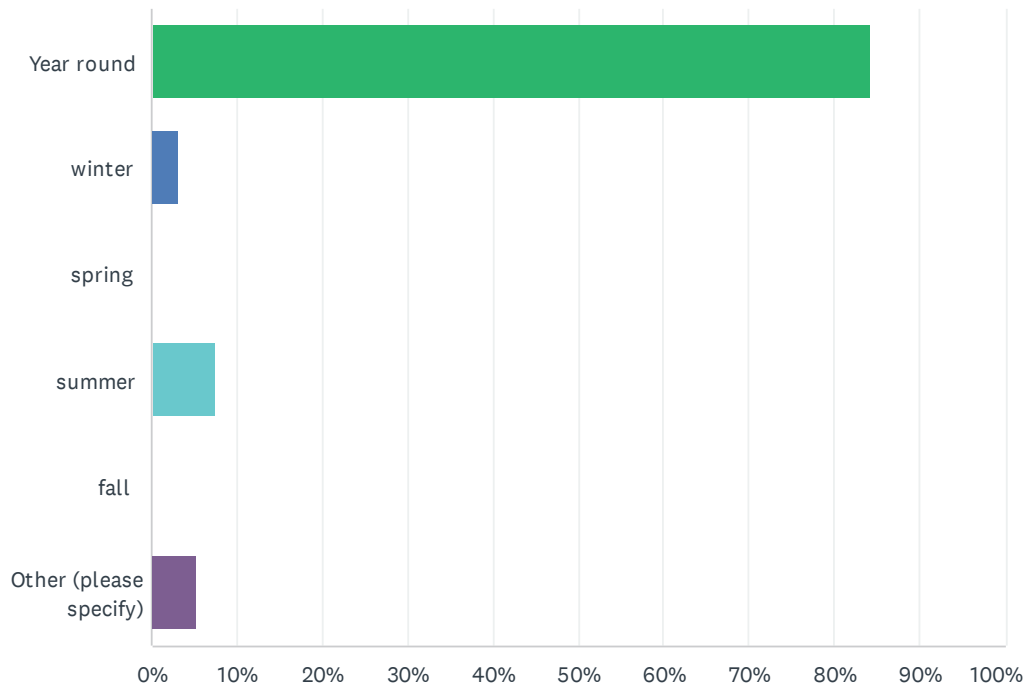
#	OTHER (PLEASE SPECIFY)
1	Big Sky-Gallatin Preserve
2	191
3	Ramshorn
4	Gallatin Gateway, but we work in Big Sky
5	Bozeman but I'm up at big sky everyday for work and events
6	Firelight Meadows. Do you consider that Town Center? We do not.
7	Big EZ
8	Shoreview, MN

Big Sky Traffic Calming Survey

9	Andesite area	
10	Spanish Peaks North	
11	Lost Trails	
12	Beavercreek	
13	Bozeman	
14	Moon Dance	
15	Antler ridge	

Q10 Which seasons do you typically live or stay in the Big Sky area?

Answered: 95 Skipped: 17



ANSWER CHOICES	RESPONSES
Year round	84.21% 80
winter	3.16% 3
spring	0.00% 0
summer	7.37% 7
fall	0.00% 0
Other (please specify)	5.26% 5
TOTAL	95

#	OTHER (PLEASE SPECIFY)
1	Winter and summer
2	Year round for recreational and work purposes
3	Bozeman
4	All summer all winter
5	and 4-5 weeks in winter