Avon Multimodal Transportation and Parking Plan
Final Report

Prepared for the

Town of Avon

Prepared by

LSC TRANSPORTATION CONSULTANTS, INC.

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July 6, 2017
LSC 177040

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Chapter 1

Introduction

As a successful mountain resort community, the Avon commercial core area is a busy place in the peak winter and summer seasons. At the same time, the Town has a strong interest in enhancing non-auto travel options, including pedestrian, bicycling and transit mobility.

Through the Town's Comprehensive Plan update process, a series of draft policy statements have emerged. The key multimodal transportation and parking goal is to "*Create an integrated multi-modal transportation system that minimizes dependence on automobile travel by making it easier and more inviting to use transit, walk, ride bicycles, and utilize other non-motorized vehicles*." Specific policies to implement this goal focus on enhancing active transportation modes and public transit services, and on minimizing auto use. In particular, one policy indicates that the Town should "*Develop a multimodal transportation plan and encourage development proposals to use it in their plans.*" Providing this multimodal transportation and parking plan is the key goal of this study.

To accomplish this key goal, the study focuses on the following elements:

- A review of existing circulation and mobility conditions, and the demographics and activity patterns that create these condition
- A detailed evaluation of parking demand and supply in the Town Center, as a basis for parking supply and management strategies
- A review of emerging technologies such, as autonomous vehicles, and their long-term potential impact on the study area
- Transit system enhancements
- Bicycle and pedestrian system enhancements

This study focuses on the Town Center area, defined as the area commercial area north of I-70 and the area between I-70 on the north and the Union Pacific rail line on the south, and from Nottingham Park on the west and The Village at Avon on the east. As necessary, connections and areas outside of this focus area will be addressed. The study is intended to provide a long-term framework for circulation system improvements, as well as policies that can be implemented to meet overall Town and community goals

The focus of this specific document is to summarize existing mobility conditions. While the final chapter presents some initial findings and potential directions for the remainder of the study, detailed evaluation of specific strategies will be addressed in future study work tasks.

Existing Demographics and Travel Demand Generators

Transportation plans, to be effective, must reflect the needs of the community. As such, it is important to review current factors that impact the need for mobility.

- The most recent available population estimate for Avon (2014) is 6,384 persons. This reflects a 1.0 percent annual growth rate between 2000 and 2014.

- Avon's population is relatively concentrated in the young adult ages of 20 to 39. While 33 percent of population across Eagle County falls within this age range, the proportion in Avon is 42 percent. This infers a relatively high propensity to use active transportation modes.

- As of 2010, the average size of households in Avon is 2.78 persons. This is slightly higher than the countywide average of 2.71.

- Avon's population has household incomes generally lower than that of Eagle County as a whole. Of Avon's households, 18 percent report incomes below the poverty line, while this figure is 12 percent countywide. Also, 32 percent of Avon households have an income of $49,000 or less, while the proportion countywide is only 30 percent. This indicates that the cost savings associated with transit and non-motorized travel is relatively attractive to Avon residents.

- Avon housing has the lowest median rent and lowest monthly mortgage cost of all communities in Eagle County (and the county as a whole), indicating a greater potential for year-round working families.

- The US Census' Longitudinal Employment-Household Dynamic dataset indicates that in 2014 404 of the 5,610 persons employed in Avon are Avon residents. This indicates that approximately 93 percent of employees commute from outside of Avon. Much of the commuters to jobs in Avon live in other communities in the Eagle Valley, both east and west of Avon. Note that these figures often do not fully reflect seasonal workers. However, it still indicates the substantial need for employees to commute, typically by auto or transit.

Between 2000 and 2014, Avon's permanent resident population grew by just over 1 percent annually.

The major employers in Avon (those with more than 100 estimated employees) consist of the Westin, Wal-Mart, Maya Mexican Restaurant, Home Depot, and City Market.

Chapter 2
Traffic, Pedestrian and Bicycle Conditions

Existing Roadways

Arterials/Collectors

Avon's key regional access roadways consist of I-70 and US 6. Within the specific study area, the following are the key roadways accommodating through traffic:

- **Avon Road** is a four-lane urban arterial roadway, with curb, gutter and sidewalks along both sides. In addition to providing access to the study area from I-70 and US 6 (including a rail underpass) it serves as the key access to Beaver Creek. The speed limit is posted at 25 mph. It is continuous with Nottingham Road to the north of I-70, and Village Road to the south of US 6

- **Beaver Creek Boulevard** serves as the key east-west collector roadway between the rail line and I-70. East Beaver Creek Boulevard connects Avon Road on the west with Post Boulevard. The section just east of Avon Road consists of five travel lanes, transitioning east of Plaza Way to a two-lane cross section. The section between City Market and Avon Road has Class II bicycle lanes and is marked with bicycle sharrows. Speed limits are posted at 25 mph on the west and 30 mph east of Beaver Creek Place. West Beaver Creek Boulevard connects Avon Road with US 6 to the west of the study area, via an at-grade rail crossing as well as a bridge crossing of the Eagle River. It consists of two travel lanes, on-street bike lanes, and parallel parking on both sides between Avon Road and Lake Street, transitioning to a two-lane cross-section to the west. The posted speed limit is 25 mph, except for a 20 mph section near Avon Elementary School. Sidewalks are provided along both sides of Beaver Creek Boulevard from Lake Street on the west to Beaver Creek Place on the east.

- **Benchmark Road** is the other collector roadway in the study area, consisting of two lane extending from Beaver Creek Place on the east to Lake Street on the west. Sidewalks are provided along both sides of the roadway east of the pedestrian rail crossing, and along the north side to the west. The posted speed limit is 25 mph, except 15 mph near the transit center.

- In addition, local roadways in the study area consist of the following:
    - Lake Street
    - Sun Road
    - Plaza Way

- Beaver Creek Place
- Chapel Place

These roadways generally have one travel lane in each direction, with speed limits of 20 to 25 mph.

Traffic Control

The key form of traffic control consists of the series of five modern roundabouts along Avon Road. These consist of two circulating lanes, with a mix of one-lane and two-lane approaches and departures. The two East Beaver Creek Boulevard/Beaver Creek Place intersections as well as the West Benchmark Road/Lake Street intersection are controlled by Stop signs on all approaches. Other public street intersections in the study area are controlled by Stop signs on the minor local-street approaches. Notably, there is only one traffic signal anywhere in Avon (at the intersection of Beaver Creek Boulevard and US 6).

Current Roadway Plans

Within the study area, the *Town of Avon Comprehensive Transportation Plan* identifies the long-term desirability (as parcels redevelop) to realign the intersections of Benchmark/Beaver Creek Place and Benchmark/Chapel to address conflicts in turning movements. This plan also identifies opportunities to reduce the Beaver Creek Boulevard approaches to the Avon Road roundabout (which have subsequently occurred). Beyond the specific study area, this plan cites widening US 6 to four through travel lanes.

The Beaver Creek Boulevard Plan is currently underway, with completion planned by 2018. This plan focuses on the section between Lake Street on the west and the western Beaver Creek Place intersection on the east. Current draft plans call for:

- All-way stop control at Beaver Creek Place
- Additional pedestrian crosswalks at the Sheraton, First Bank and Christie Lodge
- A raised median island in front of Christie Lodge, First Bank and Avon Center
- Improved alignment of driveways
- Reduction in lanes on some roundabout approaches

Of note, there are no existing plans to increase roadway capacity within the study area identified in the 2009 *Town of Avon Comprehensive Transportation Plan*, nor in the Beaver Creek Boulevard Plan.

Existing Traffic Volumes

There are several sources of traffic volume data for the study area:

- The Town of Avon has for many years commissioned a traffic count program in the peak summer.

- The Colorado Department of Transportation conducts ongoing counts on state highways (including I-70).

- Traffic counts have recently been conducted for the Beaver Creek Boulevard design project.

Together, these sources provide a good understanding of traffic patterns and levels, particularly in the summer.

Figure 1 presents a summary of busy summer daily traffic volumes in the study area[1]. As shown, the highest volumes are along Avon Road, particularly between I-70 and Beaver Creek Boulevard. The volumes along Avon Road reflect this roadway's dual function as both a through roadway for Beaver Creek traffic as well as providing local access for the Avon commercial core. Volumes are also relatively high along Beaver Creek Boulevard for the first block or two on either side of Avon Road. Beyond this point, volumes fall substantially.

Variation by Season

The best indication of traffic variation by season is provided by the Colorado Department of Transportation's nearest permanent count station on I-70 (at West Vail). The average daily traffic volumes by month are shown in Figure 2. Of note, peak summer traffic volumes (in July) are roughly 15 percent higher than the peak winter traffic volumes (in March).

Variation by Day of Week and by Time of Day

Hourly traffic counts for both a busy Friday and a busy Saturday on Avon Road are shown in Figure 3. These figures indicate that peak volumes are substantially higher on Friday than on Saturday. The busiest period of traffic activity occurs between approximately 11 AM and 5 PM, and is relatively consistent over this period. In comparison, typical urban areas exhibit peaks in the traditional AM and PM commute periods, with a dip over the mid-day. The volumes for Avon Road reflect that visitors and customers generate the large bulk of traffic, rather than persons traveling to/from work.

Traffic Trends

The Town's summer count program indicates approximately a 10 percent increase in peak summer traffic volumes (over all count locations) between 2008 and 2016. There was a general decline between 2008 and 2013, but an 18 percent increase between 2014 and 2016. At the key location on Avon Road north of Beaver Creek Boulevard, volumes between 2008 and 2016 grew 1.4 percent per year, on average.

Figure 1

[1] These figures are drawn from the most recent Town summer traffic count data, augmented by counts conducted for the Beaver Creek Boulevard project.

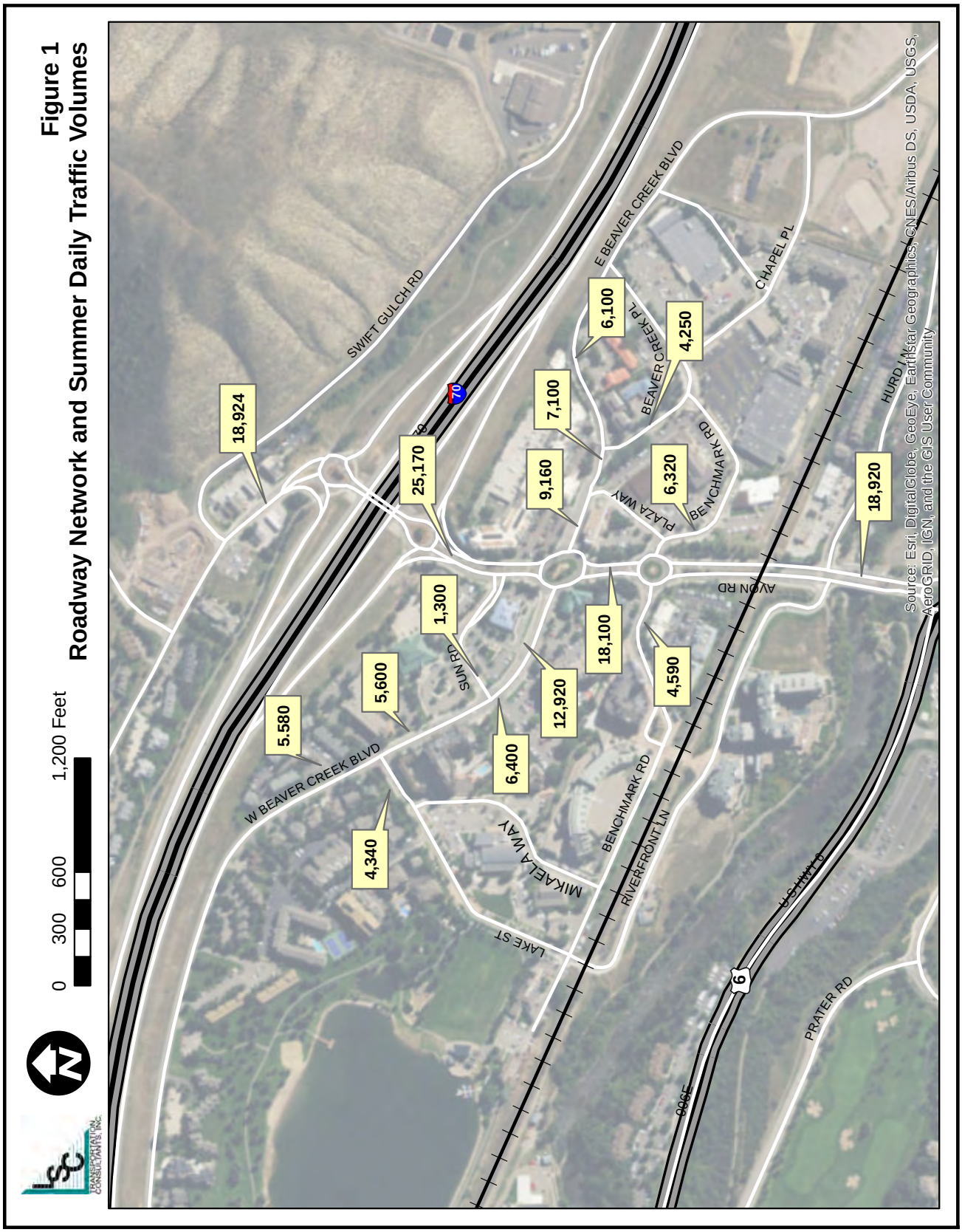

Figure 1
Roadway Network and Summer Daily Traffic Volumes

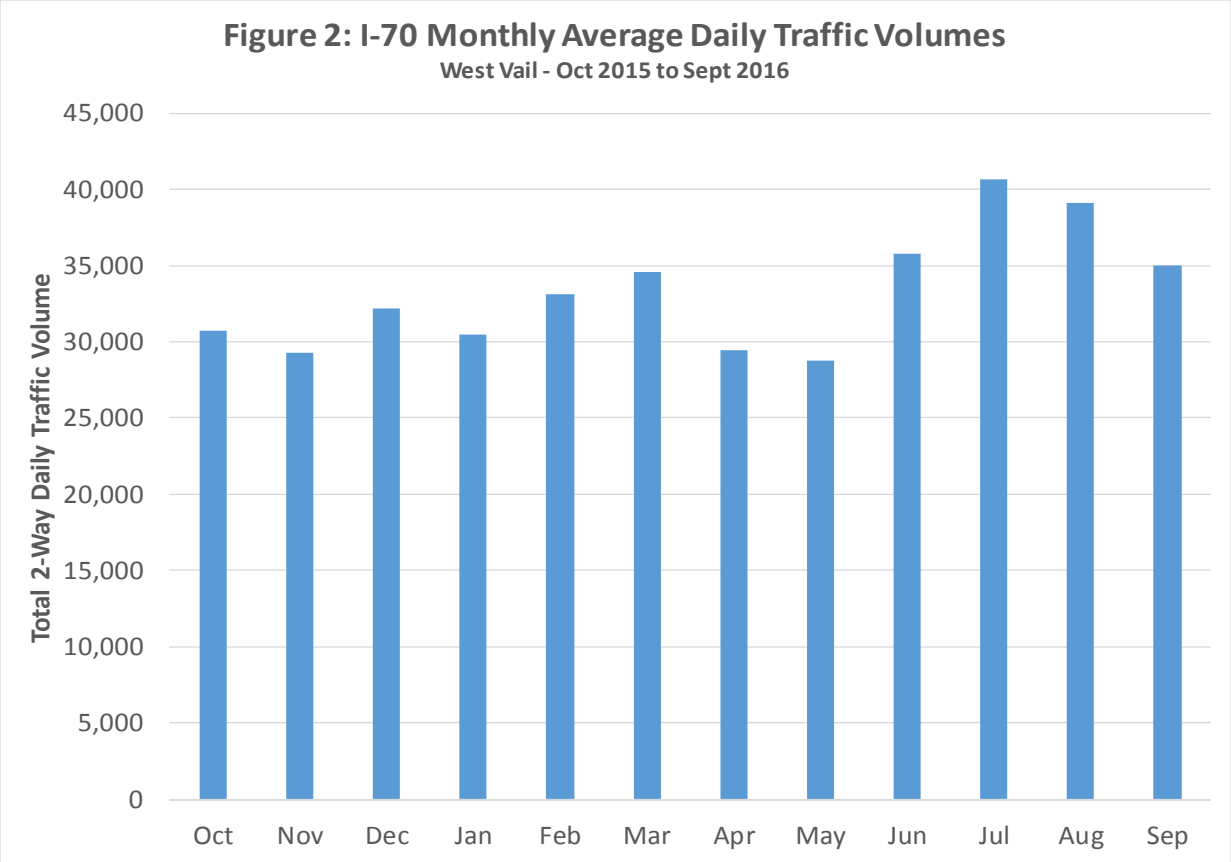
Figure 2: I-70 Monthly Average Daily Traffic Volumes
West Vail - Oct 2015 to Sept 2016
Total 2-Way Daily Traffic Volume
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep

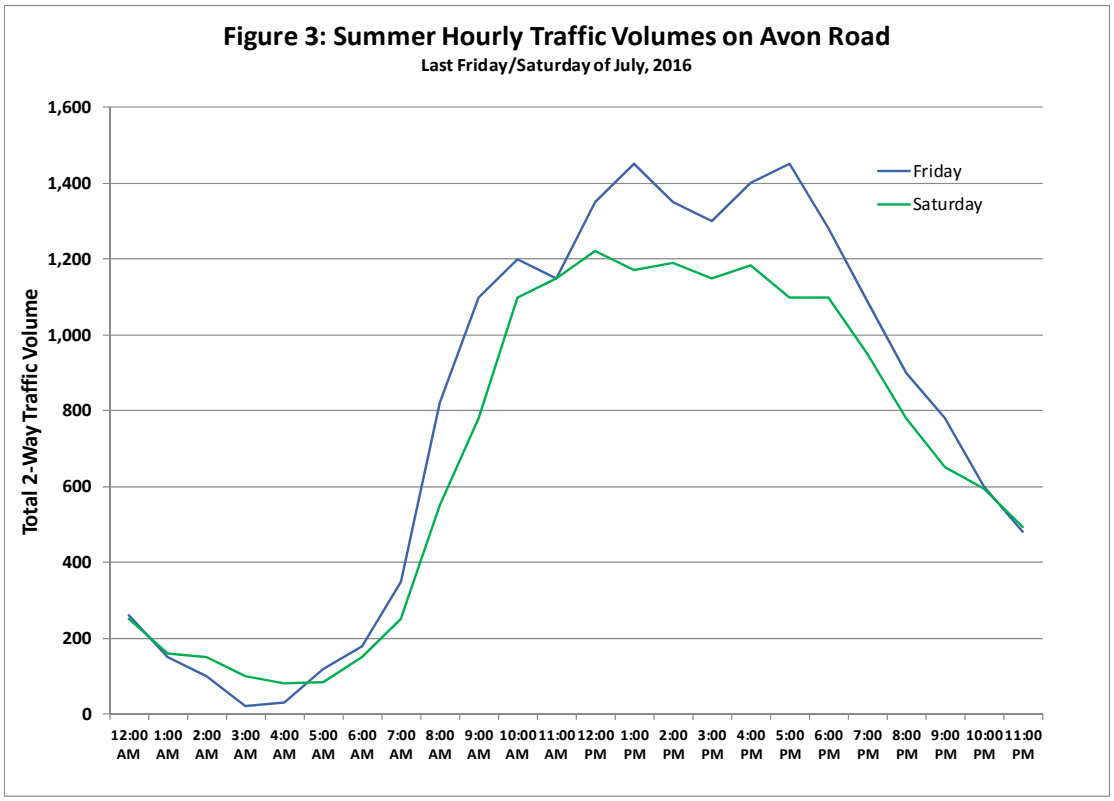
Figure 3: Summer Hourly Traffic Volumes on Avon Road
Last Friday/Saturday of July, 2016
Total 2-Way Traffic Volume
1,600
1,400
1,200
1,000
800
600
400
200
0
Friday
Saturday
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
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5:00 PM
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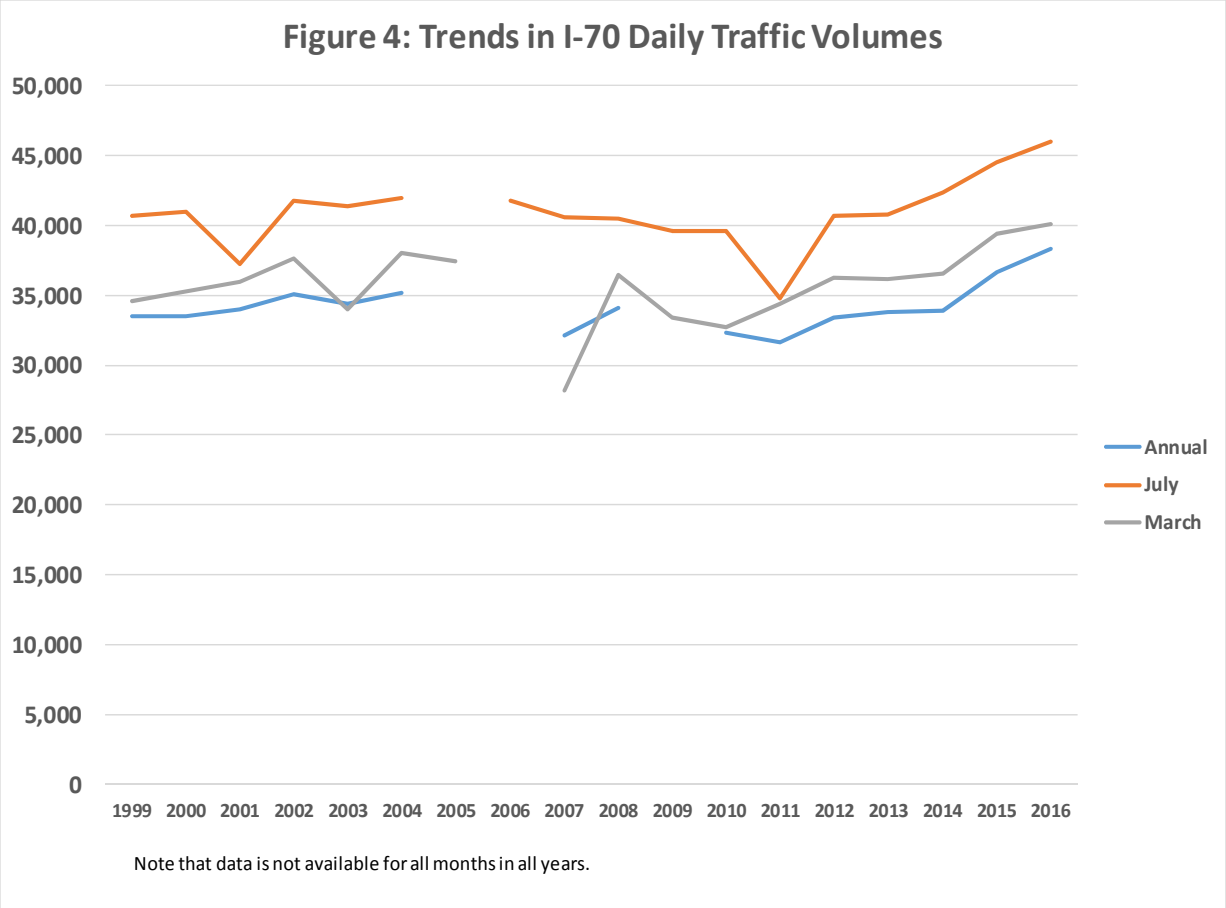
9:00 PM
10:00 PM
11:00 PM



The CDOT data for I-70 traffic volumes provides a longer view of traffic trends. As shown in Figure 4, traffic volumes in both summer and winter, as well as over the year, were flat or declining until approximately 2011. Since then, volumes have grown by over ten percent in all periods. Overall, I-70 volumes between 2008 and 2016 grew by 1.6 percent per year on average, or slightly higher than volumes on Avon Road.

Existing Level of Service

Traffic conditions are considered in terms of the "Level Of Service" (LOS), which is a scale ranging from LOS A (free-flowing conditions with minimal delays) to LOS F (stop-and-go traffic congestion with very long delays). The Town's adopted LOS standard is for roadways to operate at LOS C or better and intersections to operate at LOS D or better. The most recent comprehensive evaluation of LOS was conducted as part of the 2009 Transportation Master Plan. As shown in Table 1, all intersections through the study area (as well as Avon Road) were found to operate at good (A or B) LOS, in both summer and winter and for both the AM and PM peak hours.[2]

[2] A review of available counts more recent than 2009 indicates that the existing LOS values shown in Table 1 remain generally applicable in 2017.

TABLE 1: Intersection Level of Service Summary

LOS Exceeding Town Standard Shown in ***Bold***

		Existing				Projected			
		Summer		Winter		Summer		Winter	
		AM	PM	AM	PM	AM	PM	AM	PM
Intersection LOS (1)									
North/South St	East/West St.								
Avon Rd	I-70 Westbound	A	A	A	A	A	A	A	B
Avon Rd	I-70 Eastbound	A	A	A	A	A	A	A	C
Avon Rd	Beaver Creek Blvd	A	A	A	A	A	A	A	C
Avon Rd	Benchmark Road	A	A	A	A	A	A	A	A
Avon Rd	Riverfront/Hurd Lane	A	B	B	B	B	B	B	B
Avon Rd	US 6	A	A	A	A	Note 2			
Beaver Creek Place W	East Beaver Creek Blvd	A	B	A	A	A	B	A	A
Beaver Creek Place E	East Beaver Creek Blvd	A	A	A	A	A	A	A	A
Beaver Creek Place	Chapel Place	A	A	A	A	A	C	A	B
Roadway LOS									
Road	Direction								
Avon Rd	Northbound	B	B	B	B	B	C	C	**D**
Avon Rd	Southbound	B	B	B	B	B	C	C	C

Source: Town of Avon Comprehensive Transportation Plan, 2009

Note 1: LOS reflects total average intersection delay for roundabout-controlled intersections, and worst-movement delay for Stop sign controlled intersections.

Note 2: Growth rates on US 6 projected in the 2009 study are no longer valid.

The 2009 Transportation Master Plan also provides forecasts of LOS assuming a substantial amount of future development in Avon. This *"includes the development of East Town Center and West Town Center, as well as the completion of the Village at Avon, Riverfront, Wildridge, Buck Creek, Swift Gulch, Benchmark at Beaver Creek and the Folson Annex."* Focusing in on the East and West Town Centers, the study assumed development (over 2009 levels) of a total of 1,078 residential dwelling units, 40,000 square feet of office space, and 95,000 square feet of retail space.

Traffic Crashes

An important consideration in transportation issues is the safety of motorists, cyclists and pedestrians. The Avon Police Department logs all responses to crashes throughout the Town (on both public right-of-way and private land). These logs were obtained and summarized for the four-year period between January 2013 and December 2016, for the commercial core area. These crashes are summarized by location, as shown in Table 2. The crash data was also

TABLE 2: Summary of Reported Crashes -- 2013 to 2016

	Crash Severity					Public vs. Private	
Location	Property Damage Only	Injury	Fatality	Unknown	Total	Public ROW	Private Property
182 Avon Rd	0	1	0	0	1	1	0
Avon Rd -- Other	1	0	0	0	1	1	0
Avon Rd I-70 WB Roundabout	13	2	0	2	17	17	0
Avon Rd I-70 EB Roundabout	11	1	0	0	12	12	0
Avon Rd Beaver Creek Blvd Roundabout	38	2	0	2	42	41	1
Avon Rd Benchmark Rd Roundabout	10	1	0	0	11	11	0
Avon Rd US 6 Roundabout	24	0	0	0	24	24	0
Avon Rd/Hurd Lane	5	2	0	0	7	7	0
Avon Rd/Riverfront Lane	2	0	0	1	3	2	1
51 Beaver Creek Pl	0	0	0	1	1	0	1
71 Beaver Creek Pl	2	0	0	0	2	1	1
91 Beaver Creek Pl	0	1	0	0	1	1	0
100 Beaver Creek Pl	0	1	0	0	1	1	0
142 Beaver Creek Pl	0	1	0	0	1	1	0
260 Beaver Creek Pl	10	1	0	3	14	4	10
Beaver Creek Pl/Lake St	2	0	0	1	3	3	0
15 Benchmark Rd	4	0	0	0	4	4	0
70 Benchmark Rd	1	0	0	0	1	0	1
75 Benchmark Rd	1	0	0	0	1	1	0
100 Benchmark Rd	1	0	0	0	1	1	0
137 Benchmark Rd	1	0	0	0	1	0	1
Benchmark Rd/ Mikaela Way	1	0	0	0	1	1	0
Buck Creek Rd/Nottingham Rd	0	1	0	0	1	0	1
Buck Creek Rd/Wildwood	1	0	0	0	1	1	0
225 Chapel Pl	1	0	0	0	1	1	0
234 Chapel Pl	1	0	0	0	1	1	0
240 Chapel Pl	2	0	0	1	3	2	1
245 Chapel Pl	5	0	0	0	5	2	3
47 E Beaver Creek Blvd	6	1	0	0	7	3	4
48 E Beaver Creek Blvd	1	0	0	0	1	1	0
51 E Beaver Creek Blvd	1	0	0	0	1	0	1
82 E Beaver Creek Blvd	6	0	0	2	8	4	4
100 E Beaver Creek Blvd	1	0	0	0	1	0	1
110 E Beaver Creek Blvd	0	0	0	1	1	0	1
150 E Beaver Creek Blvd	4	0	0	0	4	2	2
220 E Beaver Creek Blvd	1	0	0	0	1	0	1
700 E Beaver Creek Blvd	1	0	0	0	1	1	0
E Beaver Creek Blvd/Beaver Creek Pl	4	0	0	1	5	5	0
E Beaver Creek Blvd/Chapel Pl	1	1	0	0	2	2	0
15 E Hurd Lane	1	0	0	0	1	0	1
25 E Hurd Lane	1	0	0	0	1	0	1
205 E Hurd Lane	1	0	0	0	1	0	1
15 Hurd Lane	1	0	0	1	2	0	2
25 Hurd Lane	1	0	0	1	2	0	2
330 Hurd Lane	0	1	0	0	1	0	1
1 Lake St	2	0	0	0	2	2	0
90 Lake St	3	0	0	2	5	2	3
175 Lake St	0	0	0	1	1	0	1
177 Lake St	1	0	0	0	1	0	1
179 Lake St	1	0	0	0	1	1	0
Lake St/Mikaela Way	1	0	0	0	1	1	0
200 Mikaela Way	1	0	0	0	1	1	0
Mikaela Way	1	0	0	0	1	0	1
126 Riverfront Lane	1	0	0	2	3	1	2
15 Sun Rd	2	0	0	0	2	1	1
W Beaver Creek Blvd/Lake St	2	0	0	0	2	2	0
10 W Beaver Creek Blvd	1	0	0	0	1	0	1
100 W Beaver Creek Blvd	6	1	0	0	7	1	6
106 W Beaver Creek Blvd	1	0	0	0	1	1	0
111 W Beaver Creek Blvd	3	0	0	0	3	1	2
160 W Beaver Creek Blvd	1	0	0	1	2	1	1
161 W Beaver Creek Blvd	2	0	0	0	2	0	2
200 W Beaver Creek Blvd	1	0	0	0	1	1	0
211 W Beaver Creek Blvd	1	0	0	1	2	0	2
218 W Beaver Creek Blvd	1	0	0	0	1	1	0
350 W Beaver Creek Blvd	1	0	0	0	1	1	0
440 W Beaver Creek Blvd	1	0	0	0	1	1	0
510 W Beaver Creek Blvd	1	0	0	0	1	1	0
800 W Beaver Creek Blvd	1	0	0	0	1	1	0
811 W Beaver Creek Blvd	4	0	0	0	4	3	1
900 W Beaver Creek Blvd	1	0	0	0	1	1	0
901 W Beaver Creek Blvd	2	3	0	0	5	0	5
TOTAL	211	21	0	24	256	184	72

Source: Avon Police Department.

TABLE 3: Summary of Reported Bicycle/Pedestrian Crashes -- 2013 to 2016

Date	Street #	Street	Type	Crash Severity: Property Damage Only	Injury	Fatality	Location
Within Commercial Core Area							
7/10/2015	901	W Beaver Creek Blvd	Bicycle	0	1	0	Private Property
9/14/2016	91	Beaver Creek Pl	Bicycle	0	1	0	Public ROW
Elsewhere in the Town of Avon							
12/9/2013	38609	US Hwy 6	Pedestrian	0	1	0	Public ROW
2/17/2015	2155	Long Spur	Pedestrian	0	1	0	Private Property
7/11/2015		Post Blvd / US6	Bicycle	0	1	0	Public ROW
5/28/2016	171	Yoder Ave	Pedestrian	0	1	0	Private Property
6/15/2016	511	Metcalf Rd	Bicycle	0	1	0	Public ROW
12/9/2016	330	Hurd Ln	Pedestrian	0	1	0	Private Property

Source: Avon Police Department.

reviewed to assess crashes involving pedestrians and bicyclists. Over the four-year period, as shown in Table 3, there were a total of eight such crashes reported across the town: four involving pedestrians and four involving cyclists.

These crashes are scattered around the community, with no location having more than one. Within the commercial core area, there were two reported crashes involving cyclists and none involving pedestrians. Given the high volumes and high number of total crashes along Avon Road, it is notable that there were no crashes involving pedestrians or cyclists along this roadway over the four-year period.

Crash Rate Analysis

An analysis was conducted of the crash rates on key roadway elements in the commercial core area, as shown in Table 4. Regarding **intersections**, the crash data at the Avon Road/Beaver Creek Boulevard roundabout and at the Avon Road/Benchmark Road roundabout was compared against the number of crashes that are seen at similar roundabouts across the US. The National Cooperative Highway Research Program *Report 672: Roundabouts – An Informational Guide* provides a crash prediction methodology calibrated against observed crash data at other roundabout locations. Applying the geometry and volumes at the Avon Road roundabouts yields the predicted number of serious (injury/fatality) and total crashes, as shown in Table 4. Compared with the reported crashes, this prediction indicates the following:

- The **Avon Road / Beaver Creek Boulevard** roundabout has an observed total crash rate that is 30 percent higher than the predicted rate, but an injury/fatality crash rate that is 4 percent lower.

TABLE 4: Crash Analysis on Key Avon Roadway Elements

Location	Crash Severity: Property Damage Only	Injury	Fatality	Total
Intersection Crash Rate Evaluation				
Total Crashes Over 4 Years				
Avon Rd Beaver Creek Blvd Roundabout	39	2	0	41
Avon Rd Benchmark Rd Roundabout	10	1	0	11
Actual Vs. Predicted Annual Crashes		Injury/Fatility		Total
Avon Rd Beaver Creek Blvd Roundabout				
-- Actual Crashes		0.50		9.75
-- Predicted Crashes (2)		0.52		7.48
-- Ratio of Actual to Predicted		96%		130%
Avon Rd Benchmark Rd Roundabout				
-- Actual Crashes		0.25		2.50
-- Predicted Crashes (2)		0.46		6.42
-- Ratio of Actual to Predicted		54%		39%
Roadway Crash Rate Evaluation				
Total Crashes Over 4 Years				
Avon Road (I-70 EB Ramps to US 6)	105	9	0	114
E. Beaver Creek Blvd - Avon Rd to Chapel Pl (1)	16	2	0	18
W. Beaver Creek Blvd - Avon Rd to RR Tracks (1)	15	1	0	16
Accident Rate (per Million Vehicle Miles)				
Avon Road (I-70 EB Ramps to US 6)	10.1	0.9	0.0	11.0
E. Beaver Creek Blvd - Avon Rd to Chapel Pl	4.4	0.6	0.0	5.0
W. Beaver Creek Blvd - Avon Rd to RR Tracks	2.3	0.2	0.0	2.5

Crashes of unknown severity are assumed to be PDO

Note 1. Crashes on Public Right-Of-Way only. Beaver Creek Blvd figures exclude those on Avon Road.

Note 2: National Cooperative Highway Research Program Report 672 Methodology

- The **Avon Road / Benchmark Road** roundabout has an observed total crash rate that is 46 percent lower than the predicted rate, and an injury/fatality crash rate that is 61 percent lower.

It should be noted that the majority of the observed crash data occurred prior to the improvements at the Beaver Creek Boulevard roundabout to reduce some of the entrance lanes. As reducing geometrics in a roundabout tends to improve safety, this analysis corroborates the decision to modify the roundabout, and indicates that rates will fall in the future.

Crash rates can also be considered by **roadway segment**, for Avon Road, East Beaver Creek Boulevard and West Beaver Creek Boulevard. Traffic volumes were used to estimate the total traffic activity over the 4-year period, and the crash rate per Million Vehicle-Mile (MVM) of travel were calculated.

As shown in the bottom portion of Table 4, Avon Road has the highest crash rate of the three roadway segments at 11.0 crashes per MVM, compared with 5.0 for East Beaver Creek Boulevard and 2.5 for West Beaver Creek Boulevard.

Existing Bicycle and Pedestrian Conditions

Existing Sidewalks, Multipurpose Paths, Bicycle Facilities

Figure 5 presents a map of bicycle and pedestrian facilities in the commercial core area. The key regional multipurpose path is the Eagle Valley Regional Trail, connecting the communities of the Eagle Valley. Near the study area, this facility consists of a Class 1 separated lane from Avon Road to the west along the north bank of the Eagle River, and from Avon Road to the east along the south side of Hurd Lane. A connection adjacent to the Westin provides access from the Regional Trail into the West Town Center area. This segment currently connects Avon with Eagle/Vail to the east and a point two miles west of Edwards to the west.

Other facilities for cyclists consist of on-street Class II bike lanes along portions (but not all) of Beaver Creek Boulevard. Sharrow markings encourage appropriate shared use of travel lanes along other portions of Beaver Creek Boulevard as well as Avon Road.

The key pedestrian amenity is the Main Street Mall in the West Town Center, along with connecting walkways. The core West Town Center and East Town Center areas are generally well provided with sidewalks and other pedestrian paths, though some gaps do exist.

Existing Bicycle and Pedestrian Counts

The counts conducted as part of the Beaver Creek Boulevard study provide a general indication of activity. These counts, as summarized in Table 5, were conducted on March 4 and 11, 2016. The busiest hourly activity was found along Avon Road at Beaver Creek Boulevard from 4:30 PM to 5:30 PM, with a total of 67 pedestrians and 13 cyclists. Activity east of Avon Road was substantially lower than west of Avon Road.

One item to note is the high level of pedestrian activity in the evening: of all pedestrians observed between 7 AM and 7 PM at the West Beaver Creek Boulevard / Sun Lane intersection (198 over the course of the 12 hours), fully 80 (40 percent) of them were seen between 5 PM and 7 PM. This indicates a pattern of visitors who are skiing during the day, and then walking in the evening (for activities such as to dining). This also reflects the importance of street lighting for pedestrian paths and crossings.

Pedestrian counts were also conducted by Town staff at the key roundabouts, as follows:

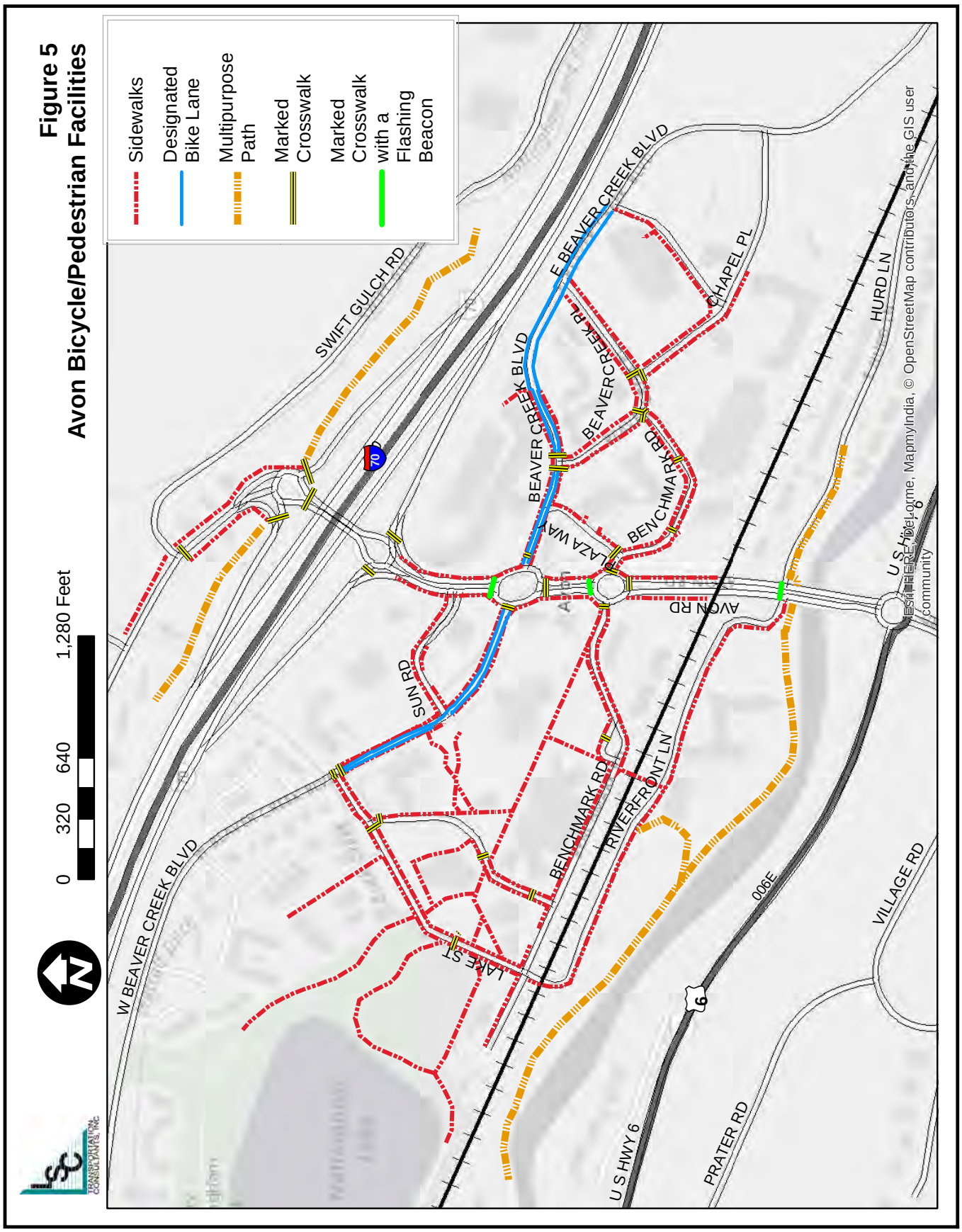


Figure 5
Avon Bicycle/Pedestrian Facilities
Sidewalks
Designated Bike Lane
Multipurpose Path
Marked Crosswalk
Marked Crosswalk with a Flashing Beacon
0
320
640
1,280 Feet
W BEAVER CREEK BLVD
SWIFT GULCH RD
SUN RD
LAKE ST
BENCHMARK RD
RIVERFRONT LN
BEAVER CREEK BLVD
E BEAVER CREEK BLVD
BEAVER CREEK PL
CHAPEL PL
PLAZA WAY
AVON RD
HURD LN
VILLAGE RD
006E
PRATER RD
U S HWY 6
70
6
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

TABLE 5: Available Winter Pedestrian and Bicyclist Counts

	Eastbound			Westbound			Northbound			Southbound				Total Crossing Street	
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Total	NS St.	EW St.
W. Beaver Creek Blvd/Lake Street								*Friday, Mar 11, 2016*							
7 AM - 7 PM															
Pedestrians	--	63	34	76	47	2	31	11	55	9	2	1	331	110	13
Bicyclists	--	9	2	7	9	0	0	2	4	0	0	0	33	25	9
Total	--	72	36	83	56	2	31	13	59	9	2	1	364	--	--
Peak Hr (4:30-5:30)															
Pedestrians	--	4	8	14	6	0	9	1	7	0	0	0	49	10	1
Bicyclists	--	1	0	2	1	0	0	0	0	0	0	0	4	4	2
Total	--	5	8	16	7	0	9	1	7	0	0	0	53	--	--
W. Beaver Creek Blvd/Sun Road								*Friday, Mar 4, 2016*							
7 AM - 7 PM															
Pedestrians	16	129	59	6	69	13	50	41	5	7	30	21	446	198	71
Bicyclists	0	10	1	0	8	0	1	2	0	1	1	1	25	20	3
Total	16	139	60	6	77	13	51	43	5	8	31	22	471	--	--
Peak Hr (4:30-5:30)															
Pedestrians	5	23	10	1	2	0	9	4	0	0	2	0	56	25	6
Bicyclists	0	1	0	0	0	0	0	1	0	0	0	0	2	1	1
Total	5	24	10	1	2	0	9	5	0	0	2	0	58	--	--
Beaver Creek Blvd/Avon Road								*Friday, Mar 11, 2016*							
4 PM - 6 PM															
Pedestrians	7	4	15	11	13	8	12	8	19	0	13	8	118	17	21
Bicyclists	0	3	4	3	4	0	7	0	2	0	1	3	27	17	4
Total	7	7	19	14	17	8	19	8	21	0	14	11	145	--	--
Peak Hr (4:15-5:15)															
Pedestrians	3	1	10	9	6	3	7	2	9	0	10	7	67	7	12
Bicyclists	0	1	2	1	3	0	4	0	1	0	1	0	13	9	2
Total	3	2	12	10	9	3	11	2	10	0	11	7	80	--	--
E. Beaver Creek Blvd/Beaver Creek Place								*Friday, Mar 11, 2016*							
7 AM - 7 PM															
Pedestrians	--	5	0	4	4	--	0	--	2	--	--	--	15	9	--
Bicyclists	--	0	1	1	2	--	1	--	0	--	--	--	5	4	--
Total	--	5	1	5	6	--	1	--	2	--	--	--	20	--	--
Peak Hr (4:30-5:30)															
Pedestrians	--	0	0	1	0	--	0	--	0	--	--	--	1	0	--
Bicyclists	--	0	0	0	0	--	0	--	0	--	--	--	0	0	--
Total	--	0	0	1	0	--	0	--	0	--	--	--	1	--	--

Note: Pedestrians crossing figures excluding those making turns, as it is not clear what side of the street they are on. Bicyclist crossing figures include left turns (assuming they are riding on the right side of the road).

Avon Road/Beaver Creek Boulevard

- 08/10/2016: 8:00 AM to 9:00 AM – 4 Pedestrians (south side)
- 08/10/2016: 12:00 PM to 1:30 PM -- 42 Pedestrians (south side)
- 08/24/2016: 11:30 AM to 1:00 PM -- 16 Pedestrians (north side) and 30 Pedestrians (south side)

Avon Road/Benchmark Road

- 08/08/2016: 11:45 AM to 1:30 PM – 43 Pedestrians (south side)
- 08/10/2016: 8:00 AM to 9:00 PM -- 7 Pedestrians (south side)
- 08/10/2016: 12:00 PM and 1:30 PM – 21 Pedestrians (south side)
- 08/25/2016: 12:00 PM to 1:30 PM – 17 Pedestrians (north side) and 16 Pedestrians (south side)

ECO Trails conducts trail counts on an annual basis. In 2016, counts were conducted on the Eagle Valley Trail adjacent to the Westin Hotel over two 2-hour-long periods in June. These counts indicated an average of 60 trail users per hour, of which approximately ¾ were pedestrians and ¼ cyclists.

Existing Crossing Conditions of Major Streets

The key barrier to pedestrian travel within the study area is Avon Road. The width of the roadway and traffic volumes form a substantial psychological barrier to travel. The presence of the roundabouts (and the associated raised splitter islands) helps to address this issue. In addition, the crosswalks on the north leg of both the Beaver Creek Boulevard roundabout and the Benchmark Road roundabout, as well as the crossing at Hurd Lane have recently been improved by the installation of Rapid Rectangular Flashing Beacons (RRFBs). While an RRFB does not fully stop all traffic, they have proven to dramatically increase the proportion of motorists who stop for pedestrians in the crosswalk. The other legs of the two roundabouts have standard crosswalks, as do the majority of approaches to the other street intersections in the core area.

Current Bicycle/Pedestrian Improvement Plans

There are a number of efforts underway to expand the bicycle and pedestrian facilities serving Avon:

- The Town's Capital Improvement Plan includes funding for improvements to sidewalks and pedestrian safety along Avon Road under the I-70 overpass.

- The Eco Trails plan is for a Class I facility to ultimately connect Summit County with Glenwood Springs.

- As discussed above, the Beaver Creek Boulevard project will enhance pedestrian and bicycling facilities, including on-street bike lanes, expanded sidewalks, bulbouts to reduce pedestrian crossing distances, and new crosswalks.

Existing Key Gaps in the Network

In the West Town Center, the Main Street Mall provides a clear pedestrian unifying element. However, the East Town Center development and street pattern lacks this unifying element. While sidewalks are present along roadways such as Benchmark Place, clear pedestrian routes are not readily obvious to visitors, which is a potential disincentive to walking within the area. In addition, there are no marked crosswalks on West Beaver Creek Boulevard at Sun Road.

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Chapter 3
Existing Transit Conditions

Existing Avon Transit Service

Throughout the year, the Avon Transit system operates two regular fare-free routes, expanding during the winter to four regular fare-free transit routes. These routes are shown in Figure 6. In addition, experimental Transit Pilot Programs began operation in February, 2017.

Avon Transit Fixed Routes

Red Line Shuttle – Year-Round

Between 6:44 AM and 6:05 PM, the Red Line provides half-hourly service to several residential and commercial areas. Specifically, the route serves the residential area of east Avon, several downtown businesses (including the Avon Station, City Market, and Christie Lodge), as well as Walmart and Home Depot, the Traer Creek Plaza, and Buffalo Ridge. One bus operates a large one-way loop (mostly in the clockwise direction).

Blue Line Shuttle – Year-Round

Similarly, the Blue Line provides half-hourly service between 6:29 AM and 6:06 PM to the residential area of west Avon, downtown businesses (including Christy Sports, City Market, Chapel Square, and Comfort Inn), Walmart, Home Depot, and the Traer Creek Plaza. It also consists of one bus operating a one-way (largely clockwise) loop.

Skier Express – Winter Only

The Skier Express service provides daily transportation between downtown Avon and Beaver Creek (Elk Lot and Village). The four morning runs travel from Christie Lodge to Beaver Creek to Chapel Square and Beaver Creek Village every 15 minutes between the hours of 6:00 AM and 11:21 AM. The two mid-day runs travel the same route every 30 minutes between 11:21 AM and 2:45 PM. The four evening runs travel every 15 minutes between the Beaver Creek Village, downtown Avon, and the Beaver Creek Elk Lot between 2:45 PM and 5:45 PM.

Restaurant Shuttle – Winter Only

The Restaurant Shuttle provides daily half-hourly evening service between 5:50 PM and 10:00 PM to the major lodging properties and restaurants in the Town of Avon and Beaver Creek. This service requires one bus, though as it does not overlap with the hours of Skier Express service it does not require an additional bus in the Town transit fleet.

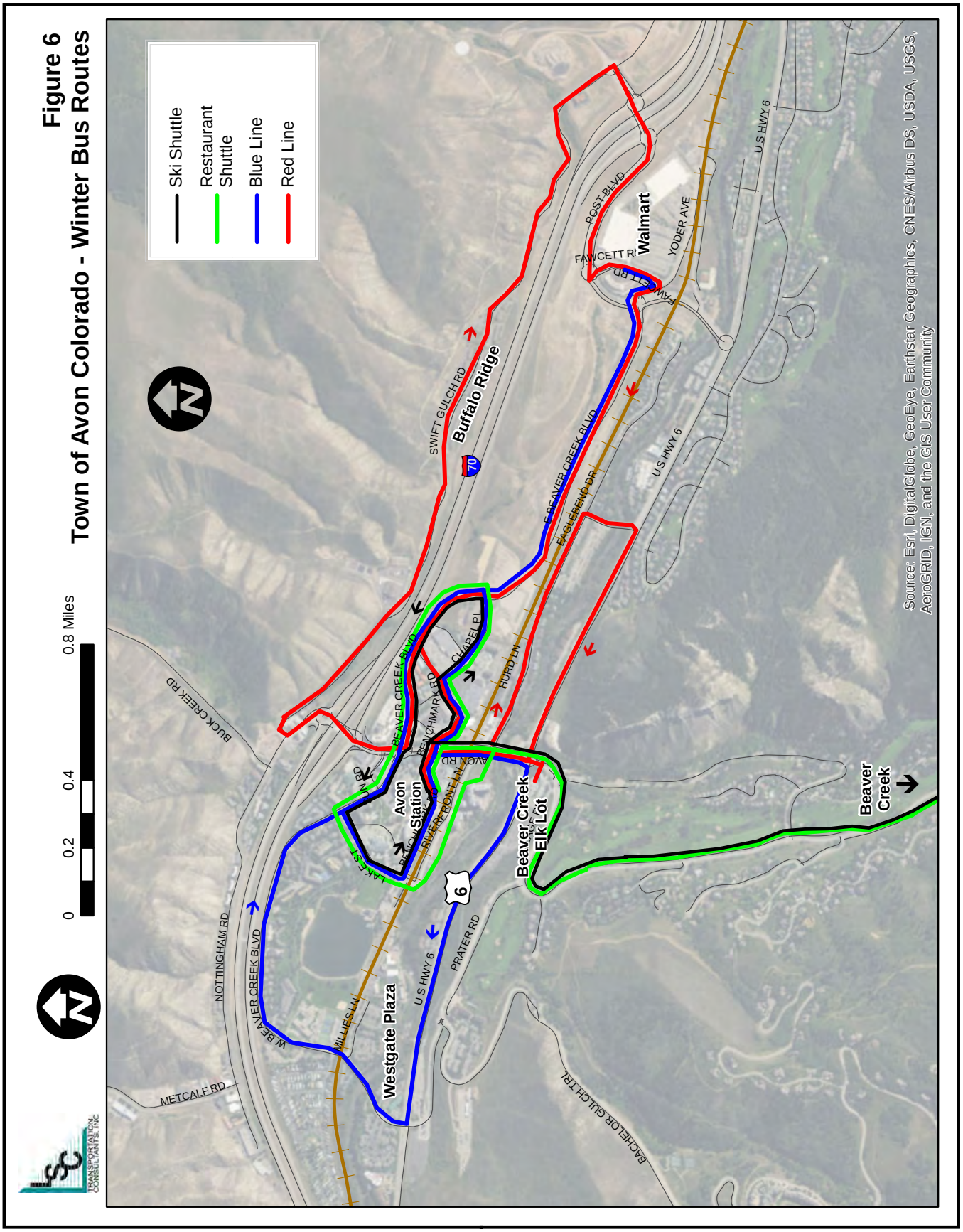


Figure 6
Town of Avon Colorado - Winter Bus Routes

Avon 2017 Transit Pilot Programs

The 2017 Transit Pilot Programs, (implemented February 8th) are described below.

Avon Night Rider

The Avon Night Rider loop runs every 36 minutes between 6:00 PM and 11:02 PM and provides service to the Blue and Red Route service areas, including downtown Avon, The Aspens, Buffalo Ridge, Eagle Bend, Walmart and Eagle Bend. This service is scheduled to terminate on April 2nd.

Wildridge Express Shuttle

The Wildridge Express was a half-hour-long route operated twice in the morning (between 8:00 – 9:00 AM and twice in the afternoon (between 3:25 – 4:25 PM). The route traveled between the Wildridge Neighborhood and downtown Avon with connections to ECO Transit and the Skier Express Shuttle, but was terminated on March 2nd and replaced with an on-demand service.

Deviated Skier Express Route

Upon request, once each morning and twice each evening the Skier Shuttle will offer service to West Beaver Creek Boulevard (beginning January 16th).

Avon Transit Ridership and Productivity by Route

Monthly and Annual Ridership Trends

Table 6 displays the FY 2015-16 ridership by route by month for the Avon Transit fixed routes. As shown, while the Blue and Red Lines run year-round, the Restaurant Shuttle only operates from December to April, and the Skier Shuttle operates between November and April. There were a total of 362,663 passenger-trips throughout the year. The Skier Shuttle had the highest ridership, with 177,427 trips, accounting for 48.9 percent of total annual ridership (as is also shown in Figure 7). The Blue and Red Lines followed, with respectively 28.2 and 18.1 percent of total trips per year. Trips on the Restaurant Shuttle accounted for 4.7 percent of total annual ridership.

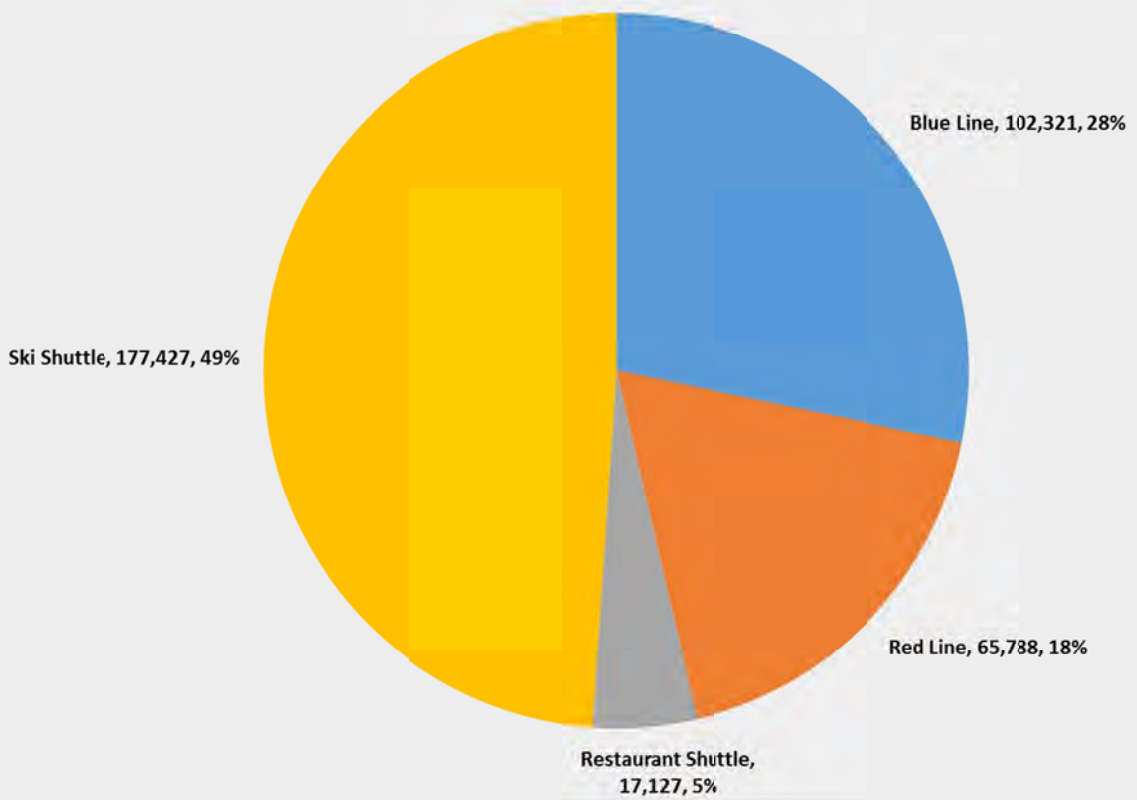
Avon Transit ridership is lower than recorded in 2008. At that time, the "Town Routes" (including the Blue Line, Red Line and evening Black Line) and the Gondola Express Route carried a total of 520,000. While there have been changes in services in the intervening years, the FY 2015/16 total of 362,663 indicates a 30 percent reduction in overall ridership.

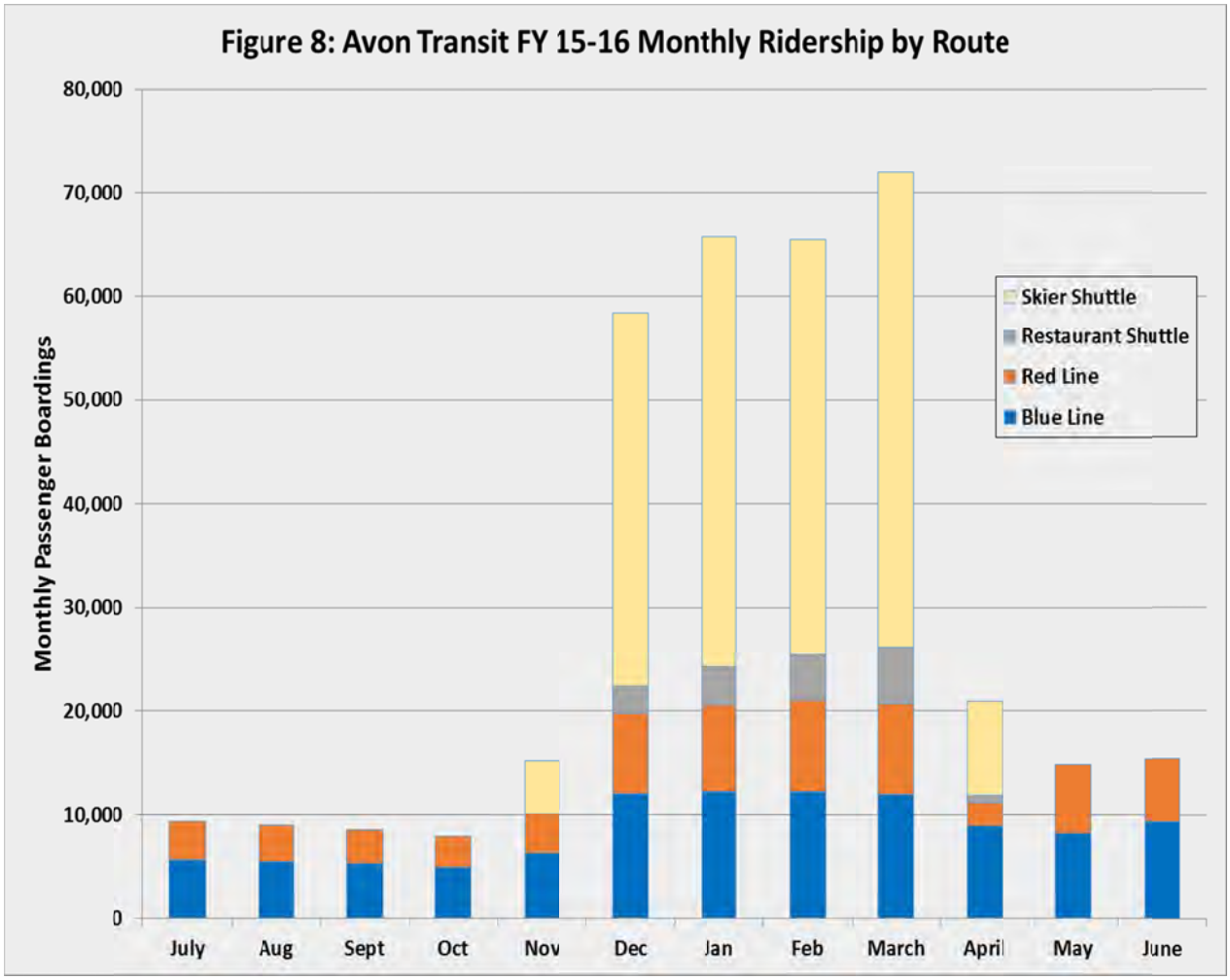
Overall, the busiest months on Avon Transit are December throughout March, with each month accounting for 16 – 20 percent of total ridership, as shown in Figure 8. March had the highest ridership of all, with 71,973 passenger-trips, representing 19.8 percent of total ridership.

Table 6: Avon FY 2015-16 Monthly Ridership by Route

Route	Month													
	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	**Total**	**% Total**
Blue Line	5,606	5,451	5,280	4,897	6,274	12,026	12,243	12,223	11,981	8,858	8,143	9,339	**102,321**	**28.2%**
Red Line	3,723	3,552	3,252	2,962	3,782	7,730	8,377	8,775	8,652	2,257	6,683	6,043	**65,788**	**18.1%**
Restaurant Shuttle	--	--	--	--	--	2,634	3,703	4,487	5,566	737	--	--	**17,127**	**4.7%**
Skier Shuttle	--	--	--	--	5,214	35,974	41,445	39,951	45,774	9,069	--	--	**177,427**	**48.9%**
Total	**9,329**	**9,003**	**8,532**	**7,859**	**15,270**	**58,364**	**65,768**	**65,436**	**71,973**	**20,921**	**14,826**	**15,382**	**362,663**	**100.0%**
% Total	**2.6%**	**2.5%**	**2.4%**	**2.2%**	**4.2%**	**16.1%**	**18.1%**	**18.0%**	**19.8%**	**5.8%**	**4.1%**	**4.2%**	**100.0%**	

Figure 7: Avon Transit FY 15-16 Ridership by Route





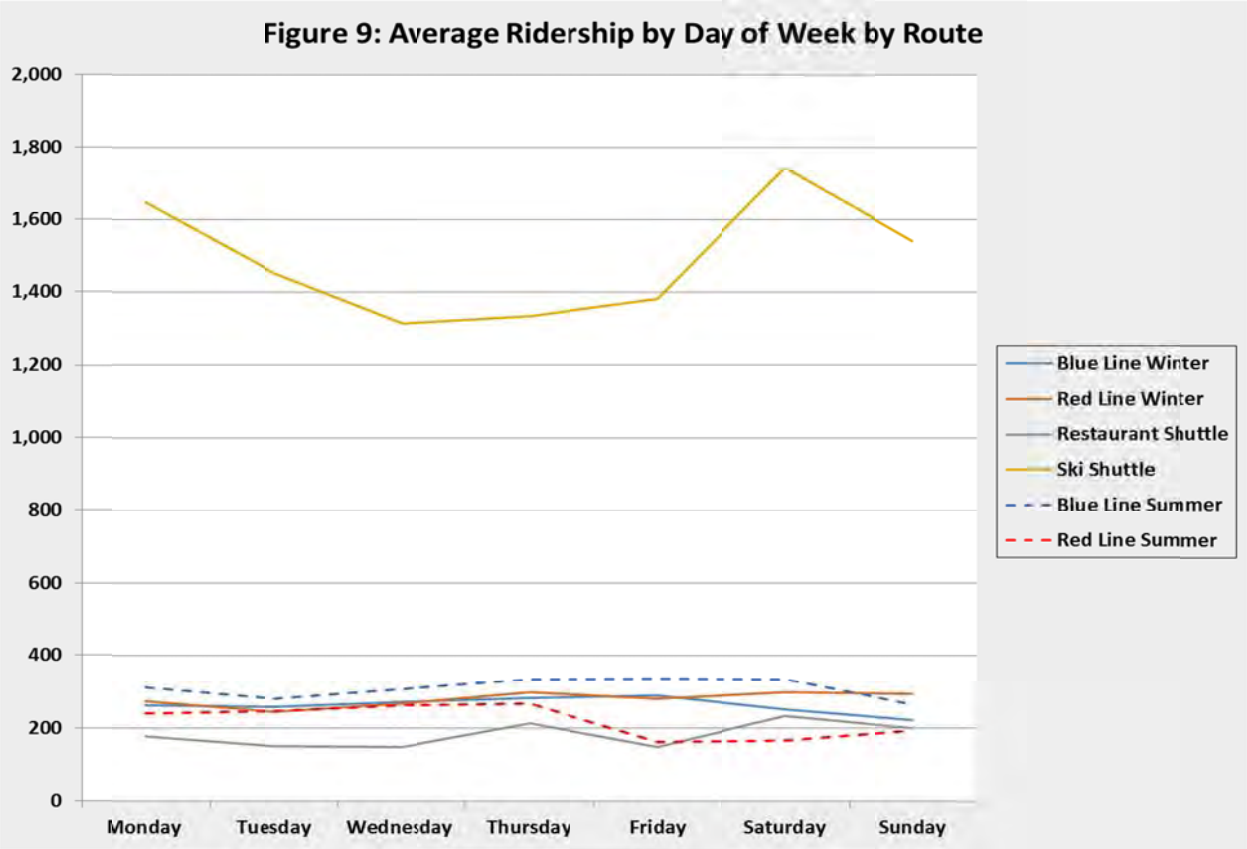
In contrast, October had the lowest ridership, with 7,859 total trips, or 2.2 percent of total annual ridership. The Blue Line had its highest ridership in January, the Red Line was busiest in February, and the seasonal shuttles were both busiest in March.

Ridership by Day of Week by Route

Table 7 and Figure 9 illustrate the average daily ridership by day of week by route for the busiest summer month (July) and winter month (March). In summer, ridership is relatively consistent by day of week, ranging from a low of 458 passengers (12.3 percent of total) on Sunday to a high of 602 (16.4 percent) on Thursday. In winter, Saturday had the highest overall ridership, with 2,527passenger-trips (16.3 percent of total weekly ridership) and Wednesday had the lowest ridership, with 2,001 passenger-trips (12.9 percent of total weekly ridership). Saturday was the busiest day on the Restaurant Shuttle and Ski Shuttle, Thursday and Saturday were tied as the busiest day on the Red Line Shuttle, and Friday was the busiest day on the Blue Line Shuttle.

Table 7: Average Avon Transit Ridership by Day of Week by Route

Route	Day of Week							Total
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	
Peak Summer Month (June)								
Blue Line	312	281	308	336	337	336	265	**2,174**
Red Line	241	247	264	266	161	166	194	**1,538**
Total	553	528	572	602	497	502	458	**3,712**
	14.9%	**14.2%**	**15.4%**	**16.2%**	**13.4%**	**13.5%**	**12.3%**	**100.0%**
Peak Winter Month (March)								
Blue Line	262	259	271	282	290	251	222	**1,836**
Red Line	274	244	268	299	282	299	295	**1,960**
Restaurant Shuttle	176	149	147	212	146	234	199	**1,264**
Ski Shuttle	1,648	1,453	1,314	1,335	1,383	1,744	1,542	**10,418**
Total	**2,360**	**2,105**	**2,001**	**2,129**	**2,100**	**2,527**	**2,257**	**15,479**
% Total	**15.2%**	**13.6%**	**12.9%**	**13.8%**	**13.6%**	**16.3%**	**14.6%**	**100.0%**



Ridership by Time of Day by Route

Table 8 and Figure 10 show the average daily boarding by time of day by route for both July and March. Summer ridership is highest in the afternoon, reaching as high as 52 passenger boardings on the Blue Line in the 4 PM hour, and 22 passenger boardings on the Red Line in the 2 PM hour. Winter ridership on the Red and Blue Lines show a similar pattern of strong ridership throughout the service day, peaking in the afternoon. The Skier Shuttle's ridership pattern reflects a typical skier activity pattern, with high morning ridership in the 8 AM and 9 AM hours, and a particularly strong afternoon peak (278 passengers) in the 4 PM hour. The Restaurant Shuttle ridership is highest in the first hour of service (6 PM hour), though strong ridership occurs across the service span.

Ridership by run data is also available for the pilot Night Rider service. As shown in Table 9, the busiest run is that starting at 9:36 PM, with 13.7 passengers on average. Ridership is low on the final two runs after this busy run.

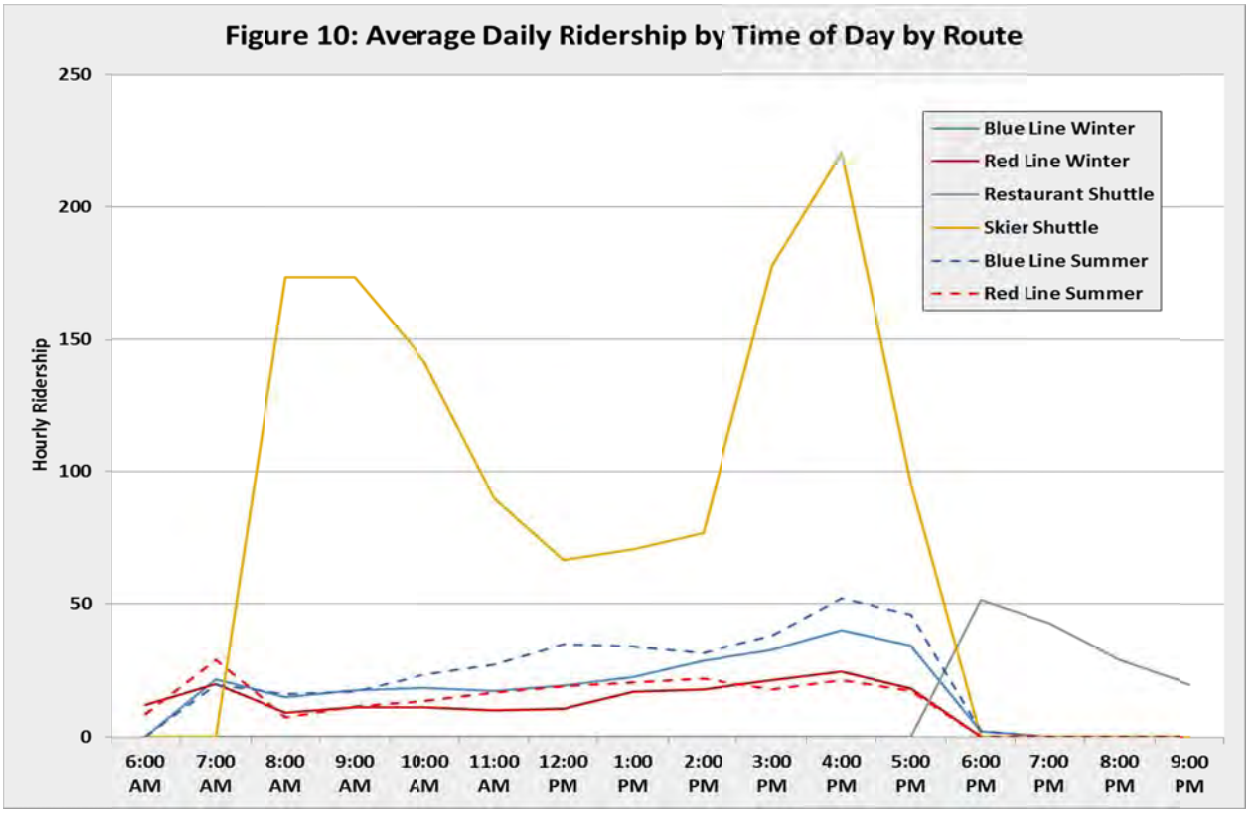
Table 8: Average Avon Daily Ridership by Time of Day by Route

	Peak Summer Month (July)				Peak Winter Month (March)					
Time	Blue Line	Red Line	Total	% of Daily Total	Blue Line	Red Line	Restaurant Shuttle	Skier Shuttle	Total	% of Daily Total
6:00 AM	0	9	9	2%	0	19	0	0	19	1%
7:00 AM	20	29	49	9%	31	34	0	0	65	3%
8:00 AM	16	7	23	4%	26	14	0	233	274	12%
9:00 AM	17	11	28	5%	26	15	0	193	233	10%
10:00 AM	23	14	37	7%	29	20	0	159	208	9%
11:00 AM	27	17	44	8%	33	20	0	90	143	6%
12:00 PM	35	19	54	10%	35	20	0	68	124	5%
1:00 PM	34	21	55	10%	34	23	0	71	128	6%
2:00 PM	32	22	53	10%	34	22	0	74	130	6%
3:00 PM	38	18	56	10%	37	30	0	193	260	11%
4:00 PM	52	21	74	13%	48	32	0	278	358	15%
5:00 PM	46	17	63	12%	43	29	0	117	189	8%
6:00 PM	2	0	2	0%	3	0	71	0	73	3%
7:00 PM	0	0	0	0%	0	0	40	0	40	2%
8:00 PM	0	0	0	0%	0	0	44	0	44	2%
9:00 PM	0	0	0	0%	0	0	25	0	25	1%
Total	342	204	546		379	279	180	1477	2315	
Daily Vehicle-Hours of Service	11.6	11.4	23.0		11.6	11.4	4.2	15.8	42.9	
Productivity: Psgrs per VHS	29.5	18.0	23.8		32.7	24.6	43.1	93.6	53.9	

TABLE 9: Average Daily Night Rider Ridership by Stop and Run

40 Days from February 8 through March 19, 2017

	Run Time									
Stop	6:00 PM	6:36 PM	7:12 PM	7:48 PM	8:24 PM	9:00 PM	9:36 PM	10:12 PM	10:48 PM	TOTAL
Westgate Plaza	0.8	1.0	0.7	0.5	0.2	0.5	1.8	0.3	0.1	5.7
Aspens Mobile Home Pk.	0.7	0.8	0.5	0.5	0.5	0.4	1.7	0.0	0.1	5.1
West Beaver Creek Blvd	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Stone Creek	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Buck Creek	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lake Street	0.2	0.1	0.1	0.2	0.2	0.0	0.5	0.0	0.0	1.1
Avon Station	1.0	1.4	1.3	1.0	0.5	0.7	3.2	0.3	0.1	9.4
North Side Kitchen	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.2	0.0	0.4
Buffalo Ridge West	0.1	0.1	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.5
Buffalo Ridge East	0.2	0.1	0.1	0.0	0.4	0.1	0.7	0.1	0.0	1.5
Wal Mart	2.7	2.5	2.4	2.2	1.9	1.5	3.9	0.6	0.0	17.7
American National Bank	1.3	0.7	0.3	0.3	0.3	0.1	0.8	0.0	0.0	3.7
Christy Lodge	0.3	0.3	0.4	0.7	0.2	0.5	0.8	0.4	0.0	3.5
Eagle Bend West	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.3
Eagle Bend East	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.3
EB&HW6-Eagle Bend @ HWY 6	0.1	0.3	0.1	0.1	0.2	0.0	0.3	0.0	0.0	1.1
Eagle Bend/Hwy 6 Req.	0.1	0.3	0.3	0.3	0.1	0.1	0.1	0.0	0.0	1.2
Rivers Edge on HWY 6	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.2
TOTAL	7.3	7.5	6.0	5.8	4.5	3.7	13.7	1.6	0.4	51.9



Ridership by Stop by Route by Season

A review of ridership activity by stop is useful in both evaluating trip patterns as well as the need for shelters and other stop amenities. Table 10 presents the average daily ridership at the stops along each of the routes, for both the busiest winter month (March) and the busiest summer month (July). This data reflects the differing functions of the various routes:

- On the **Blue Line** and **Red Line**, the busiest single stop in both summer and winter is The Aspens housing area. Other high ridership residential areas are Buffalo Ridge and the Eaglebend/Stonebridge area. Avon Station, Walmart and Westgate Plaza are also popular stops.

- The **Skier Shuttle** data reflects how the service is used to connect lodging properties in Avon with Beaver Creek Village. Beyond Beaver Creek Village (with almost half of total boardings), the busiest stops are at Christie Lodge and Comfort Inn, followed by the Avon Station and Lake Street stops.

- A majority (69 percent) of the **Restaurant Shuttle** ridership boards at Beaver Creek Village. It is clear from this data and the ridership by time of day data discussed above that some of the Restaurant Shuttle ridership consists of skiers returning to Avon from Beaver Creek, particularly in the 6:00 PM hour. The Westin is the second-most popular stop.

Ridership by stop data is also available for the Night Rider pilot service, as reflected in Table 9, above. The busiest stop was Walmart, followed by Westgate Plaza and the Aspens Mobile Home Park.

Transit Service Productivity by Route and by Season

A key productivity measure of a transit service is the passenger boardings per Vehicle-Hour of Service[3] (VHS). Dividing the total average daily ridership by route data by the daily hours of service by route yields the productivity figures shown in the bottom of Table 8. As indicated, in summer the Blue Line carries an average of 29.5 passengers per VHS while the Red Line carries 18.0. Productivity is even higher in winter, ranging from 24.6 for the Red Line and 32.7 for the Blue Line, up to a high of 93.6 for the Skier Shuttle. As a point of comparison, the Aspen City transit service carries an annual average of 20 passengers per VHS, while the figure for the Summit Stage transit program serving Summit County is 23. By this measure, all of the existing Avon Transit services are productive, particularly in winter. This also indicates a high potential for expansion of transit service.

[3] This reflects the fact that most of the cost of transit service is associated with the hours of operation (driver salaries and benefits) rather than the miles of operation (fuel and vehicle maintenance costs).

TABLE 10: Avon Transit Average Daily Ridership by Stop

Blue Route	March		July	
Westgate Plaza	53	13%	26	14%
The Aspens	100	25%	48	26%
West Beaver Creek Blvd	15	4%	2	1%
Sheraton	8	2%	4	2%
Avon Station	63	16%	16	9%
Christy Sports	1	0%	1	0%
City Market	44	11%	23	12%
Chapel Square	4	1%	1	1%
Walmart	55	14%	31	17%
Christie Lodge	21	5%	8	4%
Comfort Inn	12	3%	2	1%
Lake Street	9	2%	11	6%
Beaver Ck. Elk Lot	7	2%	10	5%
River Edge	6	2%	5	2%
Total	399	100%	187	100%

Red Route	March		July	
Buffalo Ridge	39	14%	18	15%
Walmart	29	10%	19	16%
City Market	22	8%	5	4%
Loaded Joes	0	0%	0	0%
Avon Xing/Cnyn Run	7	2%	2	2%
Eaglebend N	41	15%	14	12%
Stonebridge Dr	38	14%	14	12%
Eaglebend West	38	13%	14	11%
Beaver Ck. Elk Lot	12	4%	8	6%
Avon Station	37	13%	14	11%
City Market	13	5%	9	7%
Christie Lodge	4	2%	4	3%
Total	279	100%	120	100%

Skier Shuttle	March	
Christie Lodge	229	15%
Comfort Inn	197	13%
Lake Street	100	7%
Avon Station	129	9%
Beaver Ck Elk Lot	75	5%
Beaver Ck Village	709	48%
Christy Sports	0	0%
City Market	9	1%
Chapel Square	16	1%
Sheraton	11	1%
Total	1477	100%

Restaurant Shuttle	March	
Westin SB	19	11%
Beaver Ck Village	123	69%
Westin NB	2	1%
Avon Station	9	5%
Christy Sports	1	1%
City Market	5	3%
Christie Lodge	9	5%
Northside Kitchen	1	1%
Comfort Inn	7	4%
Lake Street	3	1%
Total	180	100%

Transit Stop Amenities

Table 11 presents an inventory of the Avon Transit bus stops, which routes each stop serves, and whether the stop locations include a sign or shelter. As shown, there are 20 total stops; 5 of which are along the Red Line, 13 serve the Blue Line, 9 serve the Skier Shuttle, and 8 serve the Restaurant Shuttle. All of the stops have signs and eight have shelters.

Table 11: Avon Transit Bus Stop Inventory

Bus Stop	Routes Serving Stop				Amenities	
	Red Line	Blue Line	Skier Shuttle	Rest. Shuttle	Sign	Shelter
Christie Lodge	♦	♦	♦	♦	♦	
Comfort Inn		♦	♦	♦	♦	
Sheraton Mountain Vista		♦	♦		♦	♦
Christy Sports		♦	♦	♦	♦	
City Market-North	♦	♦	♦	♦	♦	♦
City Market-South	♦				♦	
Chapel Square		♦	♦	♦	♦	
Walmart	♦	♦			♦	
Northside Kitchen	♦				♦	
Westgate		♦			♦	
Aspens		♦			♦	♦
Lake Street		♦	♦	♦	♦	
River Edge		♦			♦	♦
Buffalo Ridge	♦				♦	♦
Avon Crossing/Canyon Run	♦				♦	
Eaglebend North	♦				♦	
Stonebridge Drive	♦				♦	♦
Eaglebend West	♦				♦	
Beaver Creek Elk Lot	♦	♦	♦	♦	♦	♦
Avon Station	♦	♦	♦	♦	♦	♦
Total	**12**	**13**	**9**	**8**	**20**	**8**

Gondola

The gondola connecting Avon with Beaver Creek is a important element of the overall public transit network. The Riverfront Express Gondola #7 provides convenient access from the Westin Hotel in Avon to Beaver Creek Landing, where connections are redily available to the Lower Beaver Creek Mountain Express chairlift #15, or the express bus up to Beaver Creek Village. The gondola opens approximately December 10th and operates from 8:00 a.m. to 4:30 p.m. free of charge during ski season.

Eco Transit

The other key element of Avon's public transit network is the regional services provided by ECO Transit (Eagle County Regional Transit Authority). The key routes serving Avon are as follows:

- The **Highway 6 Route** serves Avon a total of 88 times per day in winter, starting at 5:17 AM and ending at 1:35 AM. In addition to serving Avon Station, stops are served at Walmart, The Elk Lot, and along Stonebridge and Eaglewood. Service frequency varies, with up to 5 buses per hour per direction in peak commute times and half-hourly service in the evening. Current plans for summer 2017 service call for a total of 61 daily one-way trips, extending from 5:24 AM all the way to 3:24 AM.

- The **Valley Route** provides faster service between major stops, using I-70. The sole stop in Avon (Avon Station) is served a total of 40 times per winter day, from 6:20 AM to 11:34 PM. Service is generally on hourly headways, with several additional runs to serve peak commute periods. Summer 2017 service is planned to consist of 28 daily trips, from 7:07 AM to 11:37 PM.

- The **Vail/Beaver Creek Express** is a winter-only service, providing three AM round-trip runs and three PM round-trip runs between the Vail Transportation Center and Beaver Creek Village. Avon Station is served in the westbound direction.

Fares are currently $4 per ride, $8 for a day pass, $35 for a 10-ride pass, and $100 for a 30-day pass. Persons 18 years of age or under and those 60 and above can board for $1.00, or pay only $25 for an annual pass.

Intercity Transportation

While the I-70 corridor is served both by Greyhound (five trips per day) and the Bustang program (one trip per day), neither service stops in Avon. There are a variety of private shuttle services, with round-trip rates from the Front Range starting at approximately $120.

Existing Parking Supply and Regulations

The current public parking supply within the commercial core area is shown in Table 12. As indicated, there are a total of 359 spaces, of which 299 are west of Avon Road and 60 to the east. Of the total, 21 percent are on-street spaces and the remainder in lots. While none of the public spaces require a fee, just under half of these spaces (47 percent) have a 2 or 3 hour parking time limit. As noted, all of the parking areas are served by Avon Transit, and two areas are within a convenient 5-minute (quarter-mile) walk of the gondola base.

TABLE 12: Existing Public Parking in Avon Commercial Center

			Within Convenient 5-Minute Walk Of…	
Area	Spaces	Current Restrictions	Transit Stop	Gondola
West Town Center				
Town Hall/Lake St	123	Weekend Only	☑	☐
Rec Center/Fire	93	3 Hr Max	☑	☐
West Beaver Creek Blvd On-Street	22	2 or 3 Hr Max	☑	☐
Library On-Street	25	2 Hr Max	☑	☑
Mikaela Way Public Lot (New Town Hall)	36	None	☑	☑
Subtotal	299			
East Town Center				
E. Benchmark Rd On-Street	21	2 Hr Max	☑	☐
Chapel Place	9	2 Hr Max	☑	☐
Behind Chapel Sq.	30		☑	☐
Subtotal	60			
Total	359			

Note: No overnight parking on any facilities (12 AM to 6 AM). Excludes loading spaces.

In addition to these spaces, beyond the commercial core area 19 public spaces are available on the north side of Nottingham Park, 72 spaces are available at Avon Elementary School on weekends, 170 public spaces are available at Traer Creek Plaza, and there are a total of 765 spaces available for skier overflow at the Rodeo Grounds.

East of the study area, there are a total of 170 covered parking spaces in Traer Creek Plaza, served by both Avon Transit and Eco Transit. The Town has also made agreements with individual private property owners to allow parking for special events when spaces are available, as follows:

- Nottingham Park evening special event parking -- US Bank after 6:00 p.m., First Bank after 6:00 p.m.

- Weekend special event parking -- Mtn. Vista Office Building, US Bank and FirstBank after 12:00 p.m. on Saturday; all day Sunday, Beaver Creek Bear Lots (overflow only).

Existing Parking Counts and Utilization

Winter Counts

Parking accumulation counts were conducted throughout the Avon commercial core area over the course of a busy winter day (Saturday, February 18, 2017, which was the Saturday of President's Day Weekend). LSC staff conducted parking counts at a total of 15 on-street and off-street parking areas every hour between 7:00 AM and 9:00 PM. The individual areas are depicted in Figures 11 and 12, while the results of the counts are shown in Table 13. A review of this data indicates the following:

- The parking spaces in the 15 areas total 887. At the peak time of overall parking utilization (6:00 PM hour), 402 vehicles were observed in these areas in total (45 percent utilization).

- The overall parking utilization is depicted graphically in Figure 13. As shown, utilization grows at a rapid rate until the 12:00 PM hour, and then grows at a slower rate over the afternoon before falling starting at 7:00 PM.

- A review of hourly utilization by specific area, as depicted in Figure 14, shows how parking is utilized in different patterns. Many areas see the highest utilization in mid-day or the early afternoon hours. The Rec Center parking lot grows over the day to a peak at 5:00 PM, after which it drops quickly. Other areas such as the Loaded Joes, Bob's Place and Chapel Place parking areas, however, see the highest utilization in the evening hours.

- Utilization rates were observed to be higher west of Avon Road than east of Avon Road. The highest utilization west of Avon Road was observed to be 55 percent, at 2:00 PM. In comparison, the east side of the commercial core had a maximum of 39 percent utilization in the 5:00 PM and 6:00 PM hours.

- While the total utilization rate was observed to be relatively low, a review of specific areas indicates areas of high parking utilization. Parking areas with utilization rates exceeding 80 percent consisted of the following:

Figure 11: Avon Parking Count Areas - East

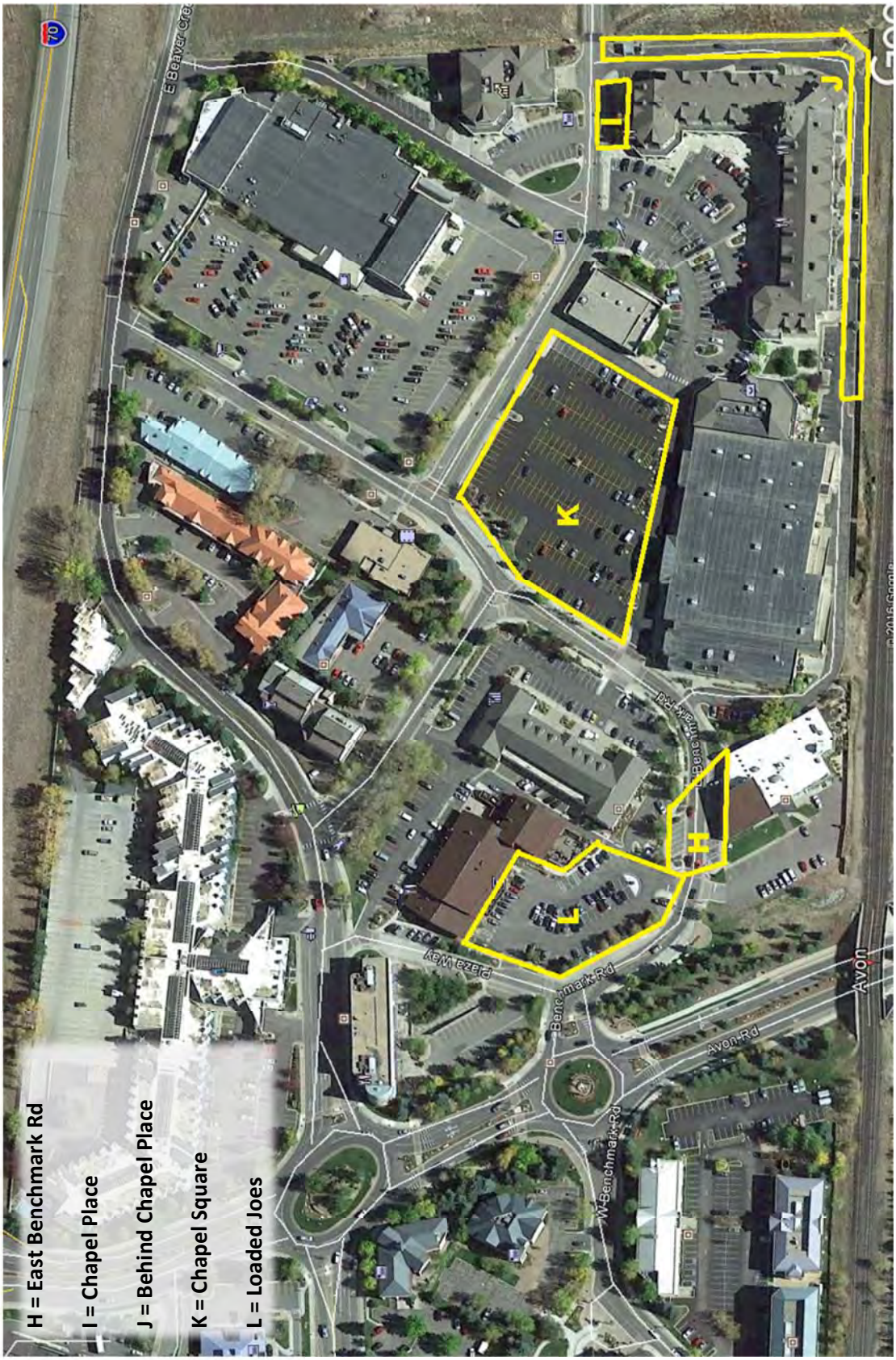
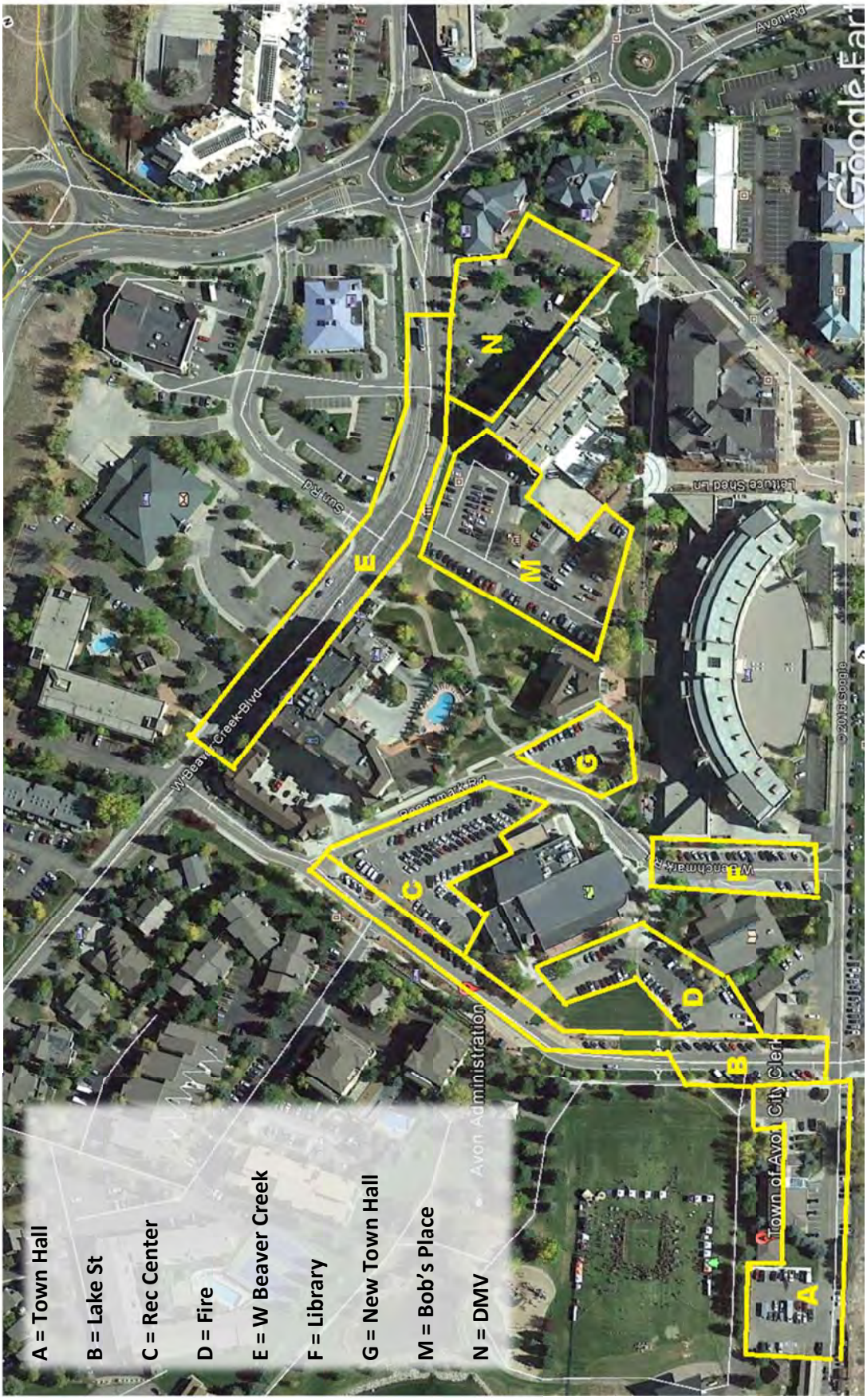
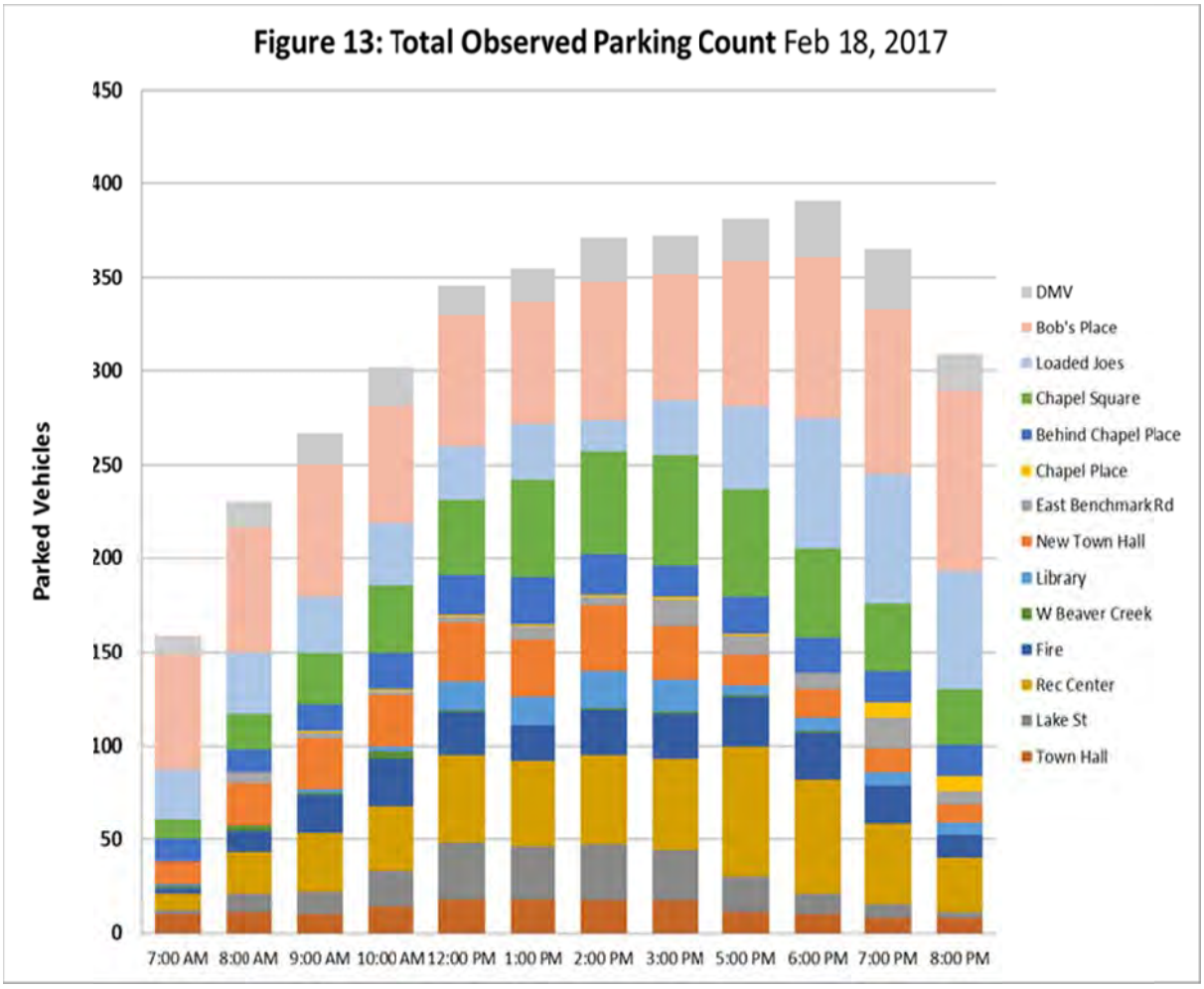


Figure 12: Avon Parking Count Areas - West



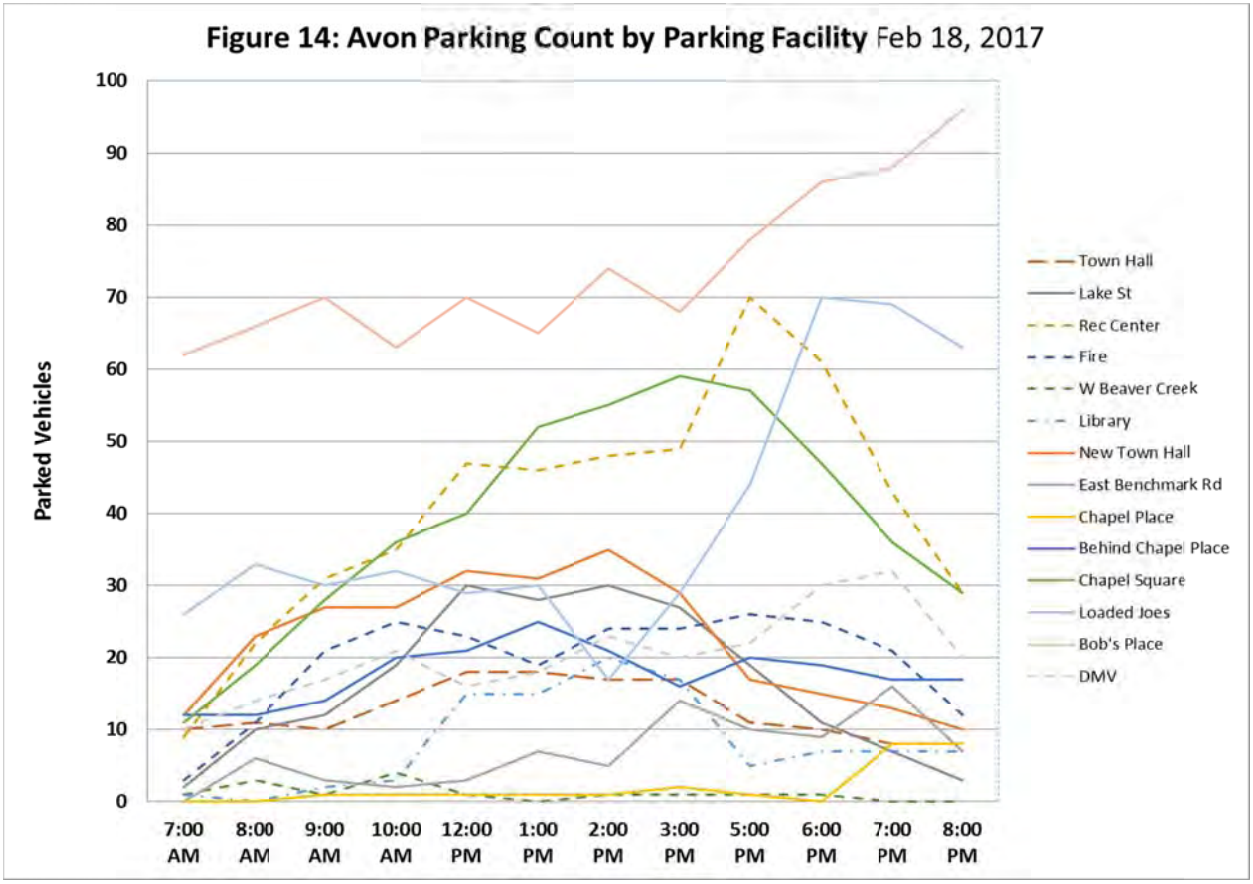


- Rec Center – 87 percent at 5:00 PM
- The New Town Hall lot – Between Noon and 2:00 PM, with a peak of 95 percent in the 2:00 PM hour
- Chapel Place – 89 percent in the 6:00 PM and 7:00 PM hours
- The lot behind Chapel Place – 83 percent at 1:00 PM
- Loaded Joes lot – After 6:00 PM, with a peak of 96 percent in the 6:00 PM hour

Another recent source of winter parking occupancy data is the *Avon Center Lot B Parking Needs Study* conducted by Walker Parking Consultants. This includes parking occupancy counts conducted for the Avon Center area, consisting of the parking lots and below-ground spaces (totaling 297 spaces) along the south side of West Beaver Creek Boulevard between Avon Road and Sun Road on Friday, February 26, 2016 and Saturday, February 27, 2016. A maximum overall occupancy of 193 vehicles (65 percent) was observed on Friday (at 10 AM) and a maximum of 173 vehicles (58 percent) on Saturday (at 7:00 PM).

TABLE 13: Avon Commercial Core Parking Accumulation Counts *-- Saturday, February 18, 2017*

ID	Parking Location	Type	Capacity	7:00 AM	8:00 AM	9:00 AM	10:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	5:00 PM	6:00 PM	7:00 PM	8:00 PM
A1	Town Hall-Police	Lot	20	11	12	11	12	12	12	12	14	12	11	10	9
A	Town Hall	Lot	65	10	11	10	14	18	18	17	17	11	10	8	8
B	Lake St	On-street	38	2	10	12	19	30	28	30	27	19	11	7	3
C	Rec Center	Lot	80	9	22	31	35	47	46	48	49	70	61	43	29
D	Fire	Lot	43	3	11	21	25	23	19	24	24	26	25	21	12
E	W Beaver Creek	On-street	30	1	3	1	4	1	0	1	1	1	1	0	0
F	Library	On-street	25	1	0	2	3	15	15	20	17	5	7	7	7
G	New Town Hall	Lot	37	12	23	27	27	32	31	35	29	17	15	13	10
M	Bob's Place	Lot	135	62	66	70	63	70	65	74	68	78	86	88	96
N	DMV	Lot	42	10	14	17	21	16	18	23	20	22	30	32	20
H	East Benchmark Rd	On-street	21	0	6	3	2	3	7	5	14	10	9	16	7
I	Chapel Place	On-street	9	0	0	1	1	1	1	1	2	1	0	8	8
J	Behind Chapel Place	Lot	30	12	12	14	20	21	25	21	16	20	19	17	17
K	Chapel Square	Lot	239	11	19	28	36	40	52	55	59	57	47	36	29
L	Loaded Joes	Lot	73	26	33	30	32	29	30	17	29	44	70	69	63
Subtotal: West Side			*515*	*121*	*172*	*202*	*223*	*264*	*252*	*284*	*266*	*261*	*257*	*229*	*194*
Subtotal: East Side			*372*	*49*	*70*	*76*	*91*	*94*	*115*	*99*	*120*	*132*	*145*	*146*	*124*
Subtotal: Public West Side			*318*	*38*	*80*	*104*	*127*	*166*	*157*	*175*	*164*	*149*	*130*	*99*	*69*
Subtotal: Public East Side			*60*	*12*	*18*	*18*	*23*	*25*	*33*	*27*	*32*	*31*	*28*	*41*	*32*
Subtotal: Public			*378*	*50*	*98*	*122*	*150*	*191*	*190*	*202*	*196*	*180*	*158*	*140*	*101*
TOTAL			**887**	**170**	**242**	**278**	**314**	**358**	**367**	**383**	**386**	**393**	**402**	**375**	**318**
Percent of Capacity															
A1	Town Hall-Police	Lot	**20**	55%	60%	55%	60%	60%	60%	60%	70%	60%	55%	50%	45%
A	Town Hall	Lot	65	15%	17%	15%	22%	28%	28%	26%	26%	17%	15%	12%	12%
B	Lake St	On-street	38	5%	26%	32%	50%	79%	74%	79%	71%	50%	29%	18%	8%
C	Rec Center	Lot	80	11%	28%	39%	44%	59%	58%	60%	61%	88%	76%	54%	36%
D	Fire	Lot	43	7%	26%	49%	58%	53%	44%	56%	56%	60%	58%	49%	28%
E	W Beaver Creek	On-street	30	3%	10%	3%	13%	3%	0%	3%	3%	3%	3%	0%	0%
F	Library	On-street	25	4%	0%	8%	12%	60%	60%	80%	68%	20%	28%	28%	28%
G	New Town Hall	Lot	37	32%	62%	73%	73%	86%	84%	95%	78%	46%	41%	35%	27%
M	Bob's Place	Lot	135	46%	49%	52%	47%	52%	48%	55%	50%	58%	64%	65%	71%
N	DMV	Lot	42	24%	33%	40%	50%	38%	43%	55%	48%	52%	71%	76%	48%
H	East Benchmark Rd	On-street	21	0%	29%	14%	10%	14%	33%	24%	67%	48%	43%	76%	33%
I	Chapel Place	On-street	9	0%	0%	11%	11%	11%	11%	11%	22%	11%	0%	89%	89%
J	Behind Chapel Place	Lot	30	40%	40%	47%	67%	70%	83%	70%	53%	67%	63%	57%	57%
K	Chapel Square	Lot	239	5%	8%	12%	15%	17%	22%	23%	25%	24%	20%	15%	12%
L	Loaded Joes	Lot	73	36%	45%	41%	44%	40%	41%	23%	40%	60%	96%	95%	86%
Subtotal: West Side				23%	33%	39%	43%	51%	49%	55%	52%	51%	50%	44%	38%
Subtotal: East Side				13%	19%	20%	24%	25%	31%	27%	32%	35%	39%	39%	33%
Subtotal: Public West Side				12%	25%	33%	40%	52%	49%	55%	52%	47%	41%	31%	22%
Subtotal: Public East Side				20%	30%	30%	38%	42%	55%	45%	53%	52%	47%	68%	53%
Subtotal: Public Total				13%	26%	32%	40%	51%	50%	53%	52%	48%	42%	37%	27%
TOTAL				19%	27%	31%	35%	40%	41%	43%	44%	44%	45%	42%	36%



These available parking counts indicate that there are specific sub-areas that experience parking shortages at peak times. However, public parking is typically available within a block or two walk at all times.

Summer Counts

In the summer of 2015, Town staff conducted a series of counts for key times in the parking facilities shown in Figure 15. The results shown in Table 14 indicate the following:

- On the date of the evening count (August 6th) there was a special event that completely filled all public parking west of Avon Road. Parking utilization during this period was also highest in the areas east of Avon Road, though this reached only 47 percent.

- Other than during this evening special event, there were several specific times when some individual facilities reached 100 percent utilization, in the vicinity of Benchmark Road/Mikaela Way. In all these cases, however, there were available spaces in other nearby facilities.

Figure 15
Summer Parking Count Areas

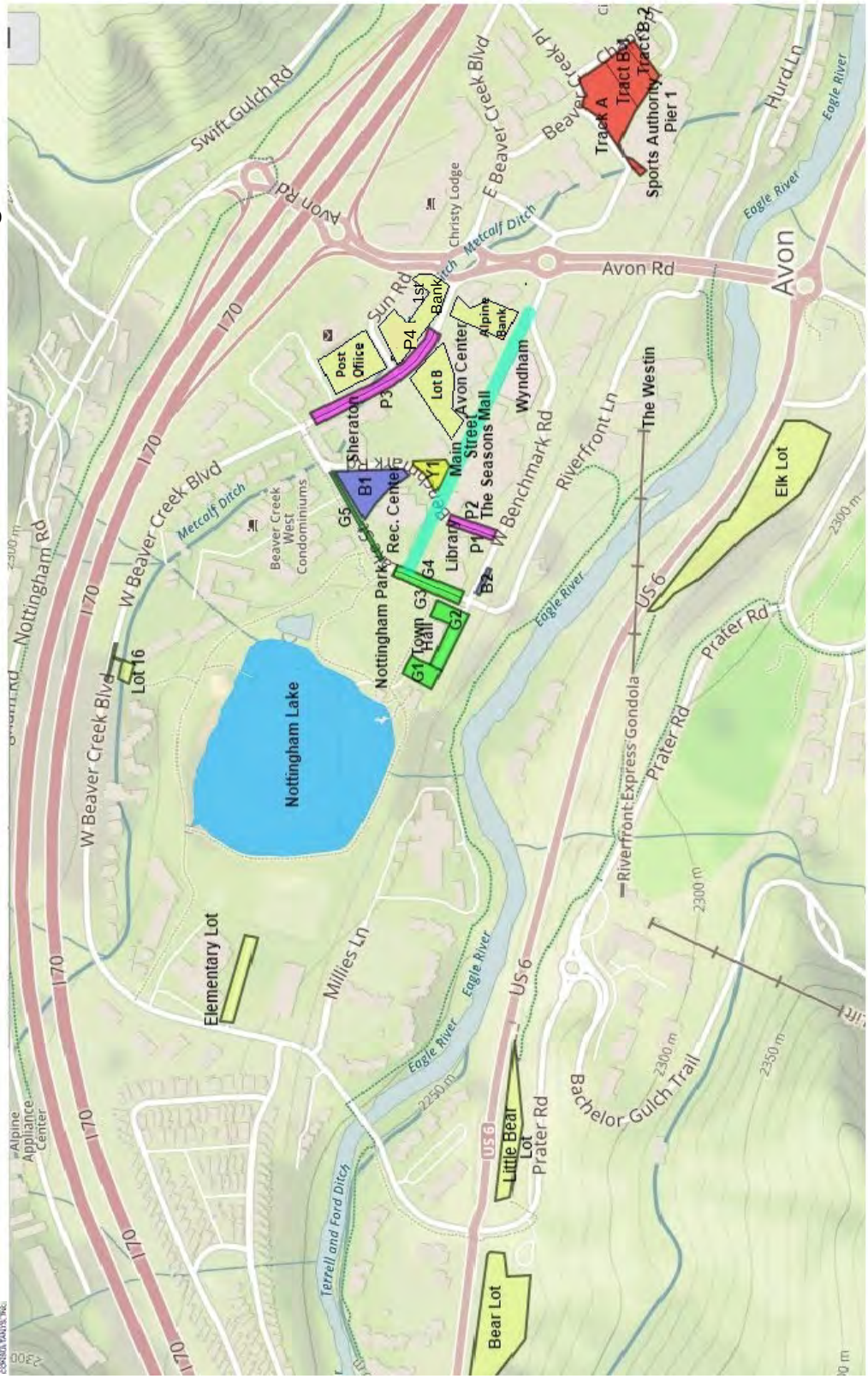


TABLE 14: Summer Parking Counts

Parking Lot	Total Spaces	7/30/2015 9:00-9:30am	7/31/2015 10:30-11:00am	7/29/2015 12:00-1:00pm	7/28/2015 12:30-1:45pm	7/27/2015 1:00-2:00pm	8/5/2015 3:15-4:00pm	8/3/2015 3:30-4:00pm	8/6/2015 8:00-9:00pm
G1	39	12	15	14	32	21	13	21	39
G2	37	17	26	25	29	30	33	24	37
G3	12	9	9	10	11	12	11	6	12
G4	12	6	9	6	11	12	11	8	12
G5	15	8	10	12	10	11	10	10	15
P1	7	2	1	2	5	4	4	4	7
P2	18	2	9	16	11	16	13	16	18
P3	14	4	3	5	3	4	5	3	14
P4	8	8	2	2	1	2	3	3	8
B1	84	37	39	42	29	34	36	31	84
B2	14	8	15	15	12	13	11	12	14
Y1	36	12	13	9	12	7	10	6	36
TA	150	9	34	0	41	49	43	41	65
TB-1	84	15	7	26	0	24	9	10	42
TB-2	17	15	12	12	13	8	10	11	12
Subtotal: West Side	296	125	151	158	166	166	160	144	296
Subtotal: East Side	251	39	53	38	54	81	62	62	119
TOTAL	547	164	204	196	220	247	222	206	415
Percent of Capacity									
G1		31%	38%	36%	82%	54%	33%	54%	100%
G2		46%	70%	68%	78%	81%	89%	65%	100%
G3		75%	75%	83%	92%	100%	92%	50%	100%
G4		50%	75%	50%	92%	100%	92%	67%	100%
G5		53%	67%	80%	67%	73%	67%	67%	100%
P1		29%	14%	29%	71%	57%	57%	57%	100%
P2		11%	50%	89%	61%	89%	72%	89%	100%
P3		29%	21%	36%	21%	29%	36%	21%	100%
P4		100%	25%	25%	13%	25%	38%	38%	100%
B1		44%	46%	50%	35%	40%	43%	37%	100%
B2		57%	107%	107%	86%	93%	79%	86%	100%
Y1		33%	36%	25%	33%	19%	28%	17%	100%
TA		6%	23%	0%	27%	33%	29%	27%	43%
TB-1		18%	8%	31%	0%	29%	11%	12%	50%
TB-2		88%	71%	71%	76%	47%	59%	65%	71%
Subtotal: West Side		42%	51%	53%	56%	56%	54%	49%	100%
Subtotal: East Side		16%	21%	15%	22%	32%	25%	25%	47%
TOTAL		30%	37%	36%	40%	45%	41%	38%	76%

- Overall, parking utilization during these summer counts was observed to reach a maximum of 76 percent during the special event, and 45 percent in other periods. West of Avon Road the maximum occupancy beyond the special event was 56 percent, while it reached a maximum of 32 percent east of Avon Road.

Existing Parking Code

The provision of parking in Avon is regulated by Section 7.28.020 of the *Code of Ordinance*. The base parking rates (spaces required per unit of development) are shown in Table 15. In addition, the Code identifies several adjustments/considerations that impact the number of off-street spaces required:

TABLE 15: Town of Avon Off-Street Parking Requirements

Residential Uses		
Residential and Accommodation Uses	Dwelling, Single-Family, Duplex	2 per unit; 3 per unit for units over 2,500 sq. ft.
	Dwelling, Multi-Family	Studio/ Lockoff/ Accommodation unit - 1 per unit 1 bedroom/ DU over 2,500 sq. ft. - 2 per unit
	Guest Parking for Multi-Family	3-5 units - 2 spaces 5-10 units - 3 spaces 11-15 units - 4 spaces 16-20 units - 5 spaces 21-25 units - 6 spaces Over 25 units - 7 spaces plus 1 space for each 5 units in excess of 25 up to a maximum of 10 additional spaces.
Group Living	Group Homes	1 per bed plus 1 per 100 sq. ft. of GFA
	Retirement home, nursing home or assisted living facility	1 per 4 beds and 1 per employee with consideration to the number of shifts worked.
Public and Institutional Uses		
Community Services	Art gallery or museum	4 per 1,000 sq. ft. GFA
	Community centers	4 per 1,000 sq. ft. GFA
	Government services, offices and facilities	4 per 1,000 sq. ft. GFA
	Library	4 per 1,000 sq. ft. GFA
	Religious assembly	4 per 1,000 sq. ft. GFA
Day Care	Child care center	2 per 1,000 sq. ft. GFA
	Preschool, nursery school	2 per 1,000 sq. ft. GFA
Educational Facilities	College or university (non-exempt)	4 per 1,000 sq. ft. GFA
	School, K-12 (public and private)	4 per 1,000 sq. ft. GFA
	School, vocational-technical and trade	4 per 1,000 sq. ft. GFA
Health Care Facilities	Medical center/ hospital	4 per 1,000 sq. ft. GFA
	Medical and dental clinics and offices	4 per 1,000 sq. ft. GFA
	Urgent care facility	4 per 1,000 sq. ft. GFA
Parks and Open Space	Golf course	4 per green
Commercial Uses		
General Commercial Uses unless otherwise stated		4 per 1,000 sq. ft. GFA
Food and Beverage Services	Restaurants, bars and taverns	1 per 60 sq. ft. of indoor seating area.
Office	Administrative and professional offices	3 per 1,000 sq. ft. GFA
Recreation and Entertainment, Outdoor	Outdoor commercial recreation/ entertainment	Determined by the Director
Recreation and Entertainment, Indoor	Indoor commercial recreation/ entertainment	Determined by the Director
Wholesale Business	Wholesale business	1 per 800 sq. ft. GFA
Industrial Service		
General Industrial Uses unless otherwise stated		1 per 800 sq. ft. GFA

https://www.municode.com/library/co/avon/codes

- A 15 percent reduction can be applied if the Town determines that an appropriate mix of uses is proposed.

- Adjacent on-street parking along the front property line may "count" towards the total parking supply, at the discretion of the Town.

- Off-site parking may be considered as part of a planned unit development, so long as it is within 500 feet from the use and a direct, adequate and convenient pedestrian connection is available.

- The maximum number of off-street spaces that may be provided is 125 percent of the required minimum number of spaces.

Comparison of Parking Counts with Code

The parking counts provides the opportunity to compare the existing Code requirements against the observed peak parking demand. The close proximity between uses in the Avon commercial core makes it a challenge to find parking areas with observed use that can be directly compared against the land uses served. Two specific areas allowed this direct comparison:

- The Chapel Square commercial center Building B consists of 53,318 square feet of commercial floor area. At the Code rate, it would require 214 spaces. A maximum of 59 parked vehicles were observed, indicating that the current parking rate is almost 4 times the observed peak rate.

- Given this high occupancy, it is probable that approximately 10 of the peak 16 vehicles parked in the adjacent East Benchmark on-street spaces were also generated by this center. This indicates that the current Code rates are approximately 132 percent of the observed peak.

- The *Avon Center Lot B Parking Needs Study* data can also be used to compare Code requirements with observed parking. Current Town Code parking requirements for the existing land uses would require 218 spaces. Compared with the maximum observed parking demand, and adjusting for the five spaces included in the counts but used for equipment storage, the current Code requires 16 percent more spaces than observed at maximum.

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Chapter 5
Review of Overall Mobility Conditions

Strengths and Weaknesses of Current Transportation Conditions

Strengths

- The Main Street Mall provides an excellent pedestrian amenity and a strong urban design organizing element for the western portion of the core area.

- Overall, the sidewalk/pedestrian path network provides good connections throughout the commercial core.

- Avon Station is an attractive and functional connection between the local and regional transit services.

- Traffic level of service is generally good, particularly in comparison with other successful mountain resort communities. As a result, the potential for diversion of traffic onto inappropriate streets is limited. Overall, the capacity of the roadway network is adequate, without generating the negative impacts associated with an overly-designed roadway network.

- Avon Transit is a highly productive transit system.

- Eco Transit provides a high level of transit service connecting Avon with the remainder of the Vail Valley.

Weaknesses

- Limited or non-existent evening transit service.

- The one-way directional structure of the transit routes reduces their convenience. For example, an employee traveling home from work at the Sheraton to their home at The Aspens is faced with a 25 minute bus ride.

- Lack of direct intercity public transit service, which limits visitor's ability to access Avon without a car.

- Gaps in the sidewalk network.

- Avon Road tends to provide a barrier to pedestrian and bicycle travel.

- The “suburban” street pattern east of Avon Road results in the potential for confusing travel routes. While it is not an unattractive area for cycling and walking, the adjacent land uses and street pattern also do not encourage active transportation.

- Accident rates are relatively high, though fortunately the rate of serious crashes is low. Recent changes to the Avon Road/Beaver Creek Blvd roundabout should help reduce the crash rate.

- Parking within walk distance of the gondola could potentially be impacted by growth in skier parking demand, or changes in Beaver Creek transportation strategies.

Chapter 6
Avon Multimodal Mobility Plan

The following plan has been developed through the detailed review of existing conditions (as discussed in previous chapters), the consideration of public input, and a review of successful strategies in other similar mountain resort communities.

An overall strategy regarding overnight visitor transportation is the development and promotion of Avon as a "park once" destination. This would build upon the fact that the Avon commercial core has a good mix of nearby land uses, has a topography and facilities that make walking and cycling viable options for many short trips, and is served by a variety of high-quality transportation options (including Avon Transit, Eco Transit and the gondola connection to Beaver Creek). While a visitor may use a private vehicle to access Avon, once here it can be parked at the lodging facility and transit, walking and cycling can be used to access a great summer or winter vacation. "Take a vacation from your car" is a tag line that is appealing to many visitors, and can help maintain the quality of environment that both visitors and residents desire.

Transportation improvements can also be made through land use strategies. Reflecting the era of its development the Avon commercial core is largely comprised of buildings set behind parking lots, which results in a functional but not particularly compelling pedestrian environment. In future land use planning and development review, the Town should strive to bring the land uses up to the sidewalks, rather than setting the land uses behind a "sea of parking". For example, redevelopment of the underutilized Tract A could bring the storefronts up to East Benchmark Road and Chapel Place, providing a more attractive pedestrian experience. This strategy is also referenced in the 2015 Bluezones study.

Finally, it should be recognized that there are many potential changes on the horizon for the transportation field in the form of emerging mobility technologies. The development of autonomous vehicles could increase the ability to use larger shared parking facilities (such as on the outskirts of an activity center) for vehicle storage, as travelers can reach their destination in the activity center and then instruct the vehicle to drive to an offsite parking facility. In addition to freeing space in the activity center for amenities such as pedestrian facilities, the increased ability to share parking spaces among various daytime and nighttime uses can reduce overall parking needs. Appendix A presents additional discussion of the current status of autonomous vehicles and the implications for Avon. Also, the growth of Transportation Network Companies (Lyft, Uber) and associated on-demand ride-hailing technologies opens up mobility options for low-density areas where traditional public transit in not effective. As the long-term impacts of these changes become clearer, Avon's transportation strategies should be adjusted.

BICYCLE/PEDESTRIAN STRATEGIES

Establish a Complete High-Amenity Pedestrian/Bicycle Network

The Avon commercial core already benefits from a substantial network of bicycle and pedestrian facilities. In particular, almost all roadways have sidewalks along one or both sides, and there are various sections of separated multipurpose paths. It is therefore physically possible to walk or bike in relative safety and comfort for the large majority of potential trips. However, the existing facilities do little to encourage or excite people to walk or bike for many of these potential trips.

Under this plan, the existing network will be improved and augmented to provide a network of "high amenity" pedestrian/bicycle facilities tying the elements of the commercial core together and to other parts of the community. As shown in Figure 16, existing Class I separated facilities will be expanded by the following:

- **Extension of the Main Street Mall westward** from Mikaela Way to Nottingham Park. This is particularly effective in that it is a relatively short section that connects existing facilities to the east and to the west.

- **Construction of a new north/south facility** providing a convenient and direct connection from north of I-70 to the Recreation Center/Library civic activity area. At present, there is no direct or obvious corridor for north/south pedestrian/bicycle travel in the commercial core, other than along Avon Road (with the attendant noise). In particular, the current roadway and development pattern west of Avon Road makes it difficult for visitors to readily identify a route of travel. In addition, the portions of Avon north of I-70 along Nottingham Road (and beyond) are growing as new facilities (such as the medical clinic) and new residences develop. However, the Interstate provides a substantial barrier to an attractive walk or cycle between this area and the remainder of the core. Considering this new facility from the north to the south, it is envisioned as follows:

    - Starting from where the bike path north of the interstate crosses Avon Road, the new path will travel south beneath I-70 to the west of the overpass pillars on the west side of Avon Road. This will require re-engineering the sloped concrete walks to include a vertical retaining wall, and could result in the elevation of the path being a few feet above the elevation of the roadway. Through landscaped walls and additional path lighting, this would provide a psychological barrier between trail users and traffic, and greatly enhance the quality of travel beneath the Interstate. The Town is already studying this improvement.

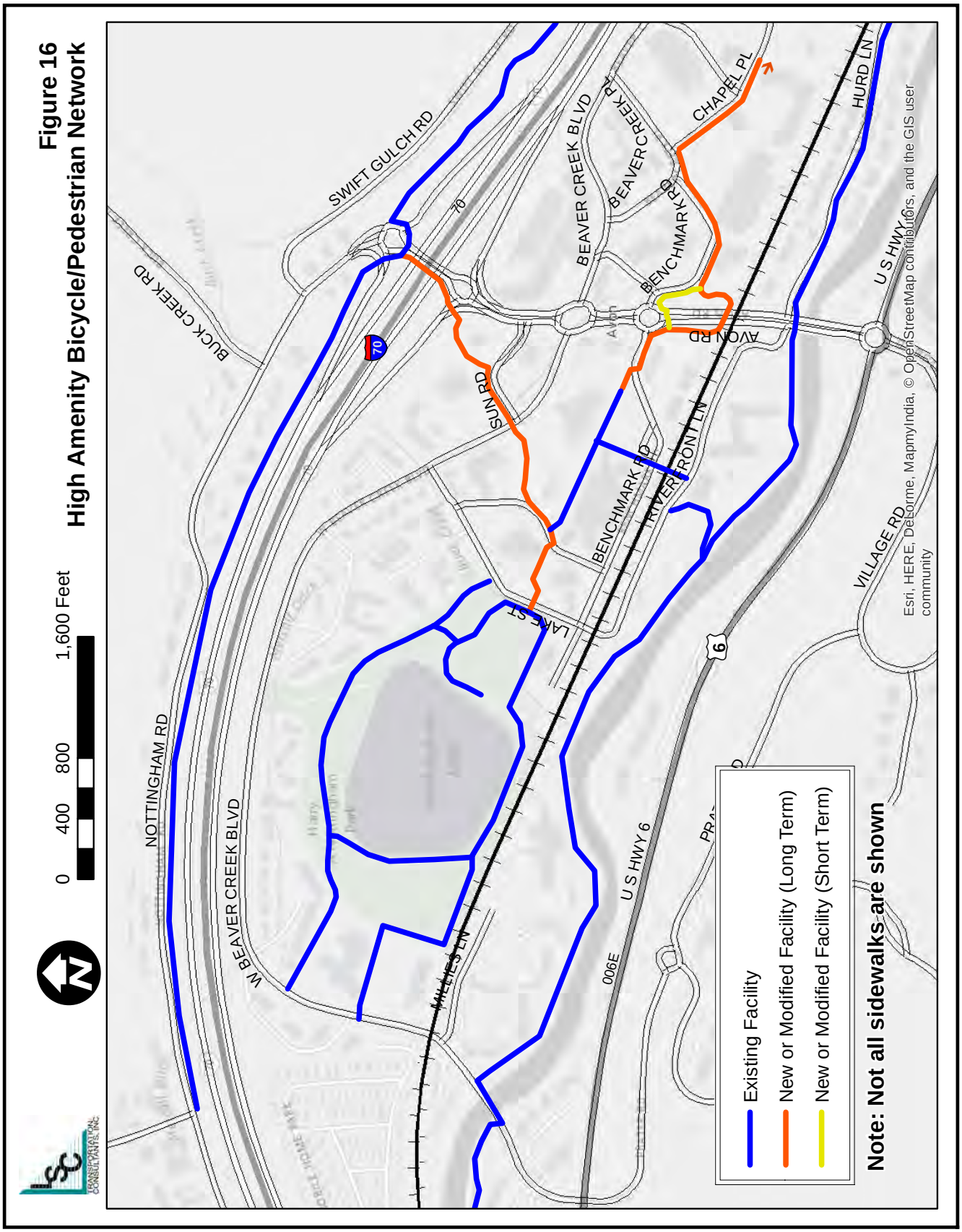
Figure 16
High Amenity Bicycle/Pedestrian Network
0
400
800
1,600 Feet
LSC TRANSPORTATION CONSULTANTS, INC.
NOTTINGHAM RD
W BEAVER CREEK BLVD
BUCK CREEK RD
SWIFT GULCH RD
70
SUN RD
LAKE ST
BENCHMARK RD
RIVERFRONT LN
BEAVER CREEK BLVD
BEAVER CREEK PL
BENCHMARK RD
AVON RD
CHAPEL PL
HURD LN
U S HWY 6
VILLAGE RD
006E
Existing Facility
New or Modified Facility (Long Term)
New or Modified Facility (Short Term)
Note: Not all sidewalks are shown
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

- South of I-70, the trail will cross at the existing crossing location at the end of the eastbound off-ramp. A new path segment will then extend to the southwest between the Walgreens building and the Post Office building to Sun Road[4].

- The existing sidewalk on the west side of Sun Road south to West Beaver Creek Boulevard will be enhanced. An improved crossing (with Rapid Rectangular Flashing Beacons) will be provided across West Beaver Creek Boulevard. The existing paths east of the Sheraton will be modified to provide a clear preferred and direct route to Mikaela Way west of the New Town Hall. Finally, improvements to the existing sidewalk along the east side of Mikaela Way will tie this new facility to the existing western end of the Main Street Mall.

- **Extension of the Main Street Mall eastward** across Avon Road is an important long-term enhancement. In the near-term, this can be provided by enhancing sidewalks along the south side of Benchmark Road as far as a small public plaza on the southeast corner of Benchmark Road and Chapel Place, as well as enhanced crossing of Benchmark Road (at the existing eastern end of the Main Street Mall) as well as of Avon Road on the south side of Benchmark Road. In the long-term, this improvement could include a pedestrian overpass of Avon Road just to the north of the railroad overpass. This takes advantage of the existing grades to provide an overpass with virtually no change in elevation required of the pedestrian. Public art, benches and other amenities could draw pedestrians along this path, including a small sculpture park on the public land along the east side of Avon Road. Another strategy that could encourage use of this facility would be to reconfigure the land uses on Tract A to provide direct streetfront small-scale retail along the west side of Benchmark Road (rather than the existing pedestrian-unfriendly big box structure behind an unattractive parking lot).[5]

This "high amenity network" should include the following:

- Shared bicycle/pedestrian paved paths a minimum of 10 feet in width
- Common design elements (benches, bollards, signs)
- Enhanced low-level path lighting, where appropriate
- Enhanced directional signage

Taken as a whole, Figure 16 shows how these new elements would result in a comprehensive bicycle/pedestrian facility network that ties the commercial core together and serves as an attractive alternative for travel within the core, as well as to connections for longer trips.

[4] There is already an informal use trail established here.
[5] Main Street in Frisco provides a good example of how successful new development can enhance the pedestrian environment.

Construct a Sidewalk Along West Beaver Creek Boulevard

In addition, a sidewalk is needed along the south side of West Beaver Creek Boulevard between Avon Elementary School on the west and Lake Street on the east. In addition to providing pedestrian access to the various residential properties, it will provide walking access to the bus stops along this section.

Consider Pedestrian Hybrid Beacons on Avon Road if Pedestrian Volumes Increase

A new strategy to enhance pedestrian crossings of busy arterial roadways is the "Pedestrian Hybrid Beacon" (PHB). Previously called a HAWK (for High Activity WalK) signal, a PHB consists of a single mast arm over each approach on the arterial with signal heads. These signal heads are turned off except when activated by a pedestrian. The signals then show a typical yellow light followed by a solid red light. The solid red light indication remains until the fastest walkers have had time to cross the walkway, after which a flashing red indication is provided until slower walkers have had sufficient time. Drivers must remain stopped during the solid red, but can proceed after stopping under the flashing signal. A PHB has the benefit of fully stopping virtually all traffic when a pedestrian is present, but providing no delays to motorists when pedestrians are not pushing the button. By waiting a minimum set time between activations, a PHB can also improve traffic flow by "grouping" pedestrians.

PHBs are allowed under the most recent version of the Colorado Department of Transportation's *Roadway Design Guide*. While current pedestrian counts at any one location do not attain the minimum of 20 per hour needed to warrant a PHB, future improvements could well meet and exceed this level. If so, one or more PHB at busy locations should be pursued to accommodate and encourage pedestrian activity.

Establish a Bike Share Program

Bike share programs are increasingly being implemented across the nation (including in smaller resort communities) as they can provide multiple benefits including reducing auto usage and associated greenhouse gas and other environmental impacts, reducing pressure for parking, and increasing overall health and well-being. In the United States, over 100 cities currently have bike share, including successful programs in Aspen/Basalt and in Ketchum/Sun Valley Idaho.

Avon should pursue starting a program with approximately 30 to 40 bikes. The flat topography in the valley floor, relatively short and bike-able distances between land uses and the presence of good cycling facilities are all factors that indicate a high potential for success. Using a private operator could minimize upfront costs, and allow Avon to test feasibility, understand staffing needs and make modifications to the program before making a long-term capital investment in bicycles. Potential bike station locations would be at Town Hall/Rec Center, major lodging properties, as well as residential areas such as Eaglebend, The Aspens, and Buffalo Ridge. The potential success of the program would be improved if other entities (such as Beaver Creek,

Vail and Eagle County) are also included to result in a broader regional program[6]. Provision of additional bike sharing stations could also be a requirement of future major developments, such as hotels and multifamily housing projects.

Apply for Bicycle Friendly Community Status

The League of American Bicyclists is a nationwide advocacy group that has established a strong program to designate "Bicycle Friendly" communities. At present, there are over 400 designated communities across the country, with 22 in Colorado (including Vail, Breckenridge and Aspen). Municipalities complete an application that provides information on five key factors regarding cycling conditions (engineering/facilities, public education, advocacy, enforcement, and evaluation/planning). The League then scores the applications and identifies the level of bicycle friendly status (Bronze, Silver, Gold or Platinum). The municipality then are the right to post signs proclaiming their status, and to include it in marketing materials.

The Town of Avon should pursue this process, as it is relatively easy to complete and can provide good insight into factors that can be improved to encourage growth in cycling. It also gives residents and visitors an indication of the Avon community's support of cycling as a travel mode.

Conduct Bicycle and Pedestrian Counts

The Town should establish an ongoing bicycle and pedestrian count program, similar to the ongoing and effective traffic count program, in order to help guide future improvements to these travel modes. A reasonable starting point for a program would be counts conducted every two years in both peak winter and peak summer. Automated trail count equipment could be installed at several locations on both the Eagle Valley Trail as well as the paved trail north of I-70 and on the Main Street Mall. This should be augmented by 2-hour-long counts during the mid-day of the individual movements at key intersections, such as the roundabouts along Avon Road, the intersections along Beaver Creek Boulevard at Lake Street, Sun Road and Beaver Creek Place, and the crossings of Beaver Creek Boulevard near the elementary school.

Establish a Bicycle/Pedestrian Advisory Committee

The Town should expand the scope of the existing Trails Committee to form a comprehensive Bicycle/Pedestrian Advisory Committee. This Committee should be charged with providing a public forum and public input regarding future pedestrian and bicycle improvements in Avon, including new facilities, maintenance, enforcement and advocacy. This will help to maintain momentum to implement ongoing bicycling and pedestrian improvements.

[6] It should be noted that Eagle County is already involved in bike sharing through the Basalt program.

TRAFFIC STRATEGIES

"Right Size" The Roadway System

In general, the Town's roadway network provide the appropriate level of capacity to accommodate existing and foreseeable future traffic levels, as is reflected in the findings of recent traffic studies. The implementation of the recently-approved Beaver Creek Boulevard Masterplan will eliminate the unnecessary approach lanes at the Avon Road /Beaver Creek Boulevard intersection, improving pedestrian crossing conditions as well as safety. As part of this current study, LSC reviewed the configuration of several other locations:

- The Avon Road/Benchmark Road roundabout includes a dual westbound approach. Level Of Service (LOS) analysis (presented in Appendix A) of future volumes identified in the 2009 Transportation Study indicates that providing only a single westbound approach lane would continue to provide LOS A, with 95th percentile westbound queues of 2 vehicles (not blocking the eastbound left turn movement into Plaza Way). If new peak winter counts confirm this conclusion, this lane reduction is recommended.

- The configuration of Beaver Creek Place was reviewed, and largely found to be appropriate for the traffic levels. The section northwest of Benchmark Road consists of one lane in each direction with a total width of approximately 25 feet, and no modifications are needed. The eastern approach of Beaver Creek Place to East Beaver Creek Boulevard, which currently provide two lanes, could be reduced to a single lane.

LSC also reviewed traffic volumes and capacity along Avon Road, and determined that the existing two through lanes in each direction are necessary and appropriate. With traffic volumes in excess of 25,000 vehicles per day during peak periods, Avon Road serves substantially more than the roughly 18,000 vehicles per day that can be accommodated on the best of two-lane roadways. Reduction to a two-lane roadway would cause roughly 7,000 drivers per day to divert to other routes connecting I-70 with Beaver Creek, such as Post Boulevard and Miller Ranch Road. It would also increase east-west delays in Avon as the capacity of the roundabouts on Avon Road to accommodate traffic entering from Beaver Creek Boulevard and Benchmark Road would be reduced. This in turn would generate traffic queues that would block nearby driveways and intersections.

One roadway reduction that could potentially be feasible would be the elimination of the third southbound lane along Avon Road between I-70 and Beaver Creek Boulevard, including the elimination of the eastbound-to-southbound slip lane at the Avon Road / I-70 Eastbound roundabout. LOS analysis of the 2009 study future forecasts indicates that this would be feasible, providing an acceptable worst LOS of D at both the eastbound ramps and at Beaver Creek Boulevard and queues that are acceptable. If analysis of new winter peak hour traffic counts confirm this conclusion, this lane should be eliminated.

Improve Wayfinding Signage for Public Parking

At present, signage along Avon Road directing visitors to public parking is virtually non-existent. In the southbound direction, this is limited to a single small (a few inches high) international P parking sign just north of Benchmark Road, and there is no signage in the northbound direction. Standard sized P parking signs should be installed directing drivers from Avon Road both to the parking along Benchmark Road to the west and in Tract A to the east. While it is true that excessive "sign clutter" can detract from the visual quality of a community, efficiently guiding drivers to available parking can reduce unnecessary traffic movements and can encourage pedestrian travel and visitor spending.

Car Sharing

As discussed in detail in Appendix B, various communities (including smaller communities such as Aspen and Ithaca, New York) have established a municipal-led car sharing program. Under these programs, participants pay for use of a vehicle when necessary, but avoid the substantial cost of private vehicle ownership. It is particularly useful for persons with only infrequent need for a vehicle, such as residents who use other modes for commuting and shopping but want to make a recreational trip, or employees who commute to work but need a car for a work trip during the day. The potential benefits to the community are that (1) less parking is needed and (2) overall less traffic is generated as it encourages residents and visitors to not have ready access to a car, reducing the potential that the car is used for other trips.

Establishing a car-share program solely within the Town of Avon under current conditions is not recommended, as there are several factors that indicate it would not be an effective use of resources:

- The low number of households without a vehicle and low population density.
- The barriers to convenient participation by visitors.
- The substantial investment and ongoing staff resources needed.
- The relatively small market for such a program that reduces the potential to break even.
- The utilization rate in Aspen (approximately 5 vehicle-trips per day during the busiest months) means that a program would not make a noticeable difference in traffic levels.

While not recommended as a "stand-alone" program, Avon should be an active participant if there is a broader effort (including other nearby communities and resorts) for a regional car-sharing program.

TRANSIT STRATEGIES

Public transit is already a strong element in Avon's transportation strategy. The Town in recent years has been proactive in expanding services, including new evening service. Under this plan, the following additional improvements are recommended over the long term.

It should be noted that new or expanded transit services typically require up to three years to reach their full ridership potential. In addition to the time needed for residents and visitors to become aware of the services, this also reflects how persons change their travel options to take advantage of new services. As an example, a seasonal winter worker that typically brings a car (and then uses it) may decide to move to Aspen for the next season without a car, knowing that the transit system has been improved. Similarly, a regular visitor who realizes that the provision of evening transit service means they do not need to incur the cost of a rental car may choose on their next visit to use a private shuttle service to access Avon and then Avon Transit or Eco Transit for all their local trips.

Increased Winter Daytime Service Frequency

Winter daytime service frequency should be improved to 15 minutes (from the current 30 minutes) by adding a second bus on both the Red Route and the Blue Route. This increased frequency substantially increases the convenience of a transit service, particularly for travelers with the option of using a car. As shown in Table 16, this improvement will come at the cost of $378,300 per year in additional operating costs[7]. However, it is forecast (based on the observed change in ridership associated with similar frequency improvements at other transit systems) to increase ridership by 240 passengers per winter day, or 32,600 over the course of a winter season. Two additional buses would be needed for peak operation. Since only existing bus stops would be served, no new stops would need to be established.

As an aside, another option was considered that similarly added two buses, but operated them in the opposite (counterclockwise) directions from the existing Red and Blue Routes. This would address the common complaint that some individual trips take a relatively long time to complete on the current route system. To assess this option, a "travel time matrix" was prepared for the existing routes and schedules. As shown in the top portion of Table 17, this indicates the minutes of travel time currently required to complete trips between key transit stops. As shown, most of the trips can be completed without the need for a transfer[8] and relatively quickly (within 20 minutes), though some require longer. A trip between the Buffalo Ridge and Aspens residential areas is the worst case, requiring 53 minutes and a transfer[9]. The trip from Walmart to Buffalo Ridge is another example of the effects of one-way loops, requiring 25 minutes of riding on the Red Route. The boarding data presented in Table 10 was used to "weight" each of the cells in the matrix to reflect the relative ridership. Summed over all trips, this indicates that the average passenger on Avon Transit has an in-vehicle travel time that is a relatively short 10.4 minutes.

[7] Based upon the marginal cost of $126.82, calculated from the 2017 budget figures.
[8] Reflecting that both routes serve the majority of key commercial centers.
[9] This could be reduced to 38 minutes with retiming of the routes to provide a direct bus-to-bus transfer at Aspen Station. Note that as both are residential areas, the proportion of trips with this origin and destination is low.

TABLE 16: Recommended Avon Transit Service Improvements

	Season	Hours of Service From	Hours of Service To	Vehicle-Hours Daily	Vehicle-Hours Annual	Marginal Cost	Ridership Daily	Ridership Annual
15-Minute Winter Daytime Service								
Blue Route	11/25-4/10	6:48 AM	5:53 PM	11.08	1,507	$191,200	139	18,900
Red Route	11/25-4/10	7:03 AM	5:54 PM	10.85	1,476	$187,100	101	13,700
Total				21.93	2,983	$378,300	240	32,600
Operate Red and Blue Routes All Day in Summer, Rather than Black Route Mid-Day								
Existing Black Route Mid-Day	4/10 - 11/24	8:30 AM	3:30 PM	7.00	1,603	$203,300		
Replacement Blue Route Mid-Day	4/10 - 11/24	8:30 AM	3:30 PM	7.00	1,603	$203,300		
Replacement Red Route Mid-Day	4/10 - 11/24	8:30 AM	3:30 PM	7.00	1,603	$203,300		
Net Change					1,603	$203,300	93	21,300
Extend Summer Evening Service - From 10 to 11 PM	4/10 - 11/24	10:00 PM	11:00 PM	1.00	229	$29,000	13	3,100
Special Event Shuttle Service	Varies	--	--	8.00	80	$10,100	Varies	Varies
Alternative Considered But Not Recommended								
Reverse Direction Daytime Service - Winter								
Blue Route	*11/25-4/9*	*6:33 AM*	*6:08 PM*	*11.58*	*1,575*	*$199,800*	*115*	*15,600*
Red Route	*11/25-4/9*	*6:48 AM*	*6:09 PM*	*11.35*	*1,544*	*$195,800*	*102*	*13,878*
Total					*3,119*	*$395,600*	*217*	*29,478*

A similar analysis was conducted assuming two-way operation on both routes. In reality, it would make no sense to operate in the opposite direction on the Hurd Lane/Stonebridge/US 6 loop, as this would result in service on the far side of busy US 6 at the Eagle bend West stop and would require construction of additional stops, while providing very minimal changes in travel times. Similarly, the portions of the Blue Route between Lake Street and Walmart would operate in the same direction, as any new stops would be close to an existing stop and would provide little travel time savings. Two-way service would therefore be provided by operating a counterclockwise loop on the Red Route loop serving Walmart and Buffalo Ride, and on the Blue Route loop serving The Aspens and Westgate Plaza. On the remaining route segments, these additional runs would improve the service frequency. Weighting the reduced travel times by the proportion of ridership, two-way service would result in an average in-vehicle travel time of 7.5 minutes, or 3.4 minutes less than the current service plan. This option would also require establishing new stops at the following locations:

- Buffalo Ridge West
- Buffalo Ridge East
- Northside Kitchen
- Stone Creek
- Buck Creek

Another consideration is that providing two-way service results in a more complicated service plan, with the potential for passengers to board the wrong bus (as buses operating other

portions of the route in both directions would serve some stops), and that would be harder for a visiting rider to understand and use. Given this, the fact that increased frequency in one direction is slightly less expensive (as service need only be provided from 15 minutes after the current beginning of service until 15 minutes prior to the current end of service), the greater ridership potential of consistent improved frequency and the capital cost of the additional bus stops, adding service frequency in the current directions is the preferred strategy.

TABLE 17: Travel Times Between Major Stops on Red Route and Blue Route (Minutes)

Color Key	Fastest On Blue Rt	Fastest On Red Rt	Requires Transfer

TO ► / FROM ▼	Aspens	Avon Station	City Market	Buffalo Ridge	Walmart	Average Travel Time
Existing 1-Way Loops						
Aspens		5	8	17	13	
Avon Station	7		3	9	8	
City Market	22	11		7	5	
Buffalo Ridge	53	21	10		5	
Walmart	17	10	5	25		10.8
2-Way Loops						
Aspens		5	8	17	13	
Avon Station	5		3	9	8	
City Market	8	3		7	5	
Buffalo Ridge	14	9	7		5	
Walmart	13	8	5	5		7.5
Change in Travel Time						
Aspens		0	0	0	0	
Avon Station	-2		0	0	0	
City Market	-14	-8		0	0	
Buffalo Ridge	-39	-12	-3		0	
Walmart	-4	-2	0	-20		-3.4

Note: 15 of the 53 minutes for Buffalo Ridge to Aspens is waiting between buses at Avon Station, which could be addressed by modifying the schedules.

Provide Consistent Daytime Service in Summer

At present, outside of the winter season Avon Transit operates the Red Route and the Blue Route at the beginning and end of the operating span (roughly 6:30 to 8:30 AM and again from 3:30 to 6:30 PM), but operating one bus on the Black Route between 8:30 AM and 3:30 PM. The Black Route serves all of the same major stops on the same frequency, but on a simplified route that requires some additional in-vehicle travel time. This strategy, while saving operating costs, also results in two changes in the service plan each day.

One of the key elements of a transit service – particularly in striving to serve visitors – is to make the serve as simple and easy to understand as possible. Accordingly, it is recommended that the Blue and Red Routes be operated throughout the day, rather than the Black Route.

This, for example, would allow a front desk clerk at the Sheraton to easily remember (and communicate to the guests) that buses always serve the hotel at 4 and 34 minutes past the hour, rather than having to explain the differences in the peak vs. the mid-day period. Between this increased convenience and the shorter travel times, this improvement is forecast to increase ridership by an estimate 93 boardings per day, or 21,300 per year. While it will increase annual costs by $203,300, the improved consistency and ridership potential makes this cost warranted.

Extend Summer Evening Service Until 11:00 PM

At present the summer Night Rider service operates until 10:00 PM. Ridership data from similar other mountain resort transit services that operate later into the evening indicate that ridership stays relatively high until 11:00 PM before dropping. Later evening service is also an economic and social benefit by providing bar transportation

Particularly as the evening transit service becomes more established in the community, it is recommended that this additional hour of service be added. This will require a relatively modest $29,000 per year in additional operating costs, and will increase ridership by 3,100 passengers per year at full potential.

Ultimately Provide Consistent Daytime and Evening Routes

Over the longer term, Red Route and Blue Route service should be expanded into the evening, in order to provide a convenient and consistent service. This would avoid the current need for riders (particularly visitors) to learn both a daytime and night-time schedule for service, as well as providing shorter travel times in the winter. This would increase operating costs by approximately $230,000 per year, and could be efficiently be phased in stages depending on ridership demand. One strategy could be to first extend Blue and Red Route service through the early evening (until 9:00 PM), with a late-night single-bus service extending until 11:00 PM.

Route Retiming

The Red and Blue Routes should be timed to meet at Avon Station. At present, the Blue Line is three minutes ahead of the Red Line. While both routes serve the majority of the commercial destinations, there are some trips that are made more difficult by the existing schedule. Providing a direct transfer between the two routes, for example, would shorten the overall travel time between Eaglebend and Walmart.

Expand Transit for Special Events

The Town has already established a process for licensing special events and for requiring parking management plans. During the largest events, however, public parking in the western commercial core is fully used, limiting access to facilities by non-event-goers. While every special event is different, a guideline would be to require a shuttle for events with 600 or more

attendees (240 spaces, at 2.5 persons per space) that occurs during typical business hours. This should be coordinated with increased restriction and enforcement of parking near the library and other destinations near the event venues. Shuttling from the Tract A parking area (as shown in Figure 15, above) could be provided, along with service to other outlying lots as identified by the event promoter.

Revisions to Bus Stops

Appropriate bus stop locations are important factor in the efficiency of a transit service. If stops are too far apart, potential riders may be dissuaded by the long walk distances to the nearest stop. On the other hand, stops that are too close together can slow the overall average speed of a bus route, both increasing the operating costs and reducing the quality of service for passengers onboard.

Transit systems in urban areas and commercial centers have typically found that bus stops spaces approximately every two city blocks (or roughly 600 feet). In rural areas, stops are typically located to serve individual land uses. Given these criteria, the existing stop spacing was reviewed, leading to the following recommendations:

- Eliminate the Chapel Square stop, as it is too close to the City Market stop, and gets very little use.

- Establish a new stop on the south side of Hurd Lane just east of Avon Road (Nottingham Station).

- Establish a new stop on the north side of West Beaver Creek Boulevard near 1st Bank, just west of Avon Road.

In addition, there is a need for additional shelters. A reasonable standard is to provide shelters at all stops that serve 20 or more daily passenger boardings in any one season. By this measure, new shelters are warranted at the following locations:

- Christie Lodge
- Comfort Inn
- Eaglebend North
- Eaglebend West
- Lake Street

Provide Real-Time Transit Information

With the widespread use of texting cell phones and smartphones, transit systems are increasingly investing in web-based tools to provide information to passengers (and potential passengers) that can make transit use more convenient. Real-time travel information systems allow a passenger to receive information regarding when the next bus will serve their stop (including the impacts of traffic delays), as well as to watch a real-time map of the buses in

operation. This is particularly useful in improving the overall convenience of transit, in that a rider can time their departure for their trip to the bus stop to minimize wait time. Being able to use computers and smartphones to plan transit trips and to track the location of arriving buses is particularly important in a resort area where many passengers are unfamiliar with the service.

A commonly used vendor of this type of service is Nextbus. Transit systems in the region already using this service include the Roaring Fork Transportation Authority, Summit Stage and the Town of Vail. In addition to providing this information on the website, a screen installed in Avon Station should depict this real-time information (and could also potentially show Eco Transit vehicles as well).

Actively Promote Expansions in Regional and Intercity Transit Services

Avon benefits greatly from the regional Eco Transit program. In addition to expanding mobility options for Avon residents, Eco Transit reduces the need for employee parking in Avon and reduces traffic congestion levels. Avon should continue to be an active participant in directing the growth of the Eco Transit program, and ensuring that Avon is well-served by the program.

At a greater level, the potential for non-auto travel in Avon is currently limited by the lack of intercity public transit service to Avon. Visitors who arrive with a car are much more likely to use it for local trips once they arrive. Though there are a variety of private shuttle companies connecting Avon with the Front Range, current rates make renting a car a comparable or less expensive option, particularly for groups of 3 to 5 travelers. The Town should advocate for a stop on the Bustang service. While Avon is relatively close to the existing stop in Vail, the fact that Avon and Beaver Creek form an important regional activity center warrants the modest increase in running time needed to serve a stop at Avon Center. As Bustang fares are roughly a quarter of those charged by the private firms, this would substantially expand the potential market for visitors arriving without the need for a car.

Conduct Passenger Surveys

To help guide future service improvements, the Town should collect additional information about who is using Avon Transit, and how they are using the service. For both busy winter and busy summer periods, surveys should be conducted to collect the following information:

- Specific trip origin and destination of individual trips
- Trip purpose (work, school, recreation, shopping, etc.)
- Transfers between Avon Transit and Eco Transit
- Travel mode to and from the bus stops
- Passenger perception of the transit service, and individual service characteristics (drivers, bus stops, timeliness, etc.)
- Passenger demographic characteristics

At least initially, surveys should be conducted every two years, in order to identify trends.

PARKING STRATEGIES

Revise Town Parking Demand Rates

The key element of local parking regulations are the parking demand rates – the number of parking spaces required per unit of development, for various development types. The current Town rates (as provided in the Town Code) were reviewed through a comparison with other similar communities, a comparison with other published data sources, and a review of the observed parking demand

Peer Review

To compare the Town of Avon's current requirements with those of similar other mountain resort communities, a "peer comparison" was conducted of seven other parking codes, as shown in Table 18. In addition to Aspen, Vail and Breckenridge in Colorado, data was collected from Park City, Utah, from Truckee (adjacent to Squaw Valley and Northstar ski resorts) and Mammoth Lakes in California, as well as from Lake Placid, New York. Note that both Aspen and Breckenridge generally require less parking in their downtown areas than in outlying areas. A review of this table indicates the following regarding how the current Avon requirements compare with the peers:

- **Multifamily Residential** – The current Avon rate is at the low end of the peer range for studio and lockoff units, is higher than the peers for a 1 bedroom unit, and is generally consistent with the peers for 2 bedroom units. Note that none of the other codes include spaces specifically for guests.

- **Hotel/Motel** – Avon's rates (which are the same as for multifamily residential) are consistent with the average of the peers, though it is higher than the rates in the core areas of Vail and Aspen (which reflect the high proportion of visitors to these areas that arrive without a car).

- **General Retail/Commercial and Grocery Store** – The current Avon rates are at the high end of the range for general commercial, and near the median for grocery stores (Avon does not have a separate rate for food sales).

- **Restaurants** – The current Avon rate of 1 spaces per 60 square feet of indoor seating area is equivalent to 16.67 spaces per KSF of floor area[10]. Avon's rates are at or near the high end of those of all the peers (assuming typical numbers of seats per thousand square feet), for both quality restaurants and fast-food restaurants. Note that the rates in the downtown areas of Vail, Aspen and Breckenridge are all much lower than the current Avon rate.

[10] Assuming 80 percent of typical total floor area is seating area.

TABLE 18: Summary of Peer Community Parking Rates

Major Land Use Category	Avon		Vail				Aspen				Lake Placid		Breckenridge				Truckee		Mammoth Lakes		Park City		Avon Rate Compared With Peers
			Core Area		Elsewhere		Downtown Area		Elsewhere				Urban Service Area		Elsewhere								
	Rate	Unit	Rate	Unit	Rate	Unit	Rate	Unit	Rate	Unit	Rate	Unit	Rate	Unit	Rate	Unit	Rate	Unit	Rate	Unit	Rate	Unit	
Multifamily Residential	1 2	Studio, Lockoff 1 BR/DU Over 2.5 KSF AND 2-10 Guest Spaces	1.4 0.7	Unit (and 1st attached accommodation unit) AND Additional attached	1.5 2 2.5	Unit, <= 0.5 KSF Unit, 0.5 to 2 KSF Unit, >= 2 KSF	1	Unit	2 1	Unit OR Bed-room (1)	1.5	Unit	1.1	Unit	1 1.5	Studio Unit Non-Studio	1.875 2.5	Studio, 1 BR Unit 2 BR + Unit	1 2 3	Studio, 1 BR Unit 2 BR, 3 BR Unit 4 BR + Unit	1 1.5 2 3	Unit (< 650 SF) Unit (650 to 1,000 Unit (1,000 to 2,500 Unit (> 2,500 SF)	Avon at low end for studio & lockoff units, generally consistent with peers for larger units
Hotel / Motel	Same as Multifamily Residential		0.7	Unit + 3/KSF of conference facilities	0.4 0.1 0.7	Unit AND 100 SF Gross Residential Floor Area, Up to 1.0 space per unit OR Fractional Unit + Spaces for Conference	0.5	Unit	0.7	Unit	1	Unit	1.1	Unit	1.0	Guest Room	1.0 0.5	Room AND Employees at Peak	1.05	Unit (6)	1.0	Room or Suite	Avon consistent with peer average
General Commercial	4	KSF	2.3	KSF	3.33	KSF	1.0	KSF	3.0	KSF	3.33	KSF	1.4	KSF GFA	2.5	KSF GFA	4.0 1.67	KSF Sales AND KSF Storage Area	4.0	KSF GFA	3.0	KSF Net Leasable	Avon at the high end of the peer range
Grocery Store	4	KSF	2.3	KSF	3.33	KSF	1.0	KSF	3.0	KSF	3.33	KSF	2.5	KSF GFA	n/a		4.0 1.67	KSF GFA AND KSF Storage Area	6.67	KSF GFA	5.00	KSF Net Leasable	Avon near median of peer rates
Restaurant -- Quality	13.33	KSF	4.00	KSF	8.33	KSF	1.0	KSF	3.0	KSF	0.33	Seat (2,4)	3.5	KSF GFA	0.25	Persons Capacity	13.33 10.00 3.33	KSF for Patrons AND KSF for Patrons in Outdoor Dining KSF Service Area	0.33	Seat (4)	10.00	KSF Net Leasable	Avon at the high end of all other peers, and substantially higher than most
Restaurant -- Fast Food	13.33	KSF	4.00	KSF	8.33	KSF	1.0	KSF	3.0	KSF	0.33	Seat (2,4)	3.5	KSF GFA	0.25	Persons Capacity	10 1.0	KSF GFA AND KSF Outdoor Dining Area	11.76	KSF GFA	15.00	KSF Net Leasable	Avon near the high end of peers
General Office	3.0	KSF	2.7	KSF	4.0	KSF	1.0	KSF	3.0	KSF	3.33	KSF	1.4	KSF GFA	2.5	KSF GFA	4.0 3.33	KSF (up to 5K) or KSF (5+ KSF)	4.0	KSF GFA	3.0	KSF (7)	Avon near median of peer rates.
Public Assembly / Auditorium	4.0 Note 9	KSF	Detailed Study Required		8.33	Seating Floor Area	Detailed Study Required				5 0.2	KSF OR Seat (1)	0.30	seat	0.25	seat	0.33 20	Seat OR KSF GFA (without fixed seats)	20.00	KSF GFA	0.20	Seat	At typical 44 seats per KSF, Avon rate is significantly lower than any peer

(1) Higher of the two
(2) Or 20 per KSF available to customers where no seating is available
(3) 1 full bedroom or greater.
(4) At a typical 31 seats per KSF, 0.33 per seat is equivalent to 10.2 per KSF
(5) Plus loading bays
(6) Plus 2 spaces for manager unit. Lockoffs count as separate unit.
(7) 5 per KSF for "Intensive Office"
(8) Plus company vehicles
9. Per Avon Code, applies to library, art gallery, government offices, and community centers

- **General Office** – Avon's rate is near the median of the peers, particularly considering the areas outside of the cores.

- **Public Assembly/Auditorium** – The rate currently in the Avon Code is significantly lower than any of the peers.

Overall, the current Avon rates are higher than the peers regarding retail and restaurant uses, are lower than the peers for public uses, and are generally consistent with the peers regarding residential, lodging and office uses.

Each peer community was also contacted and asked to provide input on their satisfaction with parking code and to discuss any issues that they have come across within their program. Related to existing parking codes, Aspen's Parking Department believes that their codes are too low, while Truckee and Park City are very satisfied with their current code.

Another nuance is that some of the peer communities set a maximum limit on the number of on-site spaces that can be provided, as a means of avoiding the urban design issues associated with excessive parking and to discourage unnecessary vehicle-trips. Specifically, the Town of Truckee sets a maximum at 120 percent of the required minimum, while the City of Aspen sets the maximum at 125 percent of the required minimum.

Review of Other Sources of Parking Demand Data

The Avon rates were also compared against two key comprehensive sources of parking demand data that reflect observed parking use by land use category across the nation:

- *Parking Generation (4th Edition)* was published by the Institute of Transportation Engineers (ITE) in 2010. It presents observed parking demand rates for 106 individual land use types, based upon studies voluntarily submitted to the ITE by local jurisdictions and consultants across the nation. The preponderance of the data reflects suburban settings, and thus reflect the travel characteristics found in such settings. The number of observations (and resulting statistical validity) varies substantially by land use type. As an example, the data reflects a total of 190 individual study sites for the general office land use. The data is summarized to the degree statistically valid given the available data. For purposes of this study, the average rate (that rate at which 50 percent of the observed sites generated greater parking demand and 50 percent generated less) as well as the 85th percentile rate (that rate at which 15 percent of observed sites generated greater parking demand) are summarized.

- *Shared Parking (2nd Edition)* was published in 2005 by the Urban Land Institute (ULI). Along with a detailed methodology for evaluating the shared parking demand of mixed-use developments, it presents recommended base parking rates for 23 key land use types based

upon the consensus of a panel of parking experts. Note that not all land use categories in the current Avon code are discussed in this document.

Table 19 presents a comparison of the existing Avon rate with the ITE and ULI rates. Where necessary, estimates of typical use patterns (such as number of seats per thousand square feet of floor area) are applied in order to provide the comparison. A review of this table indicates the following general conclusions:

- The current Avon requirements are **higher** than the rates in the other sources (indicating a potential for reduced rates) for larger multifamily residential units and general merchandise stores.

- The current Avon requirements are **consistently lower** for the following land use categories:

  - Studio or lockoff multifamily units
  - Auditorium
  - Office
  - Quality restaurants

For other land uses, the rates are comparable, it is not possible to directly compare the rates without detailed information about a specific project, or the Avon rate falls between the reported rates in the other two sources.

Recommended Rates

Based on the review of the peer mountain resort communities, the observed parking conditions in Avon and the parking demand data from the other sources, the following changes to the existing Avon parking requirements are recommended:

- Allow a 10 percent reduction in parking rates within the commercial core area for retail and restaurant uses. This is intended to reduce auto use in the core area with a high degree of transit, bicycle and pedestrian access. The base rates would remain unchanged.

- Rather than applying the current flat 4 spaces per thousand square feet of space for "Community Services" uses (art gallery, museum, community centers, government services, library, and religious assembly), parking needs for these uses should be identified through a specific special study. In reality, the parking needs for this range of uses can vary dramatically, depending on the inclusion of meeting or performance space and forecast level of patronage.

TABLE 19: Comparison of Avon, ITE and ULI Parking Demand Rates

Category	Avon Existing Rate (1)		ITE Peak Parking Demand (2)				ULI Parking Recommendation (3)		
			Rate (Spaces per Unit)						
	Rate (Spaces per Unit)	Unit	Average	85th Percentile	Unit	Avon Higher/Lower than ITE 85th?	Rate (Spaces per Unit)	Unit	Avon Higher/Lower than ULI Recommendations?
Residential									
Multiple Family Dwelling (4)	1 2	Studio, Lockoff 1 BR/DU Over 2.5 KSF AND 2-10 Guest Spaces	1.23	1.94	Unit	Lower for small units, but higher for larger units	1.65	Unit	Lower for small units, but higher for larger units
Tourist Accommodation									
Hotel, Motel, and Other Transient Dwelling Units (6)	1 2	Studio, Lockoff 1 BR/DU Over 2.5 KSF AND 2-10 Guest Spaces depending on # of units	1.29	1.59	Occupied Room	Depends on size of property, but generally lower. Avon's effective rate is 1.25 for a 20-unit property, 1.2 for a 50-unit property and 1.1 for a 100-unit property.	1.25	Room, plus spaces for lounge, restaurant, conference space	Lower for larger properties.
Entertainment									
Auditorium	4	KSF	0.25	0.32	Seat	At typical 43 seats per KSF, average rates equal 10.75. Avon is much lower.	0.4	Seat	Lower, as 0.4/seat is equivalent to 17.2 per KSF
Services									
Professional Offices	3	KSF GFA	2.84	3.45	KSF GFA	Lower	3.8	KSF GSA	Lower
Retail									
Quality Restaurant	13.33	KSF	16.4	22.7	KSF GFA	Lower	20	KSF GFA	Lower
Fast Food Without Drive-Through	13.33	KSF	12.4	14.5	KSF GFA	Higher	15	KSF GFA	Lower
Food And Beverage Retail Sales	4.00	KSF	3.78	5.05	KSF GFA	Higher	6.75	KSF GFA	Comparable
General Merchandise Stores	4.00	KSF	3.11	3.79	KSF GFA	Higher	2.75	KSF GFA	Higher

1. Source: Avon Code
2. Parking Generation, 4th Edition
3. Source: Dimensions of Parking, 5th Edition, Urban Land Institute, 2010.

KSF = One Thousand Square Feet
GFA = Gross Floor Area

Provide Overnight Bus Parking

At present, there is no available overnight parking for tour coaches. As bus touring is becoming increasingly popular (driven by the retirement of the Baby Boom population as well as the growth in international tourism, particularly from Asian nations), this is a limitation on non-auto access to Avon. It is recommended that the Town establish a permit process for overnight parking in the Tract A parking area. While this will require a revision to the current parking agreement regarding this lot (which limits use to short-term parking), this site is already available, is served by transit, and is close to driver lodging options. A reasonable limit (such as four) on the number of permits available on any one night should be set, with permits available through the Police Department.

Encourage Shared Parking Agreements

A beneficial strategy that reduces the financial and environmental costs of parking is the use of shared parking agreements, in which parking facility owners allow use by another entity at times when the spaces are not needed. This can benefit the parking facility owner by generating funding, benefit the other entity by reducing the cost of providing parking or allowing more flexibility in site design, and improve overall urban design by minimizing the footprint required for parking facilities. Examples include the use of school parking for weekend events, church parking for employee parking, or office parking for restaurant parking. While the seven-day-a-week activity levels in a resort community limit the ability to share parking by day of the week in Avon, the mix of uses in the commercial core that generate their peak parking demand in the daytime (municipal functions and skier parking, in particular) with those generating peak parking in the evening (lodging and restaurants) provides opportunities to accommodate more parking activity without adding spaces. An existing example is the use of the Town Hall parking on weekends by day skiers. The Town should review development proposals on an ongoing basis to identify opportunities for shared parking agreements that can benefit all parties.

Expand Onstreet Parking Along Benchmark Road

The Town should construct angled parking along the south side of Benchmark Road between Mikaela Way and Lettuce Shed Lane. Subtracting a few potential spaces to accommodate existing trees, approximately 74 spaces can be provided. Considering the existing 14 perpendicular spaces currently provided, this yields a net increase of 60 spaces. Angled spaces are recommended over perpendicular to reduce conflicts between parking and through vehicles. Approximately 25 of these spaces should be limited to 5 hours maximum duration (to provide increased parking for the library) and the remainder should be free parking with no overnight parking.

Expand Use of the Tract A Parking Lot

Tract A parking area constitutes an underutilized parking resource, available for increased public parking. Counts conducted in both summer and winter indicate that at least 67 percent of spaces are open at any one time, reflecting over 100 empty spaces. This parking area could be used to help solve parking issues, such as:

- Employee parking, particularly for evening uses and City Market. The eastern portion of the commercial core has a number of popular restaurants and bars, such as Loaded Joes, which result in high parking utilization in specific areas. Using Tract A as an employee parking area would free up parking near the establishments for visitors. The lot's location in the center of the eastern portion of the commercial core puts it within a short walk distance of many evening uses.

- Special event parking, particularly if served by a shuttle service. This lot is a conveniently short shuttle distance (or a 10-minute walk) from Nottingham Park, making it a convenient location for both event attendees as well as off-site parking for event participants. Having attendees return to their cars near many of Avon's commercial establishments might also encourage some additional retail activity.

- Surveys indicate that residents often have trouble parking at City Market during peak periods. Signs posted at City Market could indicate that additional public parking is available across Chapel Place.

Don't Let the Commercial Core Become the Day Skier Parking Facility for Beaver Creek

While the Avon core area is an important commercial, residential and public activity hub in its own right, it also is the "gateway" to Beaver Creek. The data and input collected as part of this study indicates that the core area sees a modest level of skier parking (such as from town residents), but is not as yet heavily impacted by this access pattern. However, Beaver Creek recently implemented paid parking ($10 per day) at the day skier lots and it is noteworthy that the beavercreek.com website provides information on how to park for free in Avon public spaces. This leaves the town open to the potential for parking (and associated traffic) impacts if there is a shift in the balance of Beaver Creek parking demand and supply, and reduced parking availability for other uses. It is therefore recommended that parking utilization be monitored on peak ski days (particularly in the core area west of Beaver Creek Boulevard). If utilization rates approach 90 percent of parking supply, additional time restrictions (such as 2 or 3 hour parking restrictions) should be considered. In addition, the Town should continue to actively monitor and participate in discussions regarding Beaver Creek parking and overall transportation management strategies.

Potential Parking Strategies That Are Not Recommended

These recommended parking strategies do not include more aggressive programs that have been pursued by other similar mountain resort communities:

- A **parking structure** could increase parking availability. As discussed above, however, with the exception of during large special events there is overall adequate parking in the commercial core at or near (within a block) of all activity centers. The available summer and winter parking counts indicate that with the exception of special events the overall maximum utilization of parking areas west of Beaver Creek Boulevard is only 56 percent. This in turn indicates that (again, with the exception of special events) there is always parking available within a short walk, and that Avon's parking issues are more a matter of managing the parking supply, rather than expanding the supply. Parking structures, moreover, are also very expensive (on the order of $2 Million for a 100-space structure, excluding land costs), costly to maintain (on the order of $50,000 per year for a hundred-space structure) and generating visual and traffic impacts. Current conditions clearly do not warrant these costs and impacts. In addition, the potential that Autonomous Vehicles will reduce future parking demand in commercial centers also argues against a sizable investment in new public parking. As long as future land use developments provides adequate on-site parking and the commercial core does not become more of a day skier parking supply for Beaver Creek, moreover, there is no indication that the need for a structure will increase in the future.

- **Paid parking** programs have been implemented in larger communities such as Aspen, Vail, Park City, and (recently) Breckenridge. While these can be effective in shifting travel away from the auto mode, they come with numerous disadvantages. Establishing and operating a paid parking program can be very costly (the Town of Breckenridge's budgeted amount for parking management in 2017 is $744,000), and turning a net "profit" is not always possible. Paid parking can be seen as a disincentive to customers, particularly for businesses that rely on short stops. There is also an "edge effect" of motorists (particularly employees) parking in residential areas just beyond the paid parking area, with associated parking and circulation impacts. Finally, the equipment and signage required for paid parking impact the visual attractiveness of an area, even if pay-and-display meters are implemented rather than individual parking meters. For these reasons, and in light of the relatively good overall parking conditions in Avon, paid parking is not recommended. When conditions would warrant a paid parking strategy in Avon would require a detailed evaluation of the costs of a program (capital investment and ongoing administrative/personnel/maintenance costs), the potential revenues, and the impact on the community. In general, however, paid parking is found to only be a net benefit when public parking shortages become a consistent problem over a substantial area. It should therefore not be considered until or unless a parking

utilization rate of 90 percent or more becomes a frequent and ongoing condition (not just during special events or a few peak weekends per year) over either the portion of the Town Center west of Avon Road or east of Avon Road.

MARKETING STRATEGIES

Public education and marketing efforts are key elements in generating changes in mobility patterns. In addition to the real-time transit information discussed above, the following strategies have proven effective in other mountain resort communities:

- Staff booths at community events such as farmers markets and Earth Day activities to promote walking, cycling and transit.

- A good way to reach second home owners and short-term renters is through refrigerator magnets promoting non-auto modes, distributed through the vacation property managers.

- Include marketing pieces in confirmation packets for short term rentals that promote the concept of "park once and use our shuttles/trails." Also encourage short-term rental owners to include transit and bike maps in information binders at the rental itself as well.

- Direct training of front-line lodging staff regarding transportation options. This may include sessions conducted through the Avon Chamber of Commerce or other business organizations to give a 15-20 minute presentation to new seasonal workers regarding the transit system and biking/walking options as well as to ask for their help in encouraging non-auto travel by guests. It is important that this effort recognize that staff can turn over quickly over the course of a season.

- Work with the Chamber and other business organizations to include information regarding non-auto travel options (both to/from Avon and while in the area) in their websites and promotional materials.

- Provide an addition to the Town's website to provide an interactive map showing public parking locations (rather than a simple text list).

- Enhance the transit webpage by adding a map of the routes, including Eagle County's Eco-Transit routes that serves Avon. While the website is already mobile-friendly and very easy to use, the Town could consider making schedules and the map even more

accessible by mobile-devices by having the schedules and maps available directly on the webpage, rather than as downloadable files.

- Conduct a "Ride Transit" campaign through attractive banners on street lights, bus stops or buses themselves promoting a simple link to the transit webpage. This could be done for biking as well. Example is Portland's "I Ride" campaign: https://bikeportland.org/2009/07/23/community-cycling-center-launches-i-ride-campaign-21362.

- Build up Avon's participation in Eagle County's Bike to Work Week activities by preparing press releases highlighting riders in Avon, including high-profile participants (like City Council members) and also regular citizens, telling the story of how they are making bike travel work for them and how it enhances their lives.

APPENDIX A

Level Of Service Outputs

Note: All volumes are "Future Winter Traffic Volumes" as presented in the Town of Avon Comprehensive Transportation Plan, prepared by Felsburg Holt & Ullevig, 2009

HCS7 Roundabouts Report

General Information

Analyst	JHB
Agency or Co.	LSC
Date Performed	5/19/2017
Analysis Year	Future
Time Period	AM
Project Description	Avon Transportation Plan

Site Information

Intersection	Avon Rd / Benchmark Rd
E/W Street Name	Benchmark Road
N/S Street Name	Avon Road
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.95
Jurisdiction	Avon

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0
Lane Assignment			LTR				LTR		LT		TR		LT		TR	
Volume (V), veh/h	0	0	0	95	0	65	10	90	0	70	280	80	0	0	705	105
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	0	0	103	0	70	11	98	0	76	304	87	0	0	764	114
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.3276			4.3276		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway (s)		2.5352			2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		103			179		219	248		413	465	
Entry Volume veh/h		100			174		213	240		401	452	
Circulating Flow (v_c), pc/h	834			380			0			157		
Exiting Flow (v_{ex}), pc/h	87			201			402			937		
Capacity (c_{pce}), pc/h		699			1028		1420	1420		1231	1231	
Capacity (c), veh/h		679			998		1379	1379		1195	1195	
v/c Ratio (x)		0.15			0.17		0.15	0.17		0.34	0.38	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		7.0			5.2		3.9	4.0		6.2	6.7	
Lane LOS		A			A		A	A		A	A	
95% Queue, veh		0.5			0.6		0.5	0.6		1.5	1.8	
Approach Delay, s/veh	7.0			5.2			4.0			6.5		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	5.6						A					

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Project Description	Avon Transportation Plan

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E/W Street Name	Benchmark Road
N/S Street Name	Avon Road
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.95
Jurisdiction	Avon

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	2	0	0	0	2	0
Lane Assignment			LTR				LTR		LT		TR		LT		TR	
Volume (V), veh/h	0	0	0	105	0	185	10	105	0	60	470	165	0	0	575	150
Percent Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Flow Rate (v_{PCE}), pc/h	0	0	0	114	0	201	11	114	0	65	510	179	0	0	623	163
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.3276			4.3276		4.5436	4.5436		4.5436	4.5436	
Follow-Up Headway (s)		2.5352			2.5352		2.5352	2.5352		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		114			326		354	400		369	417	
Entry Volume veh/h		111			317		344	388		359	404	
Circulating Flow (v_c), pc/h		824			575			0			277	
Exiting Flow (v_{ex}), pc/h		179			239			624			938	
Capacity (c_{pce}), pc/h		705			871		1420	1420		1104	1104	
Capacity (c), veh/h		684			846		1379	1379		1071	1071	
v/c Ratio (x)		0.16			0.37		0.25	0.28		0.33	0.38	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		7.1			8.7		4.7	5.0		6.7	7.3	
Lane LOS		A			A		A	A		A	A	
95% Queue, veh		0.6			1.7		1.0	1.2		1.5	1.8	
Approach Delay, s/veh	7.1			8.7			4.9			7.0		
Approach LOS	A			A			A			A		
Intersection Delay, s/veh | LOS	6.5						A					

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HCS7 Roundabouts Report

General Information

Analyst	JHB
Agency or Co.	LSC
Date Performed	5/19/2017
Analysis Year	Future
Time Period	AM
Project Description	Avon Transportation Plan

Site Information

Intersection	Avon Rd / I-70 EB Ramps
E/W Street Name	I-70 EB Ramps
N/S Street Name	Avon Road
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.95
Jurisdiction	Avon

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	0	0	0	0	0	1	0	0	0	2	0
Lane Assignment	LT		R								T		LT		T	
Volume (V), veh/h	0	110	0	270					0		380	490	0	355	745	
Percent Heavy Vehicles, %	3	3	3	3					3		3	3	3	3	3	
Flow Rate (v_{PCE}), pc/h	0	119	0	293					0		412	531	0	385	808	
Right-Turn Bypass	None				None				Non-Yielding				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)	4.6453	4.3276						4.9763		4.5436	4.5436	
Follow-Up Headway (s)	2.6667	2.5352						2.6087		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	119	293						412	531	561	632	
Entry Volume veh/h	116	284						400	516	544	614	
Circulating Flow (v_c), pc/h	1193			531			504			0		
Exiting Flow (v_{ex}), pc/h	385			0			531			1101		
Capacity (c_{pce}), pc/h	450	515						825		1420	1420	
Capacity (c), veh/h	437	500						801		1379	1379	
v/c Ratio (x)	0.26	0.57						0.50		0.39	0.45	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	12.5	19.1						11.4	0.0	6.3	6.9	
Lane LOS	B	C						B	A	A	A	
95% Queue, veh	1.0	3.5						2.8		1.9	2.4	
Approach Delay, s/veh	17.2						5.0			6.6		
Approach LOS	C						A			A		
Intersection Delay, s/veh | LOS	7.7						A					

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Agency or Co.	LSC
Date Performed	5/19/2017
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Time Period	PM
Project Description	Avon Transportation Plan

Site Information

Intersection	Avon Rd / I-70 EB Ramps
E/W Street Name	I-70 EB Ramps
N/S Street Name	Avon Road
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.95
Jurisdiction	Avon

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	0	0	0	0	0	1	0	0	0	2	0
Lane Assignment	LT		R								T		LT		T	
Volume (V), veh/h	0	205	0	415					0		680	630	0	260	790	
Percent Heavy Vehicles, %	3	3	3	3					3		3	3	3	3	3	
Flow Rate (v_{PCE}), pc/h	0	222	0	450					0		737	683	0	282	857	
Right-Turn Bypass	None				None				Non-Yielding				None			
Conflicting Lanes	2								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)	4.6453	4.3276						4.9763		4.5436	4.5436	
Follow-Up Headway (s)	2.6667	2.5352						2.6087		2.5352	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	222	450						737	683	535	604	
Entry Volume veh/h	216	437						716	663	520	586	
Circulating Flow (v_c), pc/h	1139			959			504			0		
Exiting Flow (v_{ex}), pc/h	282			0			959			1307		
Capacity (c_{pce}), pc/h	473	539						825		1420	1420	
Capacity (c), veh/h	460	524						801		1379	1379	
v/c Ratio (x)	0.47	0.83						0.89		0.38	0.43	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	16.9	36.8						33.7	0.0	6.1	6.7	
Lane LOS	C	E						D	A	A	A	
95% Queue, veh	2.5	8.5						11.9		1.8	2.2	
Approach Delay, s/veh	30.2						17.5			6.4		
Approach LOS	D						C			A		
Intersection Delay, s/veh | LOS	16.2						C					

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HCS7 Roundabouts Report

General Information

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Agency or Co.	LSC
Date Performed	5/19/2017
Analysis Year	Future
Time Period	AM
Project Description	Avon Transportation Plan

Site Information

Intersection	Avon Rd / Beaver Creek Blvd
E/W Street Name	Beaver Creek Blvd
N/S Street Name	Avon Road
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.95
Jurisdiction	Avon

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	2	0	0	0	2	0
Lane Assignment	LT		T		LT		T		LT		TR		LT		TR	
Volume (V), veh/h	0	370	50	90	0	40	40	240	0	55	305	20	0	150	695	165
Percent Heavy Vehicles, %	3	3	3	3	0	0	0	0	3	0	3	3	3	3	3	0
Flow Rate (v_{PCE}), pc/h	0	401	54	98	0	42	42	253	0	58	331	22	0	163	754	174
Right-Turn Bypass	Yielding				Yielding				None				None			
Conflicting Lanes	2				2				2				2			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)	4.6453	4.3276	4.9763	4.6453	4.3276	4.9763	4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway (s)	2.6667	2.5352	2.6087	2.6667	2.5352	2.6087	2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	214	241	98	39	45	253	193	218		513	578	
Entry Volume veh/h	208	234	95	39	45	253	188	212		500	564	
Circulating Flow (v_c), pc/h	959			790			618			142		
Exiting Flow (v_{ex}), pc/h	239			274			732			796		
Capacity (c_{pce}), pc/h	559	628	613	653	726	654	765	840		1185	1259	
Capacity (c), veh/h	542	610	595	653	726	654	745	819		1156	1228	
v/c Ratio (x)	0.38	0.38	0.16	0.06	0.06	0.39	0.25	0.26		0.43	0.46	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	12.6	11.4	8.0	6.2	5.6	10.9	7.7	7.2		7.6	7.7	
Lane LOS	B	B	A	A	A	B	A	A		A	A	
95% Queue, veh	1.8	1.8	0.6	0.2	0.2	1.8	1.0	1.0		2.2	2.5	
Approach Delay, s/veh	11.3			9.6			7.5			7.7		
Approach LOS	B			A			A			A		
Intersection Delay, s/veh | LOS	8.7						A					

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Date Performed	5/19/2017
Analysis Year	Future
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Project Description	Avon Transportation Plan

Site Information

Intersection	Avon Rd / Beaver Creek Blvd
E/W Street Name	Beaver Creek Blvd
N/S Street Name	Avon Road
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.95
Jurisdiction	Avon

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	2	0	0	0	2	0	0	0	2	0	0	0	2	0
Lane Assignment	LT		T		LT		T		LT		TR		LT		TR	
Volume (V), veh/h	0	420	130	130	0	60	120	285	0	150	570	130	0	370	540	290
Percent Heavy Vehicles, %	3	3	3	3	0	0	0	0	3	0	3	3	3	3	3	0
Flow Rate (v_{PCE}), pc/h	0	455	141	141	0	63	126	300	0	158	618	141	0	401	585	305
Right-Turn Bypass	Yielding				Yielding				None				None			
Conflicting Lanes	2				2				2				2			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)	4.6453	4.3276	4.9763	4.6453	4.3276	4.9763	4.6453	4.3276		4.6453	4.3276	
Follow-Up Headway (s)	2.6667	2.5352	2.6087	2.6667	2.5352	2.6087	2.6667	2.5352		2.6667	2.5352	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	280	316	141	89	100	300	431	486		607	684	
Entry Volume veh/h	272	307	137	89	100	300	421	474		593	669	
Circulating Flow (v_c), pc/h	1049			1231			997			347		
Exiting Flow (v_{ex}), pc/h	683			589			1073			648		
Capacity (c_{pce}), pc/h	514	582	713	435	499	462	539	608		981	1057	
Capacity (c), veh/h	499	565	692	435	499	462	526	594		959	1034	
v/c Ratio (x)	0.54	0.54	0.20	0.20	0.20	0.65	0.80	0.80		0.62	0.65	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	18.2	16.4	7.5	11.4	10.0	24.4	32.7	29.8		12.7	12.9	
Lane LOS	C	C	A	B	B	C	D	D		B	B	
95% Queue, veh	3.2	3.2	0.7	0.8	0.7	4.5	7.6	7.8		4.4	5.0	
Approach Delay, s/veh	15.4			19.1			31.2			12.8		
Approach LOS	C			C			D			B		
Intersection Delay, s/veh | LOS	19.2						C					

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APPENDIX B

Detailed Review of Bike Share Programs, Car Share Programs and Autonomous Vehicles

Bike Share

Bike share is a form of transportation and recreation that can bring multiple benefits to communities, including reducing auto usage and associated greenhouse gas and other environmental impacts, reducing pressure for parking, and increasing overall health and well-being. In the United States, over 100 cities currently have bike share, with more in the process of implementation. Over the last decade, the range of experiences of different cities has led to an evolution in bike sharing, resulting in bike share systems with simplified access for users, good bicycle security, and a variety of management options for municipalities.

Factors for Success

Multiple studies have examined the conditions under which bike share has been most successful around the world. While bike share is more common in larger cities with dense land uses and low auto-ownership, smaller cities have also successfully adopted bike share. Smaller communities with bike share include Aspen, Colorado[11], and Ketchum and Hailey, Idaho. Factors that contribute to a successful bikeshare include:

- High density of bikes (more bikes in a smaller area works better than fewer bikes spread out over a larger area)
- Correctly estimating the number of bicycles needed before launching the program
- Young and active population
- A network of convenient facilities already in place for bicyclists to use
- Specific destinations to which people would want to travel by bike
- Strong local champion

To be successful, communities should have some of the above favorable conditions, but not necessarily all. Factors that seem to have contributed to the failure of bike share systems include mandatory helmet laws (not the case in Colorado) and lack of good bicycling facilities (not the case in Avon).

Costs

Hardware and maintenance costs vary depending on whether the system is publicly-owned and operated or privately-owned and operated. It is also possible for municipalities to own the equipment but contract out operation to a bike share company. Many localities with bike share obtain a grant for initial purchase of hardware, and strive to cover operational costs through bike rental and/or membership fees.

As a form of public transportation, bike share can be cost-effective. Cost-recovery (operating only) ranges from 35 percent on the low-end (Boulder BCycle) to 85 percent on the high-end (Chicago's Divvy). Nearly all bike share programs currently in place in the United States rely on

[11] The Aspen program is branded as "We-Cycle" and is currently expanding into Basalt.

some form of public subsidy, although there are some programs which are fully privately funded, such as Citibike in New York City. At present, the City of Aspen budgets $25,000 per year to support their bike sharing program.

Hardware

Earlier-generation bike share systems required hardware-intensive bike-kiosk stations from which bikes were picked up and dropped off. Newer systems allow bikes to be picked up and dropped off at a bike kiosk or anywhere, and include a self-locking mechanism.

Capital Costs:

- Kiosk-based bike-share: $4,000 - $5,000 per bike to launch.
- Flexible bike-share: $2,000 - $3,000 per bike to launch.
- Software must also be purchased.

Operating costs:

Operating costs range from about $1.00 to $4.80 per trip, and include:

- Customer service and rider support
- Fleet maintenance
- Rebalancing (bringing bikes back to popular locations)
- Marketing
- Storage

Private Operator Option

Municipalities may also contract out complete operation of the system to a private entity. In this case, the municipality does not own the hardware, and is not responsible for the maintenance or upgrade of the system. One trade-off associated with this option is in relinquishing control of how the system is managed and operated. Zagster is an example of a private entity that offers complete management of the bike share system. An annual subscription to Zagster services is $20,000 to $60,000 per year, depending on the size of the system.

Local Staff Time

Local staff time requirements vary with the number of bikes in the system and the level of public versus private involvement. When a private company like Zagster fully manages and owns the system, the local staff time is minimal. The Zagster sales team reported that a local champion is needed, but not full-time. Municipalities that use Zagster typically do not need to hire anyone additional to manage the program. Social Bikes, however, which sells the bicycle hardware (Social Bikes requires a minimum purchase of 100 bikes) and trains local staff to

operate and manage the program, notes that launching and operating a bike share system is a full-time job.

Other Considerations

Additional factors for Avon to consider include:

- Program goals – What problem is Avon hoping to solve through bike share? The goals of the program will influence where bike share stations are sited. For instance, if the goal is to reduce parking pressures in one part of town, bicycle stations should be conveniently located in that area, and at areas where would-be drivers could be intercepted and lured onto the bike.
- Bike Parking - Are there locations conducive to siting of bike racks and bike stations?
- Storage - What will happen to the bicycles in winter – is there a storage location, or will the program operate year-round?

Recommendations for Avon

Avon should consider starting a program with approximately 30 to 40 bikes, similar to Ketchum, Idaho's program. Using a private operator such as Zagster could minimize upfront costs, and allow Avon to test feasibility, understand staffing needs and make modifications to the program before making a long-term capital investment in bicycles. Potential bike station locations would be at Town Hall/Rec Center, major lodging properties, as well as residential areas such as Eaglebend, The Aspens, and Buffalo Ridge. The potential success of the program would be improved if other entities (such as Beaver Creek) are also included to result in a broader regional program[11].

Sources

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[11] It should be noted that Eagle County is already involved in bike sharing through the Basalt program.

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Car Share

Car sharing has been less widely-adopted compared to bike sharing, likely because the upfront investment is higher, and car share is generally more successful in locations with high population density, a good mix of land uses, high transit usage, and low vehicle ownership. Zipcar, one of the main private operators of car share in the U.S., cites a minimum density of 10,000 persons per square mile for car share to be successful. (In comparison, the population density of Avon is 810 persons per square mile.) While there are some smaller cities with car share, such as Aspen, Colorado; Ithaca, New York; and Nelson, British Columbia, most car-share programs are in metropolitan areas.

Private companies that operate car share include Ego carshare, Car2Go, Enterprise, Flexcar, and Zipcar. As with bike share, car share can be publicly owned and operated, operated through a public-private partnership, or fully privately operated. In some locations, like Nelson, BC, car share is operated through a non-profit organization.

Factors for Success:

Early research on minimum thresholds for car-sharing to succeed showed the following ranges in demographics for successful programs:

Thresholds for Car-Sharing Level of Service		
	Level of Service	
	Low	High
Demographics		
Percent 1-person households	30%	40-50%
Commute Mode Share		
Percent drive alone to work	55%	35-40%
Percent walk to work	5%	15-20%
Vehicle Ownership		
Percent households with no vehicle	10-15%	35-40%
Percent households with 0 or 1 vehicle	60%	70-80%
Neighborhood Characteristics		
Housing units per acre	5	5

Source: Celsor, Christine; and Millard-Ball, Adam (2006, November 15). Where does Car-Sharing Work? Using GIS to Assess Market Potential. Retrieved from: https://people.ucsc.edu/~adammb/publications/Celsor_Millard-Ball_2007_Where_Does_CarSharing_Work_TRBversion.pdf

Not all of these characteristics are needed for success, but at least some must be consistent for car share to be successful.

Avon is at or below the low end of these ranges:

- Percent 1-person households: 34%
- Percent drive alone to work: 70%
- Percent commuting by public transit: 8%
- Percent households with no vehicle: 7%; Percent households with 1 vehicle: 38%

Another potential market would be visitors or second-home owners. However, the limited options for travel to Avon means that the large majority of visitors arrive with a car. As discussed below, moreover, the day or two that are required to be approved to be a car share member reduces the attractiveness of the program to visitors, particularly for visitors staying only a few days.

Costs

For car share to make a profit, operators should expect to have at least 50 cars in the fleet, and 2,500 members, and possibly as many as 100 cars. In areas where car share is operated publicly, member fees may cover operational costs, however public agencies may want to subsidize service to encourage greater utilization. In addition to the cost of purchasing the vehicles and operating the system, the hardware and software used for vehicle tracking and reservations must be considered. Upfront expenses for technology can run between $1,000 and $1,700 per vehicle, and last between three to six years. Software will have monthly hosting and support fees.

Local Staff Time

For publicly operated, small-scale systems, local staff time ranges from one to three full-time staff. In 2011, Ithaca Carshare had thirteen vehicles and employed three full-time staff people. Syracuse, with a system of six vehicles, used two full-time staff plus interns and volunteers. The City of Aspen uses one full-time staff person, plus additional higher-level staff time dedicated to grant-writing and outreach.

Users

As with bike share, car share users tend to be younger than the average population. In Ithaca, the majority of member users are in their 20s and 30s, with high numbers of university students. In Syracuse, most active members of the car share system, CuseCar, are between the ages of 37-42, and are of low middle income level. In Aspen, typical users include those who use the program to avoid having a first or second car, workers who take transit into town and then use the car for errands during the day, and second homeowners who are in Aspen for a few weeks at a time and have realize they can dispose of a car that would otherwise sit in a

garage. In the busier months (peak summer), approximately 150 trips per month are made using car sharing vehicles.

Other Considerations:

As Avon investigates implementation of car share, other considerations should include:

- Parking – Is centrally located parking available for car share vehicles?
- Primary uses - Who is the target audience for car share? Are there locations nearby, to which tourists might want to take a car to do day trips? Do locals who take transit into town need a car to run errands during the day? Could local companies or agencies save money by using car share for their business needs?
- Sign-up barriers – Car share may not be well-suited to short-term visitors, as there is some lag time involved with sign-up. For instance, the car share operator needs to check the driving record of the new member, and this may take time. Car2Go Seattle takes 1-2 days to process applications. However, if Avon were to contract with a private operator that operates car share in multiple locations, those visitors who are already signed up with that service would be able to use the car share immediately.
- New development - Developers will often agree to include car-sharing in their projects, to help reduce parking demand and help gain planning approval by providing a community service.
- Local business champion - Is there an anchor member, such as a city or business that wishes to replace its vehicle fleet with car-sharing that can provide guaranteed baseline usage?

Recommendations for Avon

Establishing a car-share program solely within the Town of Avon is not recommended, as there are several factors that indicate it would not be an effective use of resources:

- The low number of households without a vehicle and low population density.
- The barriers to convenient participation by visitors.
- The substantial investment and ongoing staff resources needed.
- The relatively small market for such a program that reduces the potential to break even.
- The utilization rate in Aspen (approximately 5 vehicle-trips per day during the busiest months) means that a program would not make a noticeable difference in traffic levels.

While not recommended as a “stand-alone” program, Avon should be an active participant if there is a broader effort (including other nearby communities and resorts) for a regional car-sharing program.

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Autonomous Vehicles

Autonomous (AV) or "self-driving" technologies are evolving rapidly. AV vehicle impacts on transportation conditions can be considered both regards to changes in auto use as well as changes in transit vehicles.

Changes in Auto Use

AV technology has the potential to change auto use in many ways:

- It reduces the overall "cost" of auto driving, if the value of the driver's time is considered. By allowing the driver to instead accomplish some other function or to be entertained, the overall impact on long duration travel on individual's lives is reduced. As a result of this, people may well choose to accept longer and longer commutes to more scenic or lower cost housing options. This factor has many observers concerned that AV autos will increase overall vehicle use and add to roadway congestion, as well as increase urban sprawl.

- It allows persons with disabilities much greater access to personal vehicle mobility. For the many persons with disabilities that preclude driving but do not preclude negotiating themselves in and out of a vehicle, AV autos hold the promise of providing the convenience of private auto use. As the cost of AV vehicles declines, this could ultimately reduce the demand for paratransit services.

- It has the potential to dramatically improve traffic safety, as more than 90 percent of crashes are currently related to driver errors.

- It reduces the need for expensive auto parking within activity centers. Auto owners arriving at a destination in a paid parking area can simply program the vehicle to drive to a parking area outside of the activity center (or back home). Some urbanists predict that this will spur the development of large shared parking facilities on low-cost land at the periphery of a downtown area, allowing more shared use of parking spaces and freeing up space in urban cores for pedestrians and cyclists. Of course, the additional "empty" travel to and from the remote parking areas also adds to the traffic levels.

Much of the actual impact of AV autos will depend on the model of ownership. If the individual ownership model that is prevalent today continues, the growth in traffic levels discussed could well occur. However, we as a society already have examples of a shared ownership model, as evidenced by the development of the Transportation Network Companies (TNC) such as Uber and Lyft, and more traditionally the cab industry. AV vehicles will bring down the cost of TNC organizations by eliminating their highest costs (drivers). If individuals start to take advantage of these shared ownership options by foregoing individual car ownership, much of the potential benefits of AV autos could be realized while reducing overall individual mobility costs.

It is important to note that AV technology is not a matter of either/or, but instead encompasses a wide range of levels or options. The AV industry has developed the following five levels to describe the various levels of vehicle autonomy:

- **Level 1:** At this level most functions are still controlled by the driver, but a specific function (like steering or accelerating) can be done automatically by the vehicle.

- **Level 2:** At least one driver assistance system of both steering and acceleration/ deceleration using information about the driving environment is automated, like cruise control and lane-centering. The driver is disengaged from physically operating, having their hands off the steering wheel AND foot off pedal at the same time. However, the driver must still always be ready to take control of the vehicle.

- **Level 3:** Drivers are still necessary, but are able to completely shift "safety-critical functions" to the vehicle, under certain traffic or environmental conditions. It means that the driver is still present and will intervene if necessary, but is not required to monitor the situation in the same way required for Level 2. AV developers are striving to avoid this level, as it raises issues when drivers must quickly react to take back control.

- **Level 4:** At this level, vehicles are "designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip." However, it's important to note that this is limited to the "operational design domain" (ODD) of the vehicle—meaning it does not cover every driving scenario. An example might be a closed campus shuttle loop, or interstate driving.

- **Level 5:** This refers to a fully-autonomous system that expects the vehicle's performance to equal that of a human driver, in every driving scenario—including extreme environments like dirt roads and storm conditions that are unlikely to be navigated by driverless vehicles in the near future.

Level 5 autonomy is what is typically considered to be a full autonomous vehicle, and has yet to be fully achieved in a wide range of real-world conditions (particularly in snow or fog conditions). There is also an important distinction between when AV auto technology is developed to the point that it can first be used by the general public and when the proportion of the total US vehicle fleet is sufficient to actually change the demands on the transportation network. If AV technology proves to reduce the need for public parking in core areas, for example, it makes little real-world difference if only 1 percent of the total vehicles in a community are AV. There is a wide range of professional opinions as to when the “tipping point” regarding AV deployment will be reached. The overall consensus, however, is that this will not occur until 2030 or beyond.

While 2030 may seem a long way off, it still is within the life span of transportation facilities constructed today. In particular, the expectation that AV vehicles may well reduce the need for core area parking argues that communities such as Avon should avoid substantial investment in additional parking unless the need is very clear.

Changes in Transit Services

Fixed Route Buses

The first experimental applications of AV fixed route buses are already being implemented. A low-speed (25 mph maximum) 12-passenger electric bus shuttle has begun operation in a suburban neighborhood of Helsinki, Finland. A five-month demonstration was also conducted in 2015 on the campus of the Swiss Federal Institute of Technology in Lausanne, Switzerland. Future demonstration projects are planned in the Netherlands and Sion, Switzerland.

Closer to home, the Contra Costa Transportation Authority in the San Francisco Bay Area has received approximately $5 Million in funding to implement a two-bus shuttle service within the Bishop Ranch business park. These electric 12- passenger vehicles are currently undergoing testing in a closed facility, but are planned to be introduced to private streets in the business park in 2017. If California law can be changed to allow AV vehicles without a steering wheel, brake pedal and accelerator, the route will be expanded to include 4 blocks of public streets within the business park.

Operator wages and benefits current comprise roughly 40 percent of Avon Transit's variable (non-fixed) annual operating costs. Put another way, if 40 percent of the variable costs could be eliminated through AV buses, total service levels could be increased by 66 percent within the same operating budget. This means, for example, that implementing AV technology on all services could allow Blue Line frequency to be improved from the current 30 minutes to 15 minutes while reducing costs. The fact that Avon Transit does not charge a fare also eliminates one of the hurdles that other transit systems face, which is that staff is needed to ensure fares are paid regardless of whether they also drive the bus.

Full Level 5 autonomy, moreover, is not necessary for this emerging technology to be a benefit to transit. In particular, lane-centering and automatic emergency brake technologies could improve transit safety. The evolution of these types of AV technologies should be monitored, and considered as part of new bus purchases over the coming years.

Dial-A-Ride

AV technology could also greatly reduce the cost of Dial-A-Ride or paratransit services. However, this ignores the crucial role of the transit drivers in assisting passengers into and out of the vehicles, and in settling and securing the passengers. There could be the potential to have a lower paid attendant on the vehicle to assist passengers rather than a higher paid driver, yielding some cost savings.

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