

Appendix 5

Haymeadow Interim Traffic Analysis

MEMORANDUM

To: Rick Pylman
Gary Brooks

From: Bill Fox

Date: September 15, 2016

Project: Haymeadow

Subject: Evaluation of interim access configuration

Currently Brush Creek Road and Meadowlark Road each intersect Sylvan Lake Road in two offset “T” intersections near the west end of the proposed Haymeadow development (see attached Alpine Engineering “Existing Conditions” drawing). It is my understanding that a new roundabout intersection had been proposed as part of the Haymeadow project that would eliminate the offset and link Meadowlark Road and Brush Creek Road into a single intersection on Sylvan Lake Road. This new intersection is illustrated on the attached Alpine Engineering “Final Condition” drawing.

In this context, the question has been raised as to the potential to construct an interim intersection that would serve the first phase of the Haymeadow development before the construction of the new roundabout intersection is needed. Specifically, can the interim intersection design accommodate the increased traffic resulting from the buildout of Neighborhood A1 in the Haymeadow project coupled with the increase in traffic on the upper reaches of Brush Creek Road that occurs by the time Neighborhood A1 is completed (assumed to be a 10-year buildout of A1, or by Year 2027). This interim intersection would extend Meadowlark Road southeast into the Haymeadow site using the ultimate alignment planned for the “Final Condition”, while maintaining the existing offset to Brush Creek Road. This interim intersection configuration is illustrated on the attached Alpine Engineering “Interim Condition” drawing.

To address this question of interim intersection capacity and operations I have completed the following steps:

- Began with the existing peak hour traffic in the Brush Creek Road / Sylvan Lake Road intersection. See the attached Figure 5 from the Haymeadow Traffic Impact Study.
- Isolated the traffic to be generated by the Haymeadow Neighborhood A1 from the traffic study previously completed. See the attached Table 2 from the Haymeadow Traffic Impact

Study that indicates that Neighborhood A1 will generate 1,372 automobile trips per day, with 105 in the AM peak hour and 132 in the PM peak hour.

- Calculated the amount of traffic that will be added from the adjacent 32-unit single family Soleil development. Using the same trip rates as applied to the Haymeadow development, it is projected that the Soleil project will generate 276 daily automobile trips, with 22 in the AM peak hour and 29 in the PM peak hour.
- Calculated the amount of additional traffic on Brush Creek Road that will be generated by the Year 2027 from developments up valley from Sylvan Lake Road. Using the Trip Generation in the Brush Creek Valley (copy attached) that was developed by Town staff, it is projected that there will be 2,100 additional automobile trips per day on Brush Creek Road, with 250 in the AM and 250 in the PM peak hours (straight line interpolation).
- Utilized the trip distribution pattern that was estimated in the Haymeadow Traffic Study based on input from Town staff (see attached Figure 11 from the Haymeadow TIS), with the assumption that the Brush Creek Extension to US 6 has not yet been completed.
- Assigned the additional traffic from the Soleil development, the Haymeadow Neighborhood A1, and the up valley traffic increase by Year 2027 to the roadway network using the trip distribution pattern referenced above, and the Interim Condition roadway configuration. This new traffic was then added to the existing traffic in Figure 5 referenced above.
- The resulting traffic projection for the Year 2027 is illustrated in Figure 1 of this memo (attached).
- The traffic operations and Level of Service (LOS) was evaluated for the projected Year 2027 conditions using procedures defined in the Federal Highway Administration's Highway Capacity Manual (Synchro software) at the two interim intersections along Sylvan Lake Road. The results of this analysis can be seen in Table 1 of this memo (attached). It is projected that, with stop sign traffic control, these two intersections will operate comfortably at LOS A overall, with all approach movements at LOS A or B. A description of the traffic operating conditions for each LOS letter grade is attached for reference.

In summary, it is projected that the interim intersection configuration proposed will be able to accommodate the traffic from the development of Haymeadow Neighborhood A1 and the background growth in traffic that is projected to occur by Year 2027. In this context, the realignment of Sylvan Lake Road and the construction of the roundabout intersection (Final Condition) could be postponed until the development in Neighborhood A1 has been realized.

I hope this information is helpful. Please let me know if you have any questions.

BF/

Attachments: Alpine Engineering – Existing Conditions
Alpine Engineering – Final Condition
Alpine Engineering – Interim Condition

Haymeadow Year 2027 Peak Hour Traffic Projections

Table 1 – Intersection LOS and Queue Summary

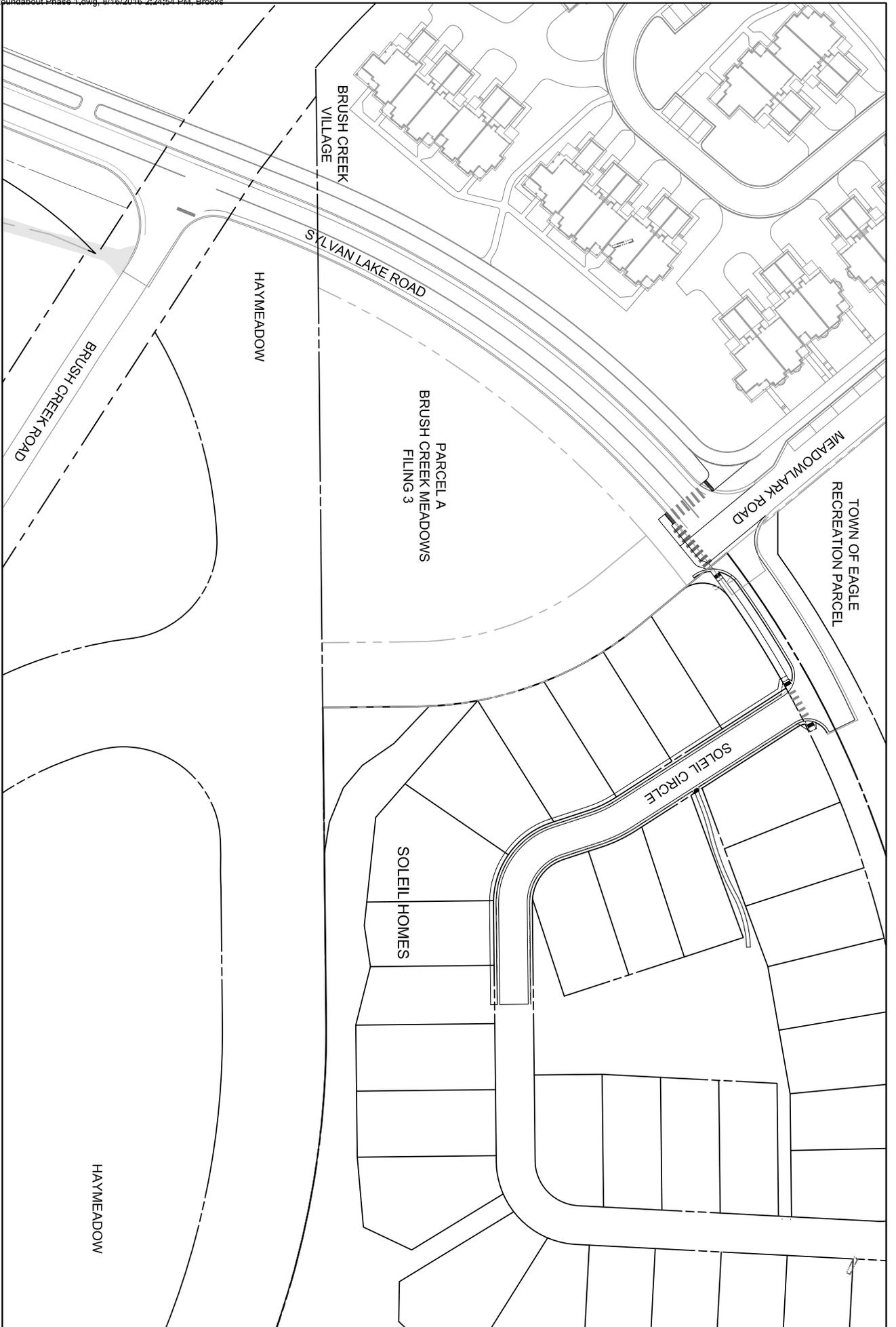
Haymeadow TIS Figure 5 - Existing Peak Hour Traffic

Haymeadow TIS Table 2 – Trip Generation

Haymeadow TIS Trip Generation in the Brush Creek Valley

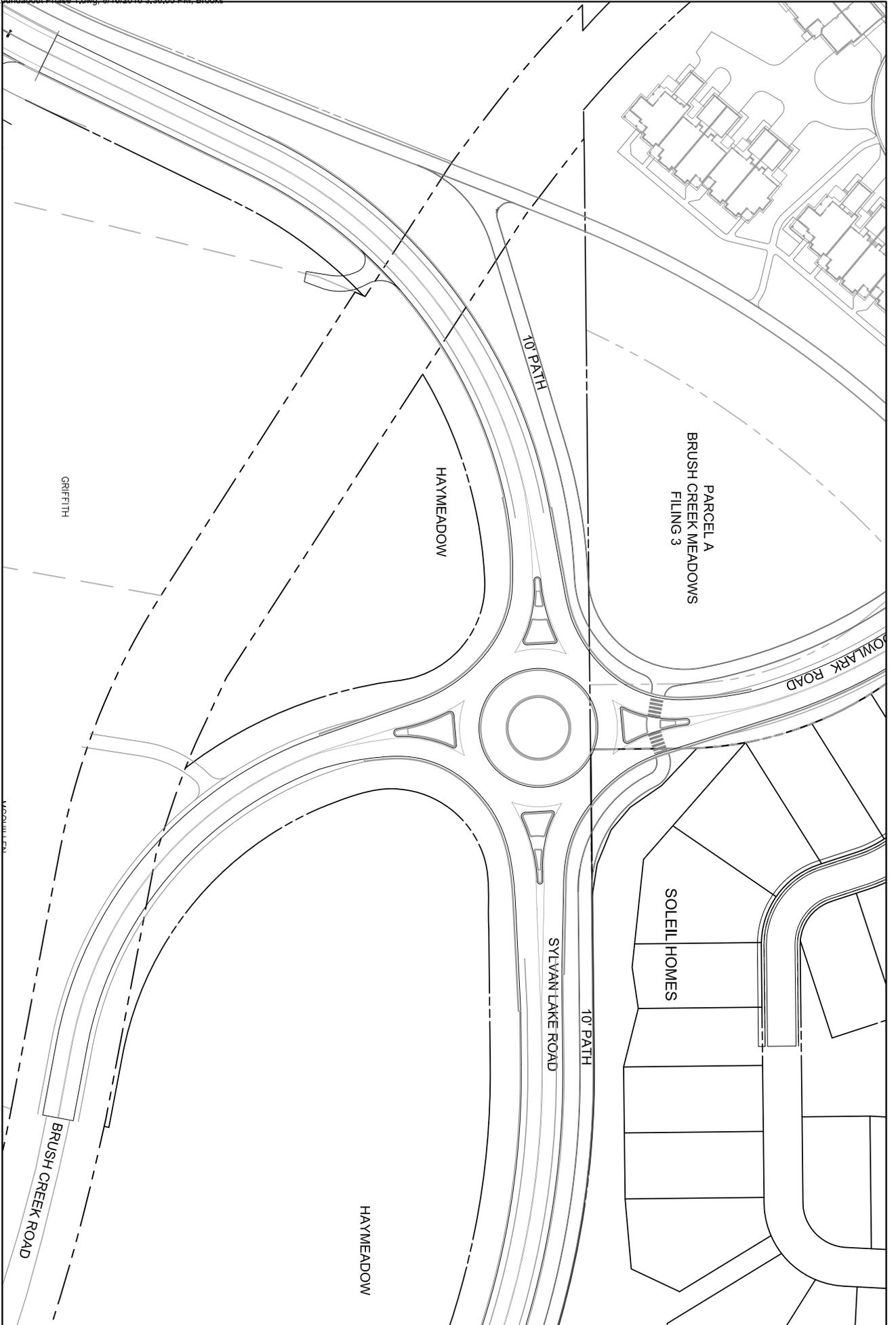
Haymeadow TIS Figure 11 – Directional Trip Distribution of Site Traffic

Intersection LOS Definitions



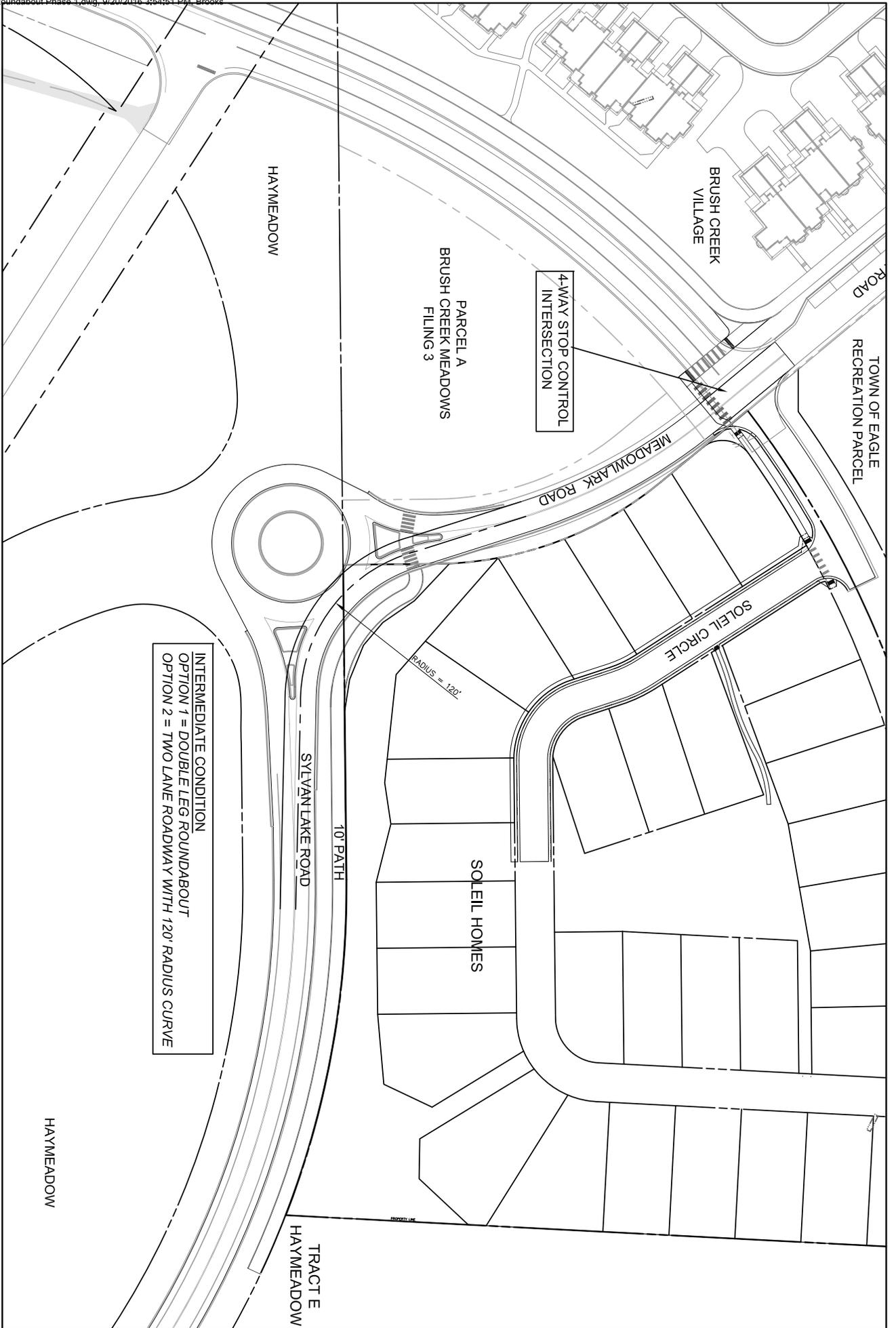
HAYMEADOW
SYLVAN LAKE ROAD
ROUNDABOUT
EXISTING CONDITIONS

DRAWING NO: C1.0
REFERENCE:
ISSUE:
DATE: 08/16/16
SCALE: 1"=100'
DRAWN BY: GLB



HAYMEADOW
SYLVAN LAKE ROAD
ROUNDABOUT
FINAL CONDITION

DRAWING NO: C1.2
REFERENCE:
ISSUE:
DATE: 08/16/16
SCALE: 1"=100'
DRAWN BY: GLB



INTERMEDIATE CONDITION
 OPTION 1 = DOUBLE LEG ROUNDABOUT
 OPTION 2 = TWO LANE ROADWAY WITH 120' RADIUS CURVE

4-WAY STOP CONTROL
 INTERSECTION

PARCEL A
 BRUSH CREEK MEADOWS
 FILING 3

RADIUS = 120'

10' PATH

SYLVAN LAKE ROAD

SOLEIL HOMES

SOLEIL CIRCLE

MEADOWLARK ROAD

TOWN OF EAGLE
 RECREATION PARCEL

BRUSH CREEK
 VILLAGE

HAYMEADOW

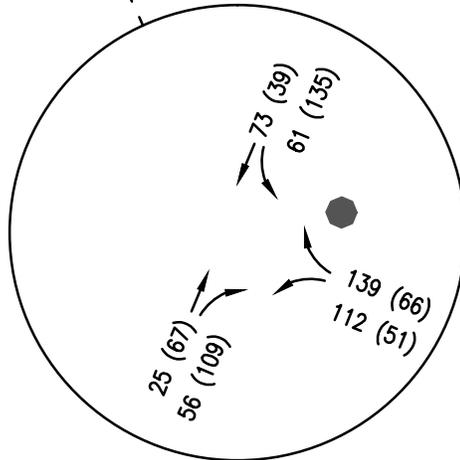
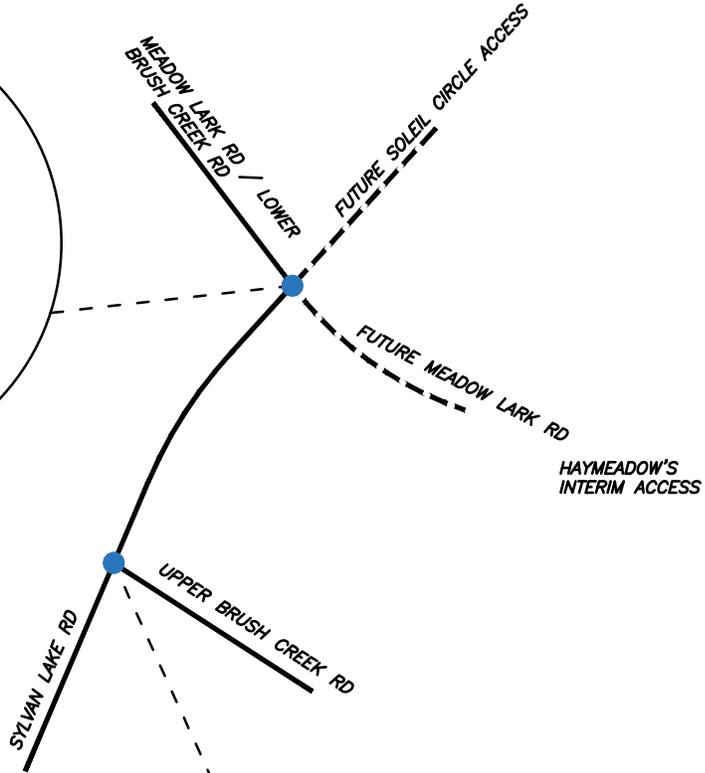
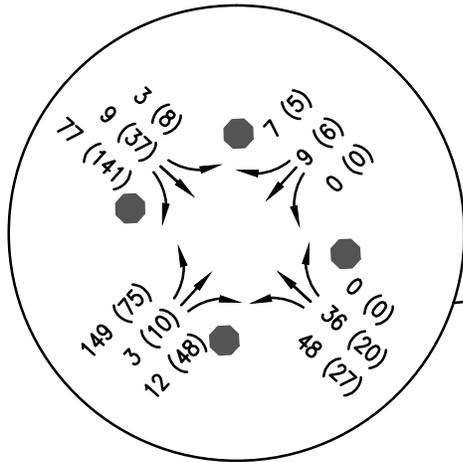
HAYMEADOW

TRACT E
 HAYMEADOW

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HAYMEADOW
 SYLVAN LAKE ROAD
 ROUNDABOUT
 INTERIM CONDITION

DRAWING NO: C1.1
 REFERENCE:
 ISSUE:
 DATE: 08/16/16
 SCALE: 1"=100'
 DRAWN BY: GLB



KEY

→ LANE CONFIGURATION
 XXX (XXX) AM (PM) WEEKDAY PEAK HOUR TRAFFIC VOLUME

FOX TUTTLE HERNANDEZ
TRANSPORTATION GROUP

HAYMEADOW YEAR 2027 INTERIM ACCESS
PEAK HOUR TRAFFIC PROJECTIONS

Project #	09026	Original Scale	NTS	Date	9/16/16	Drawn by	CRS	Figure #	1
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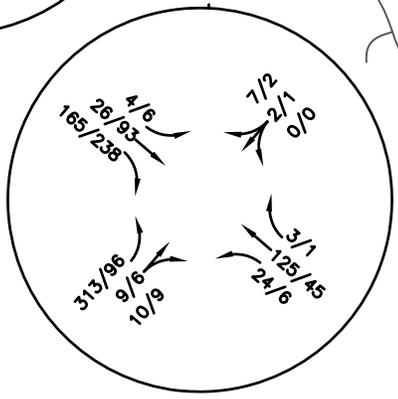
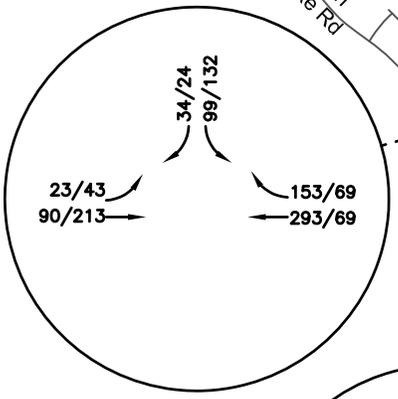
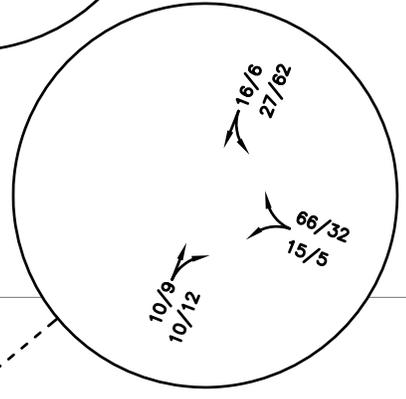
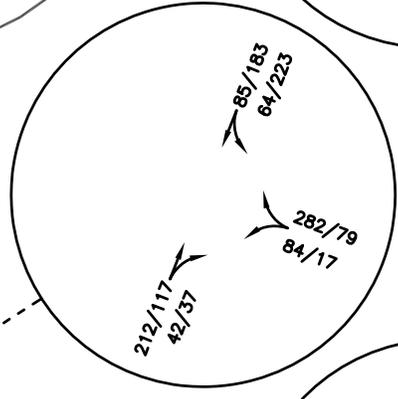
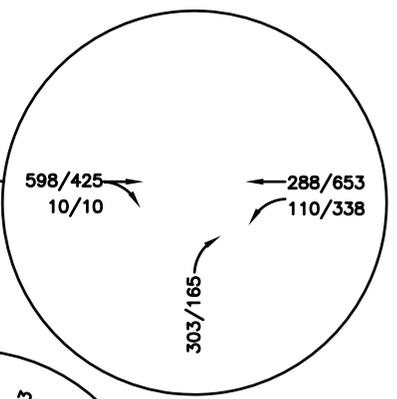
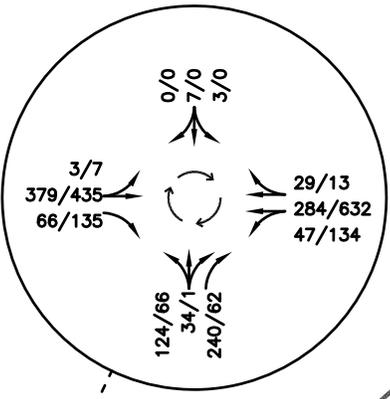
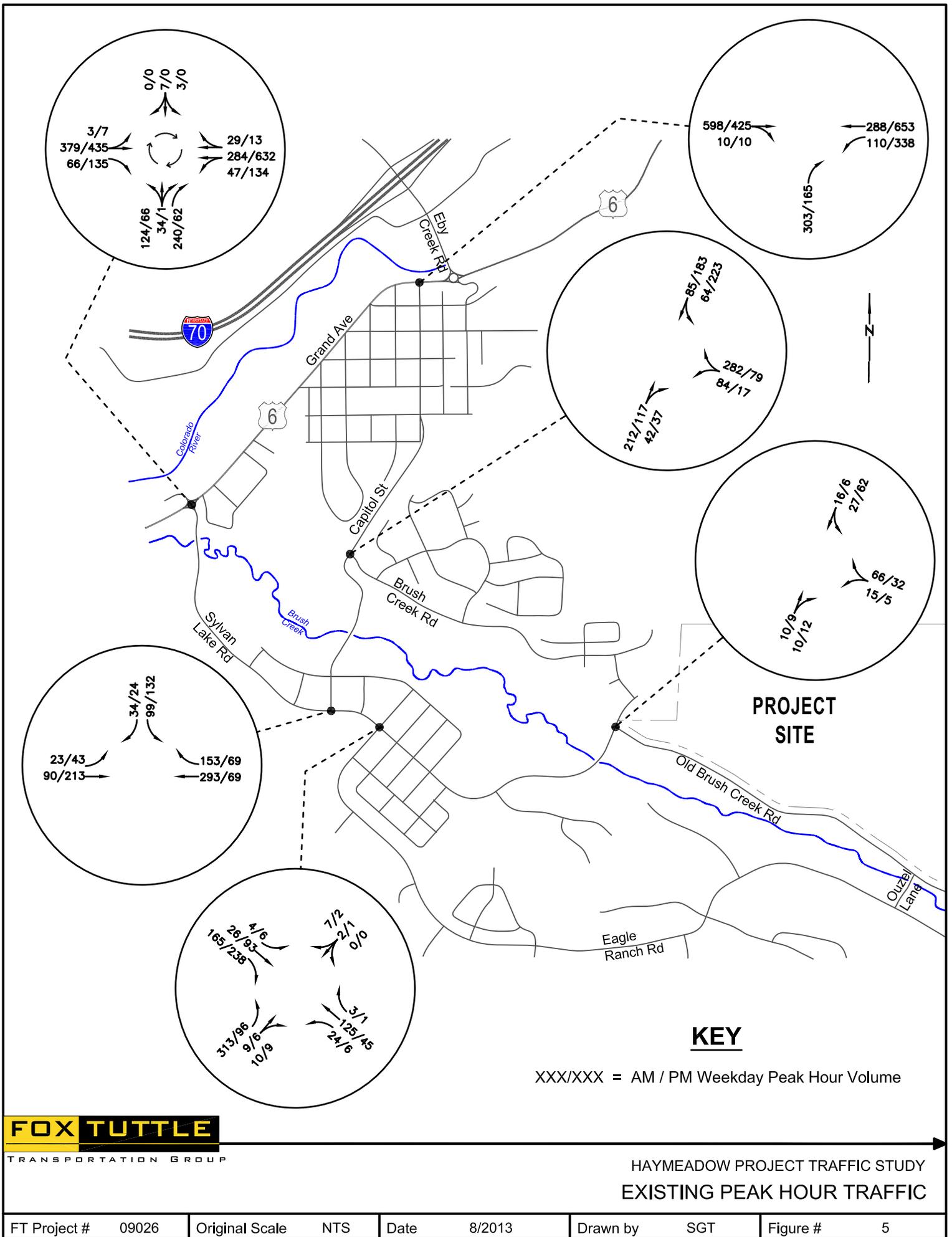
Haymeadow Future Interim Access Capacity Analysis



Table 1 - Intersection Level-of-Service and Queue Summary

Intersection and Lanes Groups	2027 Future Interim Access					
	AM Peak			PM Peak		
	Delay	LOS	95th Queue	Delay	LOS	95th Queue
TWO-WAY STOP SIGN CONTROL						
Sylvan Lake Rd & Upper Brush Creek Rd	7.1	A	-	5.2	A	-
Westbound Left+Right	11.4	B	35'	11.7	B	18'
Northbound Through+Right	0.0	A	0'	0.0	A	0'
Southbound Left+Through	3.4	A	3'	6.1	A	10'
ALL-WAY STOP SIGN CONTROL						
Sylvan Lake Rd & Meadow Lark Rd	8.3	A	-	8.1	A	-
Eastbound Left+Through+Right	7.5	A	10'	8.0	A	20'
Westbound Left+Through+Right	8.2	A	10'	7.9	A	5'
Northbound Left+Through+Right	8.8	A	23'	8.3	A	15'
Southbound Left+Through+Right	7.4	A	3'	7.4	A	0'

Notes: (1) Delay represented in average seconds per vehicle.



Haymeadow Traffic Study



Table 2. Trip Generation Estimate for the Haymeadow Development and the Recreation Facility

Parcel	ITE Code	Land Use	Size	Unit	Trip Reduction Factors			Average Daily Trips			External A.M. Peak Hour Trips				External P.M. Peak Hour Trips			
					Multi-Modal	Internal Trips and Multi-Purpose Trips	Pass-By	Rate	Total Trips with No Trip Reductions	Total External Trips With Trip Reductions	Rate	Total	In	Out	Rate	Total	In	Out
School	520/522	K - 8 School (4)	600	Students	0.10	0.375	0.00	1.36	816	459	0.47	159	87	72	0.15	51	25	26
A1	210	Single Family Detached	67	Dwelling Units	0.05	0.05	0.00	9.57	641	579	0.75	45	11	34	1.01	61	38	23
A1	230	Townhome / Condo / Apt	140	Dwelling Units	0.05	0.05	0.00	5.86	820	740	0.44	56	9	47	0.52	66	44	22
A1	(2)	Accessory Dwelling Units	10	Dwelling Units	0.05	0.05	0.00	5.86	59	53	0.44	4	1	3	0.52	5	3	2
A1		Subtotal Parcel A1:	217						1,520	1,372		105	21	84		132	85	47
A2	210	Single Family Detached	90	Dwelling Units	0.05	0.05	0.00	9.57	861	777	0.75	61	15	46	1.01	82	52	30
A2	230	Townhome / Condo / Apt	93	Dwelling Units	0.05	0.05	0.00	5.86	545	492	0.44	37	6	31	0.52	44	29	15
A2	(2)	Accessory Dwelling Units	13	Dwelling Units	0.05	0.05	0.00	5.86	76	69	0.44	5	1	4	0.52	6	4	2
A2		Subtotal Parcel A2:	196						1,482	1,338		103	22	81		132	85	47
B	210	Single Family Detached	147	Dwelling Units	0.05	0.05	0.00	9.57	1,407	1,270	0.75	100	25	75	1.01	134	84	50
B	230	Townhome / Condo / Apt	48	Dwelling Units	0.05	0.05	0.00	5.86	281	254	0.44	19	3	16	0.52	23	15	8
B	(2)	Accessory Dwelling Units	22	Dwelling Units	0.05	0.05	0.00	5.86	129	116	0.44	9	1	8	0.52	10	7	3
B		Subtotal Parcel B:	217						1,817	1,640		128	29	99		167	106	61
C	210	Single Family Detached	88	Dwelling Units	0.05	0.05	0.00	9.57	842	760	0.75	60	15	45	1.01	80	50	30
C	230	Townhome / Condo / Apt	64	Dwelling Units	0.05	0.05	0.00	5.86	375	338	0.44	25	4	21	0.52	30	20	10
C	(2)	Accessory Dwelling Units	13	Dwelling Units	0.05	0.05	0.00	5.86	76	69	0.44	5	1	4	0.52	6	4	2
C		Subtotal Parcel C:	165						1,293	1,167		90	20	70		116	74	42
D	210	Single Family Detached	50	Dwelling Units	0.05	0.05	0.00	9.57	479	432	0.75	34	9	25	1.01	46	29	17
D	230	Townhome / Condo / Apt	0	Dwelling Units	0.05	0.05	0.00	5.86	0	0	0.44	0	0	0	0.52	0	0	0
D	(2)	Accessory Dwelling Units	8	Dwelling Units	0.05	0.05	0.00	5.86	47	42	0.44	3	0	3	0.52	4	3	1
D		Subtotal Parcel D:	58						526	474		37	9	28		50	32	18
Civic	412	Community Park (3)	13	Acres	0.15	0.50	0.00	2.28	30	13	0.01	0	0	0	0.06	0	0	0
Civic	(1)	Fire Station	2	Acres	0.00	0.00	0.00	10.00	20	20	2.00	4	3	1	2.00	4	1	3
Total External Haymeadow Trip Ends:									7,504	6,483		626	191	435		652	408	244
T.O.E. Rec.	495	Recreation Community Center	68	1,000 sq. ft.	0.10	0.10	0.00	14.00	952	771	1.62	89	54	35	1.45	80	30	50
T.O.E. Rec.	488	Soccer Complex	3	Fields	0.10	0.10	0.00	71.33	214	173	1.40	3	2	1	20.67	50	35	15
Total External Recreation Facility Trip Ends:									1,166	944		92	56	36		130	65	65
Total External Trips From Both Sites:									8,670	7,427		718	247	471		782	473	309

Total Single Family DUs: 442
 Total Multi-Family DUs: 345
 Total Accessory DUs: 66
Total DUs: 853

Notes:

1. No ITE information available. Trip rate for Fire Station estimated for normal daily activity (not a fire event) assuming some resident fire fighters on-site..
2. To be conservative, Accessory Dwelling Units are assumed to be similar to apartment units from a trip generation perspective.
3. Community Park will not likely host a significant event during weekday peak hours
4. ITE school rates have been prorated as follows: 78% Elementary and 22% Middle School / Junior High School

Trip Generation in the Brush Creek Valley

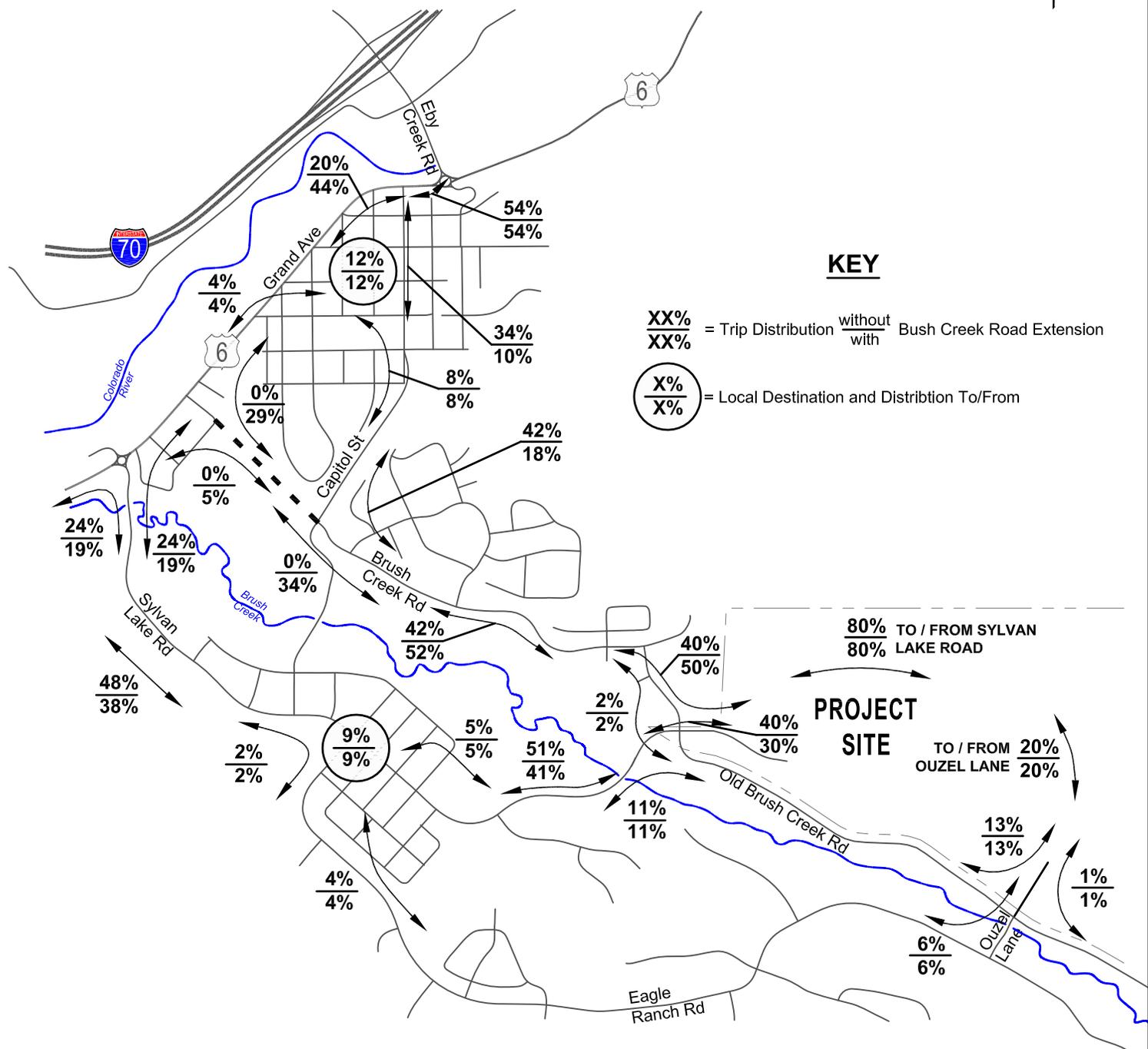
May 8, 2012

Parcel Name	Residential Development in the Brush Creek Valley													Vehicle Trips Generated from Residential Development in the Brush Creek Valley		
	Approximate Parcel Size	Single Family Units			Multi-Family Units			ADU			Total Residential Units			Existing	Future	Total at build out
	[acres]	Existing	Future	Total at build out	Existing	Future	Total at build out	Existing	Future	Total at build out	Existing	Future	Total at build out			
Corky Hillside	45	0	0	0	0	10	10	0	0	0	0	10	10	0	59	59
JHY	30	0	90	90	0	30	30	0	9	9	0	129	129	0	1,098	1,098
Ewing	7	0	0	0	0	30	30	0	0	0	0	30	30	0	176	176
Terrace	120	225	0	225	58	0	58	20	0	20	303	0	303	2,628	0	2,628
Brush Creek Meadows	30	58	0	58	32	49	81	0	0	0	90	49	139	743	287	1,030
Eagle Ranch	2,000	628	315	943	205	112	317	63	32	95	896	459	1,355	7,635	3,886	11,521
Haymeadow	660	0	646	646	0	333	333	0	59	59	0	1,038	1,038	0	8,530	8,530
Upper Ranch	550	2	73	75	0	0	0	0	7	7	2	80	82	19	746	765
Charlie Ridgeway	230	2	33	35	0	0	0	0	3	3	2	36	38	19	336	355
Lower Ranch	340	2	27	29	0	0	0	0	3	3	2	30	32	19	279	298
Adams Rib Ridgeway	120	0	14	14	0	0	0	0	1	1	0	15	15	0	141	141
Salt Creek	520	0	3	3	0	0	0	0	0	0	0	3	3	0	29	29
Moser Lane	180	25	10	35	0	0	0	2	1	3	27	11	38	253	102	355
Frost Creek	1,000	5	93	98	0	0	0	0	9	9	5	102	107	48	950	998
Other Development - Adjacent to Brush Creek Downvalley from Hardscrabble Road	200	32	5	37	0	0	0	3	1	4	35	6	41	326	55	381
Bruce Creek Area	3,500	50	55	105	0	0	0	5	5	10	55	60	115	512	560	1,072
Other Development - Adjacent to Brush Creek Upvalley from Bruce Creek Area	500	15	10	25	0	0	0	1	1	2	16	11	27	150	102	253
Totals	10,032	1,044	1,374	2,418	295	564	859	94	131	225	1,433	2,069	3,502	12,351	17,335	29,686

Other Trip Generators in the Brush Creek Valley	Vehicle Trips Generated from Other Development in the Brush Creek Valley		
	Existing	Future	Total at build out
Medical Center (Eagle Ranch)	1,246	5,259	6,505
Village Center (Eagle Ranch)	5,343	2,302	7,645
Elementary School (Eagle Ranch)	367	0	367
Recreation Center	759	831	1,590
Golf Course (Eagle Ranch)	643	0	643
Elementary and Middle School (Haymeadow)	0	744	744
Equestrian Center (Salt Creek)	0	148	148
Shooting Range (Salt Creek)	0	200	200
Recreation Center (Salt Creek)	0	53	53
Golf Course (Frost Creek)	643	0	643
Sylvan Lake State Park	?	?	?
National Forest	?	?	?
Totals	9,002	9,536	18,538

Trips per Single Family = 9.57
 Trips per Multi-Family = 5.86
 Trips per ADU = 6.72

Total Vehicle Trips Generated in the Brush Creek Valley		
Existing	Future	Total at build out
21,353	26,871	48,224



HAYMEADOW PROJECT TRAFFIC STUDY
DIRECTIONAL DISTRIBUTION OF SITE TRAFFIC

LEVEL OF SERVICE DEFINITIONS

In rating roadway and intersection operating conditions with existing or future traffic volumes, “Levels of Service” (LOS) A through F are used, with LOS A indicating very good operation and LOS F indicating poor operation. Levels of service at signalized and unsignalized intersections are closely associated with vehicle delays experienced in seconds per vehicle. More complete level of service definitions and delay data for signal and stop sign controlled intersections are contained in the following table for reference.

Level of Service Rating	Delay in seconds per vehicle (a)		Definition
	Signalized	Unsignalized	
A	0.0 to 10.0	0.0 to 10.0	Low vehicular traffic volumes; primarily free flow operations. Density is low and vehicles can freely maneuver within the traffic stream. Drivers are able to maintain their desired speeds with little or no delay.
B	10.1 to 20.0	10.1 to 15.0	Stable vehicular traffic volume flow with potential for some restriction of operating speeds due to traffic conditions. Vehicle maneuvering is only slightly restricted. The stopped delays are not bothersome and drivers are not subject to appreciable tension.
C	20.1 to 35.0	15.1 to 25.0	Stable traffic operations, however the ability for vehicles to maneuver is more restricted by the increase in traffic volumes. Relatively satisfactory operating speeds prevail, but adverse signal coordination or longer vehicle queues cause delays along the corridor.
D	35.1 to 55.0	25.1 to 35.0	Approaching unstable vehicular traffic flow where small increases in volume could cause substantial delays. Most drivers are restricted in ability to maneuver and selection of travel speeds due to congestion. Driver comfort and convenience are low, but tolerable.
E	55.1 to 80.0	35.1 to 50.0	Traffic operations characterized by significant approach delays and average travel speeds of one-half to one-third the free flow speed. Vehicular flow is unstable and there is potential for stoppages of brief duration. High signal density, extensive vehicle queuing, or corridor signal progression/timing are the typical causes of vehicle delays at signalized corridors.
F	> 80.0	> 50.0	Forced vehicular traffic flow and operations with high approach delays at critical intersections. Vehicle speeds are reduced substantially and stoppages may occur for short or long periods of time because of downstream congestion.

(a) Delay ranges based on 2010 Highway Capacity Manual criteria.