

Karman Line

Transportation Memorandum

Prepared for:

Mr. Craig Dossey

Vertex

455 East Pikes Peak Avenue, Suite 101

Colorado Springs, CO 80909

AUGUST 14, 2023

LSC Transportation Consultants

Prepared by: Kirstin D. Ferrin, P.E.

Reviewed by: Jeffrey C. Hodsdon, P.E.

LSC #S234150



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LSC TRANSPORTATION CONSULTANTS, INC.
2504 East Pikes Peak Avenue, Suite 304
Colorado Springs, CO 80909
(719) 633-2868
FAX (719) 633-5430
E-mail: lsc@lscctrans.com
Website: <http://www.lscctrans.com>

August 14, 2023

Mr. Craig Dossey
Vertex
455 East Pikes Peak Avenue, Suite 101
Colorado Springs, CO 80909

RE: Karman Line
Transportation Memorandum
Colorado Springs, CO
LSC #S234150

Dear Mr. Dossey,

In response to your request, LSC Transportation Consultants, Inc. has prepared this transportation memorandum for proposed Karman Line Master Plan. As shown in Figure 1, the site is located north of Bradley Road and west of Curtis Road in Colorado Springs, Colorado.

REPORT CONTENTS

This memorandum has been prepared to address the project's traffic impact.

This report contains the following:

- The existing street and traffic conditions in the site's vicinity including the street widths, lane geometries, traffic controls, and existing traffic counts at key area intersections;
- The estimated average weekday and peak-hour trip generation; and
- The estimated directional distribution of site-generated trips and the projected site-generated traffic volumes;

AREA DEVELOPMENTS

Figure 2 shows the location of known future major developments in the vicinity of the proposed Karman Line Master Plan.

LAND USE AND ACCESS

The site location is shown in Figure 1. Figure 2 presents a context map showing other area developments. The site plan for Karman Line is shown in Figure 3.

Land Use

Figure 3 shows the proposed Karman Line Master Plan. The site planned to be developed with a mix of residential, commercial industrial, and office uses. The total number of residential dwelling units within the Master Plan area is 6,500. About 105.12 acres are planned for commercial/retail uses and about 45.58 acres are planned for light industrial/office uses. Table 1 shows the land use assumed for each planning area.

Access

Six full-movement access points are proposed to Bradley Road and Curtis Road. All of the proposed access points are spaced greater than the ¼-mile spacing (1,320') except for the north Road 1/Curtis Road intersection which is about 1,051 feet south of Book Drive and the proposed access to the light industrial parcel (P-21) which is located about 1,193 feet north of Book Drive.

STREET AND TRAFFIC CONDITIONS

Area Streets

The adjacent streets are shown in Figure 1 and are described below. Copies of the 2016 El Paso County *Major Transportation Corridors Plan (MTCP) 2040 Roadway Plan* and 2016 *MTCP 2060 Corridor Preservation Plan* with the site location identified on them have been attached to this report.

- **Powers Boulevard** (State Highway 21) is classified as a Freeway (FW). Powers Boulevard is one of the region's main north/south corridors. Powers Boulevard has a center median and a posted speed limit of 60 miles per hour (mph) north of Crestera Parkway. South of this point, the posted speed limit is 65 mph. Powers Boulevard is ultimately planned to be converted to a Freeway with grade-separated intersections.
- **State Highway (SH) 94** is a two-lane roadway that extends east from US Highway (US Hwy) 24 to US Hwy 40. SH 94 is classified as a Principal Arterial (NR-A) and has a speed limit of 55 mph. The El Paso County Major Transportation Corridors Plan (MTCP) shows SH 94 as a four-lane road in 2040 from the US Hwy 24 to Slocum Road. The intersection of Curtis Road/SH 94 is signalized with auxiliary lanes for all turning movements.
- **Curtis Road** is a two-lane roadway that extends from Bradley Road to Judge Orr Road. The roadway is classified as a Minor Arterial south of SH 94. The posted speed limit is 55 mph adjacent to the site.
- **Bradley Road** is shown with a Minor Arterial classification on the 2016 2040 El Paso County *Major Transportation Corridors Plan (MTCP)*. Adjacent to the site, Bradley Road is a two-lane roadway with a 55-mph posted speed limit and has an edge-of-asphalt median, left-turn lanes, and rural paved shoulders.
- **Marksheffel Road** extends north from the Link Road/C&S Road intersection in Fountain, Colorado to north of Woodmen Road. It has recently been upgraded north and south of Bradley Road with a PPRTA project and is shown as a four-lane Expressway on the *MTCP*. The posted speed limit on Marksheffel Road in the vicinity of Bradley Road is 55 mph.

Existing Traffic Volumes

Figure 4 shows the existing traffic volumes at the intersections of Powers Boulevard/Bradley Road, Marksheffel Road/Bradley Road based on the attached traffic counts conducted by LSC in March 2021 and March 2023. The 2021 traffic-count data for the intersections of Powers/Bradley and Marksheffel/Bradley have been adjusted based on the more recent counts conducted at Legacy Hill/Bradley in February 2023. Figure 4 also shows traffic counts at the intersection of SH 94/Curtis Road based on the traffic counts conducted by LSC in October 2017.

Figure 4 also shows the 2021 Colorado Department of Transportation (CDOT) Average Annual Daily Traffic Volume (AADT) on Powers Boulevard and estimates of the average daily traffic volume on Bradley Road and Marksheffel Road based on the peak-hour traffic counts.

Existing Levels of Service

Level of service (LOS) is a quantitative measure of the level of congestion or delay at an intersection. Level of service is indicated on a scale from “A” to “F.” LOS A represents control delay of less than 10 seconds for unsignalized and signalized intersections. LOS F represents control delay of more than 50 seconds for unsignalized intersections and more than 80 seconds for signalized intersections. Table 2 shows the level of service delay ranges.

Table 2: Intersection Levels of Service Delay Ranges

Level of Service	Signalized Intersections	Unsignalized Intersections
	Average Control Delay (seconds per vehicle)	Average Control Delay (seconds per vehicle) ⁽¹⁾
A	10.0 sec or less	10.0 sec or less
B	10.1-20.0 sec	10.1-15.0 sec
C	20.1-35.0 sec	15.1-25.0 sec
D	35.1-55.0 sec	25.1-35.0 sec
E	55.1-80.0 sec	35.1-50.0 sec
F	80.1 sec or more	50.1 sec or more

(1) For unsignalized intersections if V/C ratio is greater than 1.0 the level of service is LOS F regardless of the projected average control delay per vehicle.

The intersections of Powers/Bradley and Marksheffel/Bradley have been analyzed using Synchro. Figure 3 shows the level of service analysis results. The intersection of Legacy Hill Drive/Bradley Road has been analyzed based on the unsignalized method of analysis from the *Highway Capacity Manual, 6th Edition* by the Transportation Research Board.

All movements at the signalized intersections of Powers/Bradley and Marksheffel/Bradley are currently operating at LOS D or better during the peak hours.

The northbound left-turn movement at the stop-sign-controlled intersection of Legacy Hill/Bradley is currently operating at LOS D during the morning peak hours and LOS E during the afternoon peak hour.

TRIP GENERATION

The site-generated vehicle trips were estimated using the nationally-published trip-generation rates from *Trip Generation, 11th Edition, 2021* by the Institute of Transportation Engineers (ITE). Table 1 shows the average weekday and peak-hour trip-generation estimates.

The total number of external vehicle trips generated by the land uses has been reduced to account for the internal vehicle trips made within the site between land uses, without use of the external streets surrounding the site. The percentage of internal trips between the residential uses and the retail uses was estimated based on the NCHRP 684 Internal Trip Capture Estimation Tool. The percentage of internal trips related to the school site and the amenity center are estimates by LSC based on the proposed number of dwelling units. Appendix Table 1 shows the percentage of internal trips assumed for each land use.

The total number of vehicle trips generated has also been reduced to account for the “pass-by” phenomena. A pass-by trip is made by a motorist who would already be on the adjacent roadways regardless of the proposed development, but who stops in at the site while passing by. The motorist would then continue on his or her way to a final destination in the original direction. The pass-by percentages shown in Table 2 are from the *Trip Generation Handbook - An ITE Proposed Recommended Practice, 3rd Edition, 2017* by ITE. As shown in Appendix Table 1, 34 percent of the retail trips were assumed to be pass-by trips.

At buildout, Karman Line is projected to generate about 70,171 new external vehicle trips on the average weekday, with about half entering and half exiting the site. During the morning peak hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 1,503 vehicles would enter and 2,918 vehicles would exit the site. During the afternoon peak hour, which generally occurs for one hour between 4:15 and 6:15 p.m., about 4,145 vehicles would enter and 3,174 vehicles would exit the site.

TRIP DISTRIBUTION AND ASSIGNMENT

The directional distribution of the site-generated traffic volumes on the adjacent roadway system is one of the most important factors in determining the traffic impacts of the site. Figure 5 shows the long-term directional distribution of new, external traffic projected to be generated by the site.

The long-term directional-distribution estimates were based on the anticipated regional development and future roadway networks, as shown on the attached map from the PlanCOS.

When the distribution percentages (from Figure 5) are applied to the trip-generation estimates (from Table 1), the resulting site-generated traffic volumes can be determined. Figures 6 and 7 show the projected daily site-generated traffic volumes on key links in the study area.

ROADWAY CLASSIFICATION

Figure 8 shows the recommended Roadway classification for the internal roadways.

* * * * *

Please contact me if you have any questions regarding this report.

Respectfully Submitted,

LSC TRANSPORTATION CONSULTANTS, INC.



By Jeffrey C. Hodsdon, P.E.
Principal

JCH/KDF:jas

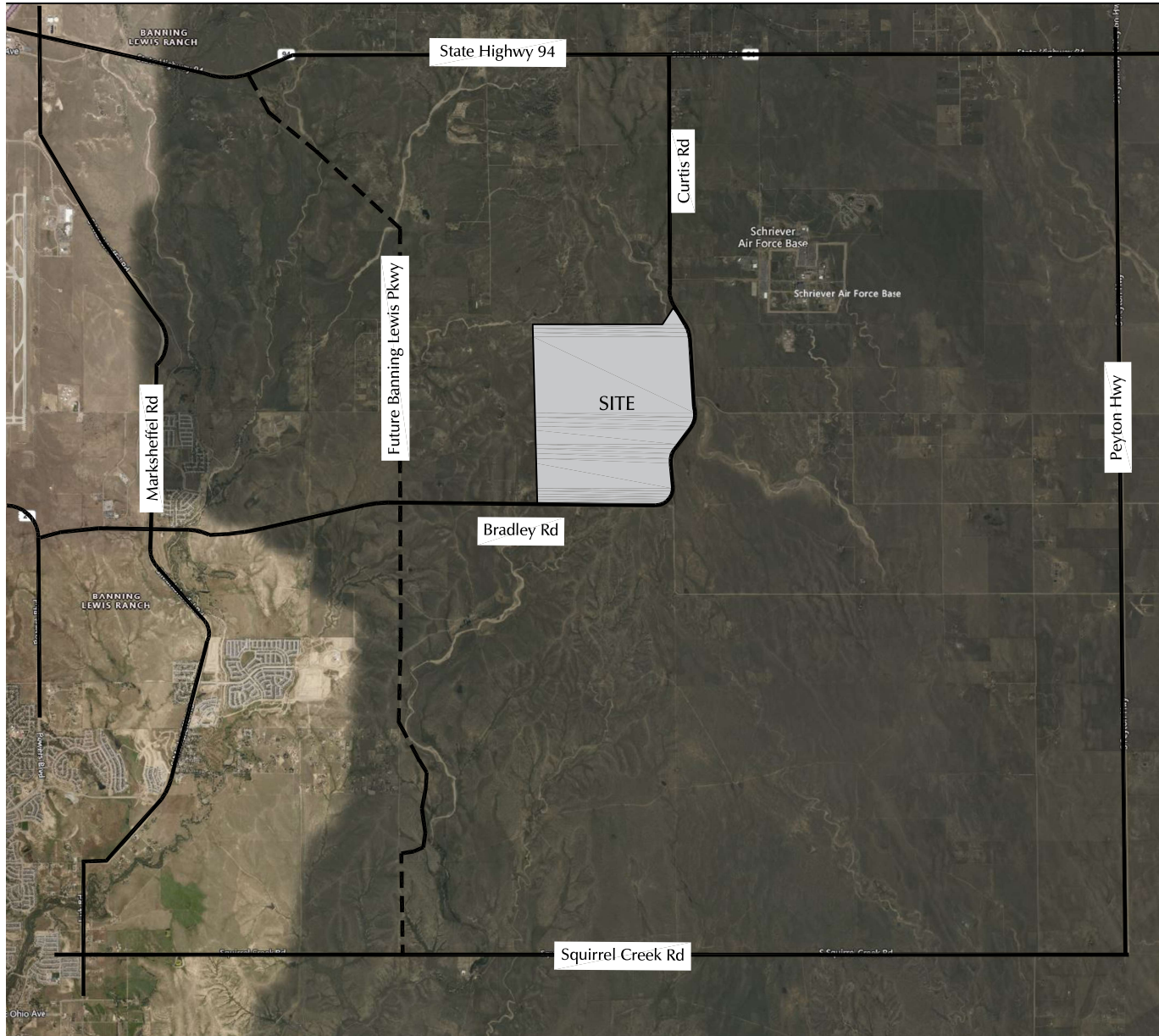
Enclosures: Table 1
Figures 1-8
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Table 1



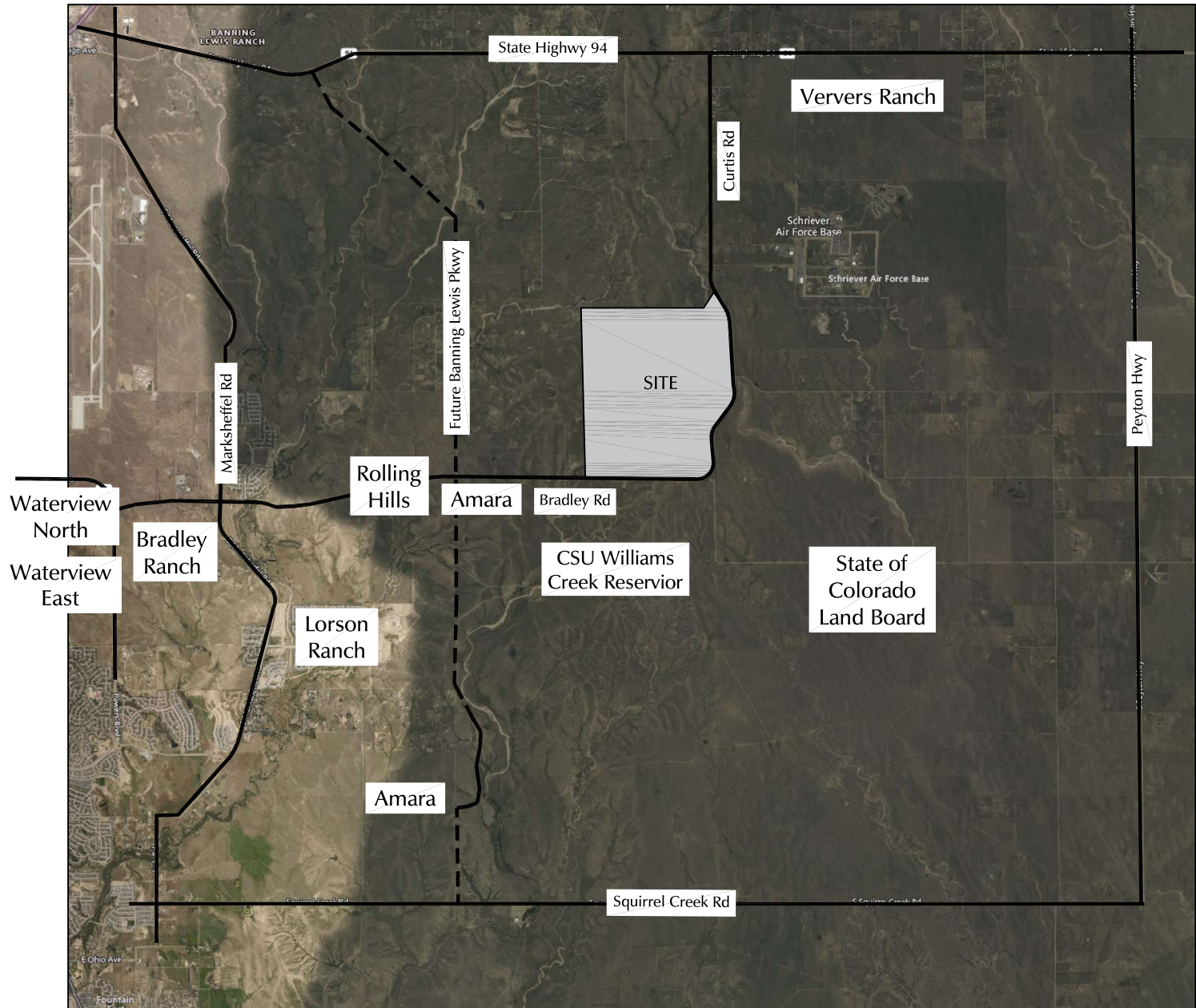
Figures 1-8





Not to scale

Figure 1
Vicinity Map
Karman Line (LSC# S234150)



Not to scale

Figure 2
Context Map
 Karman Line (LSC# S234150)



1" = 600'
scale

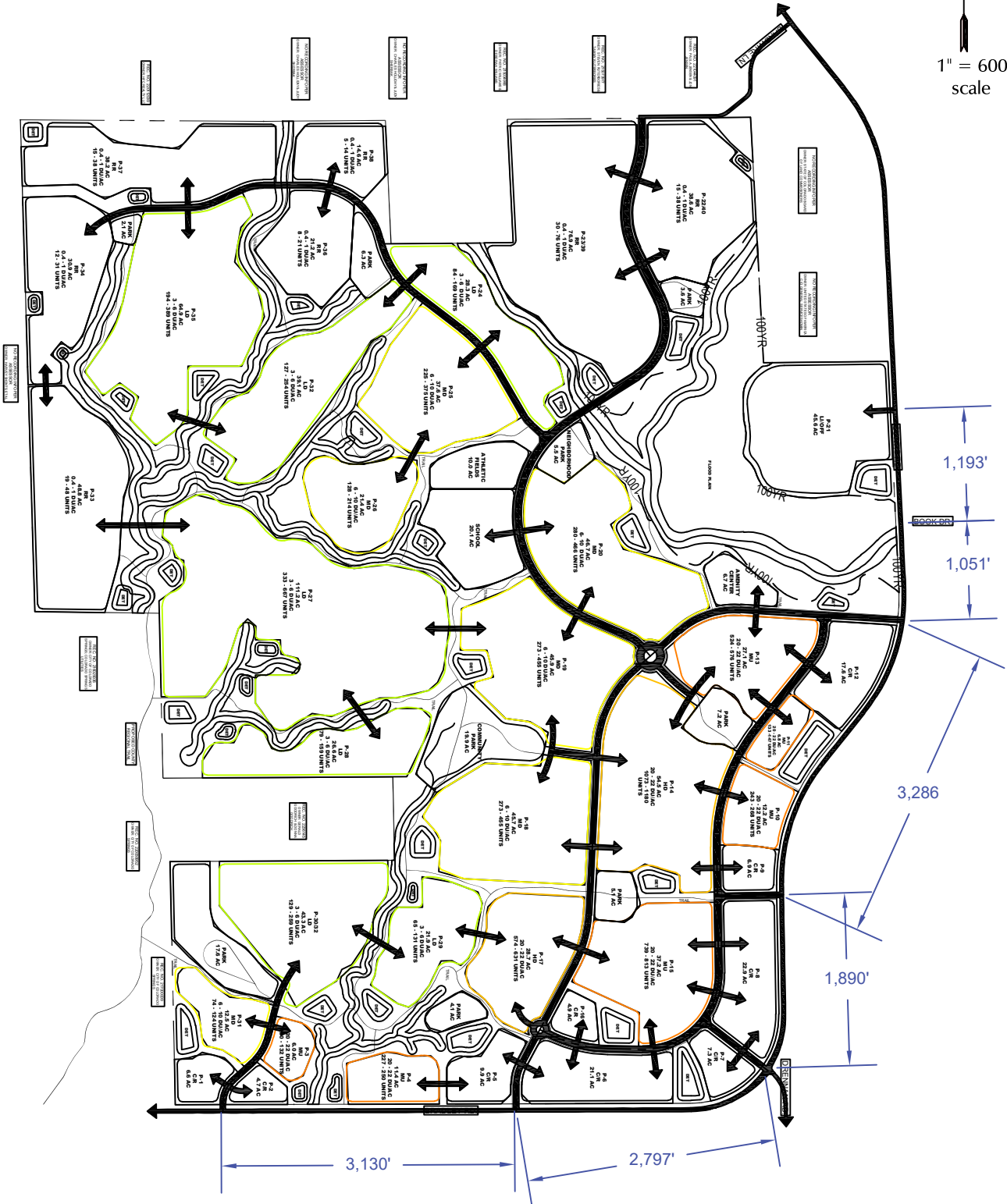
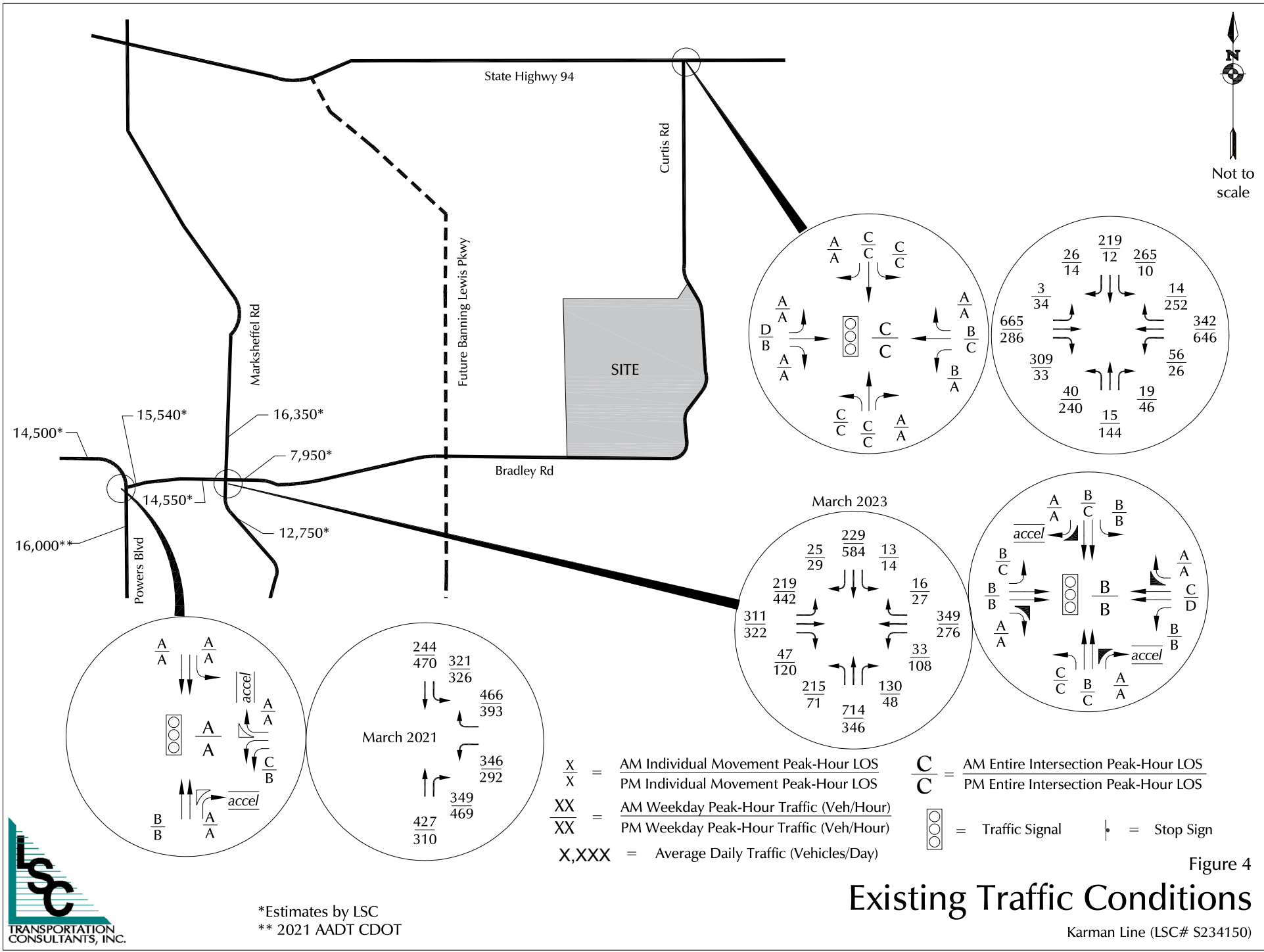


Figure 3
Site Plan

Karman Line (LSC# S234150)

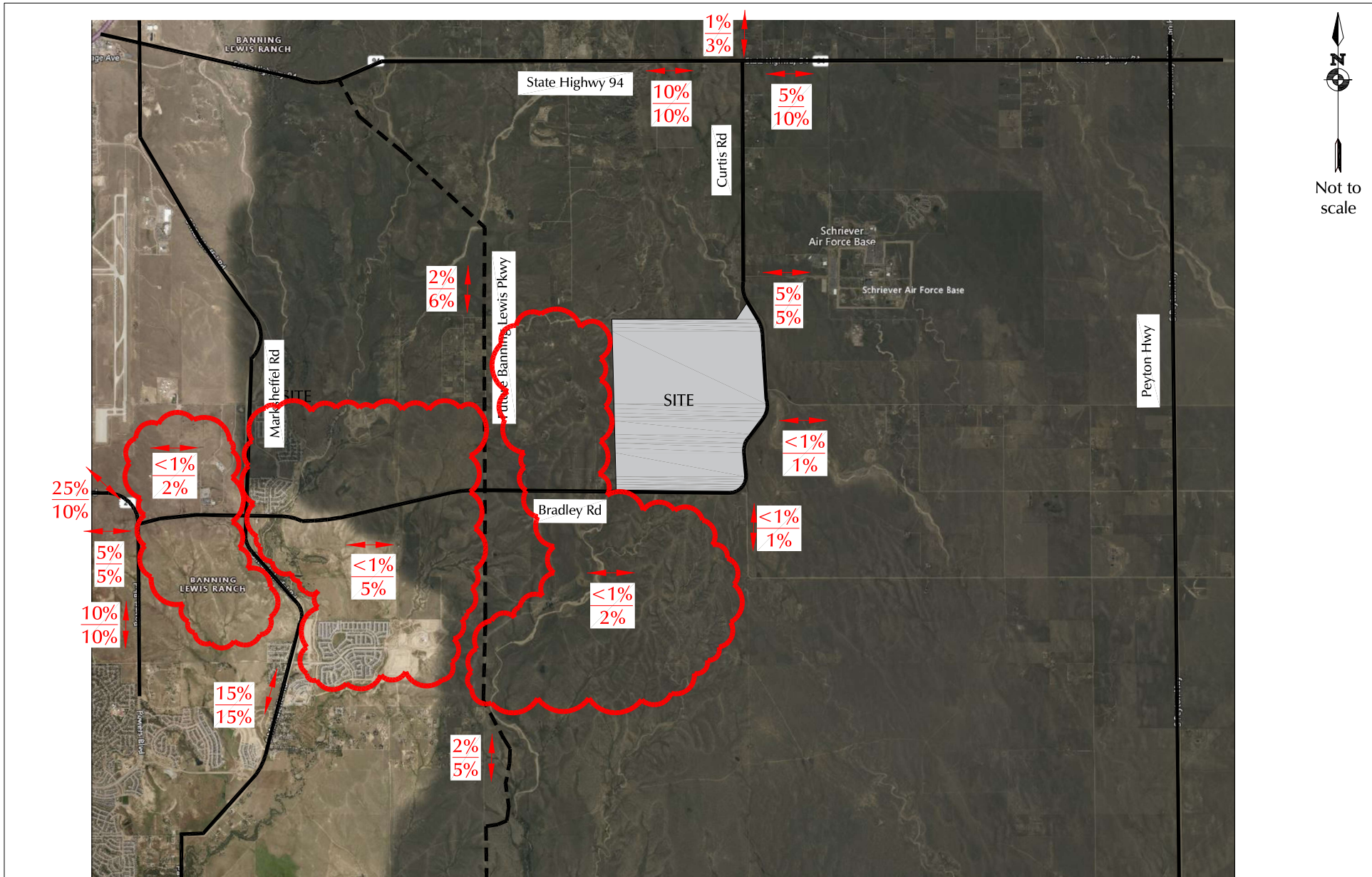




*Estimates by LSC
 ** 2021 AADT CDOT

Figure 4
Existing Traffic Conditions

Karman Line (LSC# S234150)



North Arrow
Not to scale



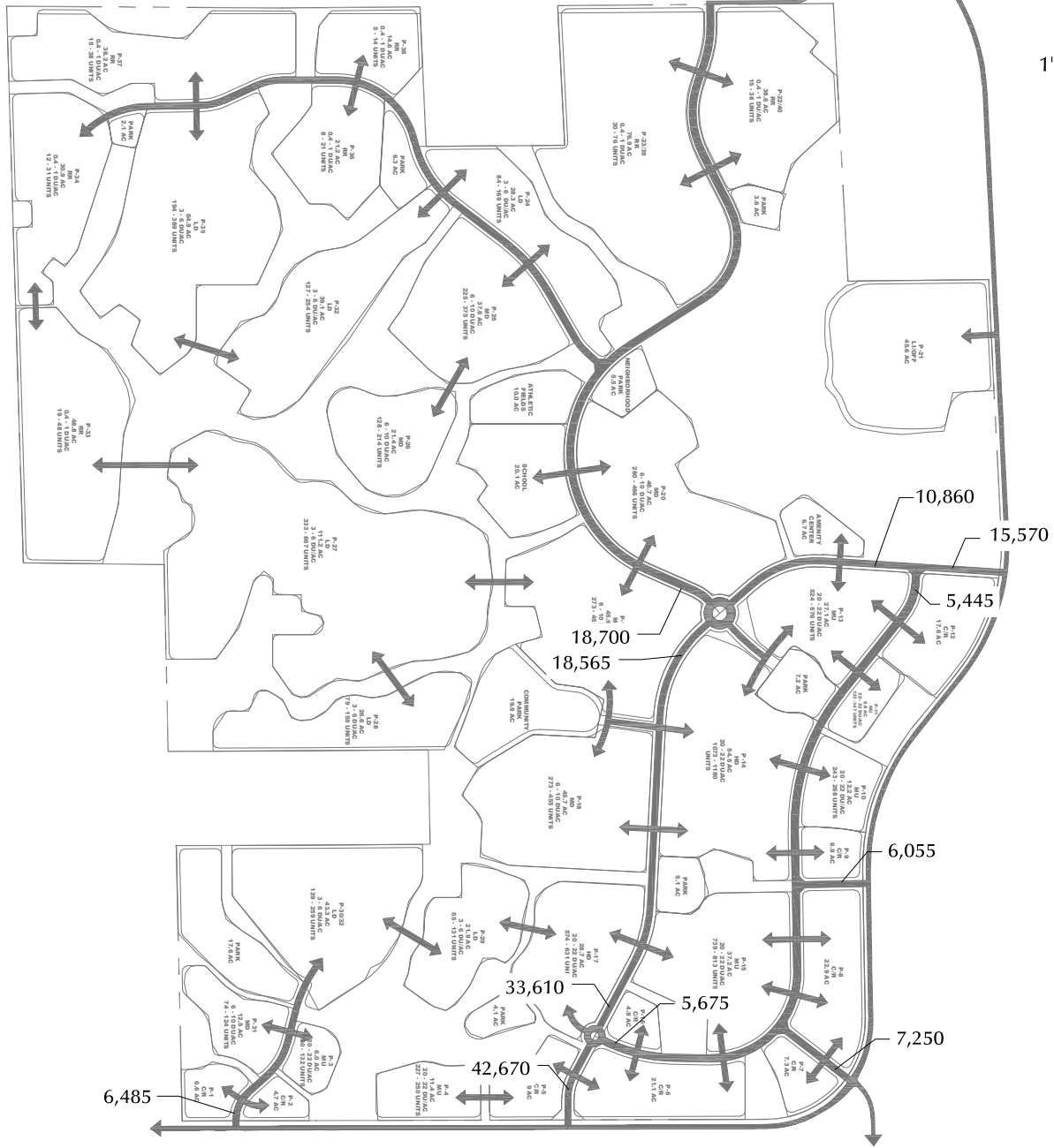
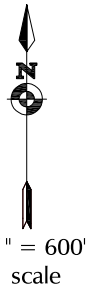
 Residential % Distribution
 Non-Residential % Distribution

Figure 5
Directional Distribution

Karman Line (LSC# S234150)



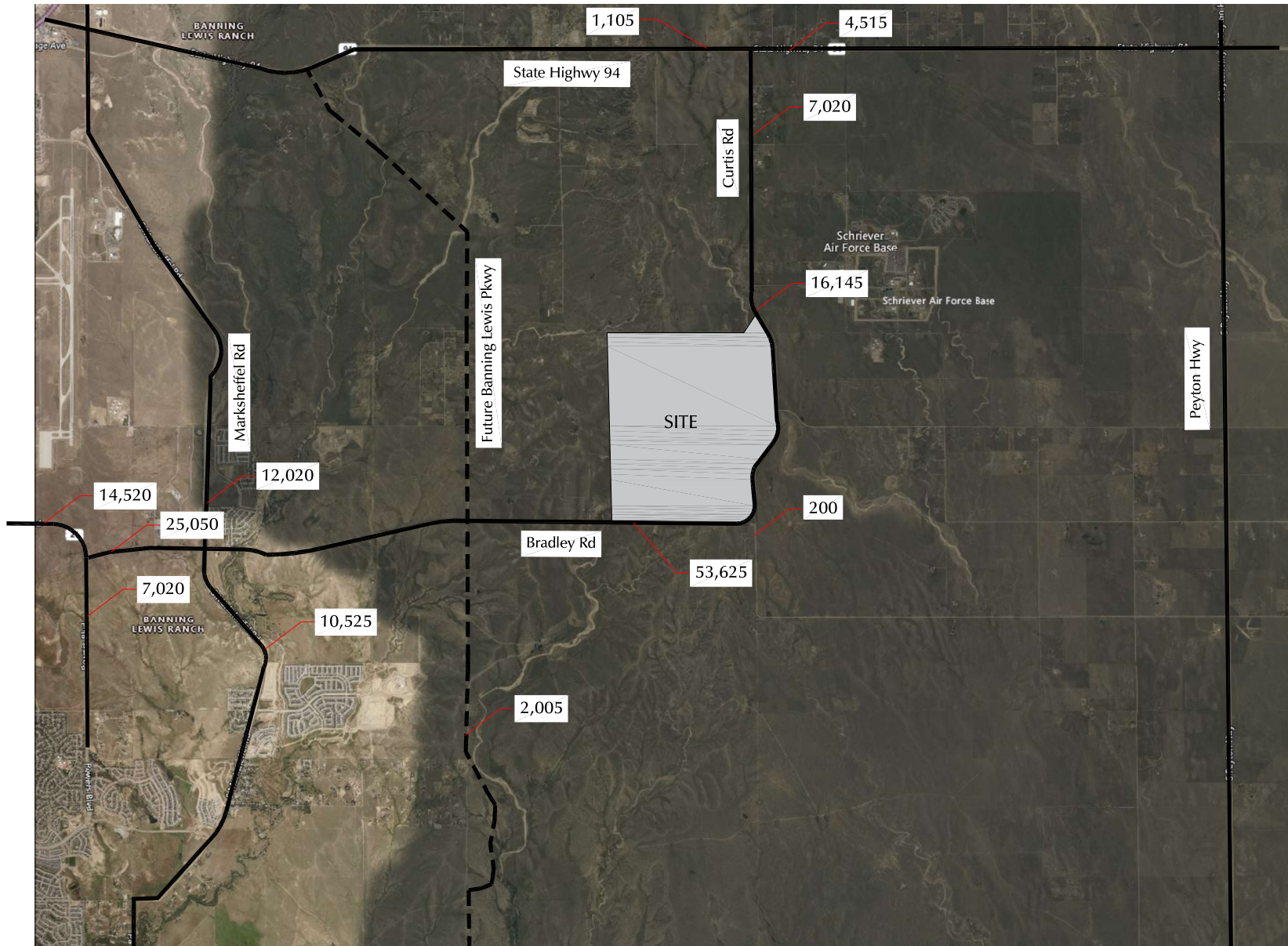


X,XXX = Average Daily Traffic (Vehicles/Day)

Figure 6
 Site-Generated Traffic on
 Internal Roadways

Karman Line (LSC# S234150)





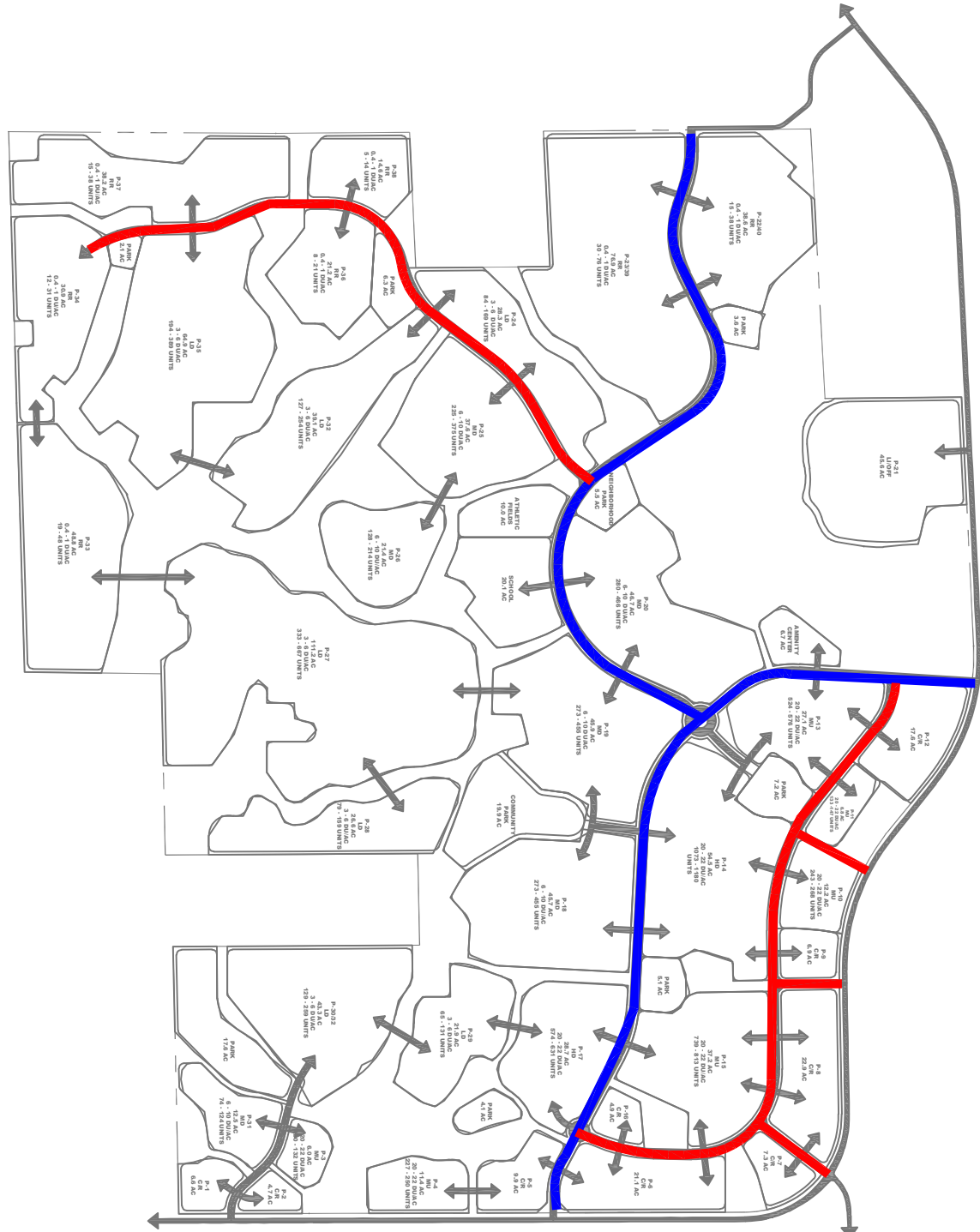
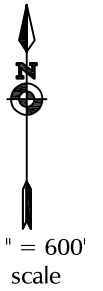
North arrow pointing up with 'N' and 'Z' markers.
Not to scale



X,XXX = Average Daily Traffic (Vehicles/Day)

Figure 7
Site-Generated Traffic on
External Roadways

Karman Line (LSC# S234150)



- █ Minor Arterial
- █ Collector

Figure 8
Recommended Classifications
 Karman Line (LSC# S234150)



Traffic Counts



LSC Transportation Consultants, Inc.

2504 E. Pikes Peak Ave, Suite 304
 Colorado Springs, CO 80909
 719-633-2868

File Name : Marksheffel Rd -Bradley Rd AM
 Site Code : S234150
 Start Date : 3/21/2023
 Page No : 1

Groups Printed- Unshifted

Start Time	Marksheffel Rd Southbound					Bradley Rd Westbound					Marksheffel Rd Northbound					Bradley Rd Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
06:30	18	23	1	0	42	0	18	0	0	18	7	52	8	0	67	2	17	22	0	41	168
06:35	15	27	0	0	42	1	16	1	0	18	12	59	6	0	77	1	19	25	0	45	182
06:40	23	24	1	0	48	2	24	1	0	27	8	44	20	0	72	7	24	15	0	46	193
06:45	15	18	0	0	33	0	29	3	0	32	5	36	9	0	50	2	24	18	0	44	159
06:50	24	23	1	0	48	0	22	2	0	24	8	43	18	0	69	6	14	20	0	40	181
06:55	20	12	2	0	34	2	36	3	0	41	6	44	13	0	63	4	27	11	0	42	180
Total	115	127	5	0	247	5	145	10	0	160	46	278	74	0	398	22	125	111	0	258	1063
07:00	23	18	0	0	41	2	42	3	0	47	6	58	16	0	80	3	29	8	0	40	208
07:05	23	16	2	0	41	4	31	4	0	39	11	56	13	0	80	9	21	21	0	51	211
07:10	25	23	1	0	49	1	27	5	0	33	16	70	19	0	105	2	31	22	0	55	242
07:15	14	24	2	0	40	0	36	2	0	38	12	67	28	0	107	2	30	20	0	52	237
07:20	24	29	2	0	55	0	33	3	0	36	11	73	17	0	101	1	26	16	0	43	235
07:25	29	21	0	0	50	0	26	4	0	30	12	49	15	0	76	6	30	29	0	65	221
07:30	26	18	0	0	44	2	19	0	0	21	11	63	29	1	104	5	29	17	0	51	220
07:35	28	19	0	0	47	0	29	1	0	30	16	65	14	0	95	2	29	17	0	48	220
07:40	16	14	3	0	33	4	25	3	0	32	13	65	20	0	98	5	22	26	0	53	216
07:45	20	12	0	0	32	1	23	3	1	28	8	60	13	0	81	2	23	22	0	47	188
07:50	24	20	1	0	45	0	21	2	0	23	11	24	6	0	41	6	22	12	0	40	149
07:55	28	15	1	0	44	3	18	4	0	25	7	31	12	0	50	2	12	19	0	33	152
Total	280	229	12	0	521	17	330	34	1	382	134	681	202	1	1018	45	304	229	0	578	2499
08:00	39	18	0	0	57	4	29	1	0	34	4	37	8	0	49	3	23	8	0	34	174
08:05	17	18	0	0	35	2	27	1	0	30	5	33	4	0	42	3	22	18	0	43	150
08:10	30	12	1	0	43	0	10	0	0	10	9	41	5	0	55	4	17	9	0	30	138
08:15	25	16	0	0	41	1	21	4	0	26	5	29	6	0	40	4	13	18	0	35	142
08:20	23	22	1	0	46	1	19	1	0	21	4	35	8	0	47	3	17	12	0	32	146
08:25	21	11	0	0	32	2	19	2	0	23	5	28	7	0	40	4	23	18	0	45	140
Grand Total	550	453	19	0	1022	32	600	53	1	686	212	1162	314	1	1689	88	544	423	0	1055	4452
Apprch %	53.8	44.3	1.9	0		4.7	87.5	7.7	0.1		12.6	68.8	18.6	0.1		8.3	51.6	40.1	0		
Total %	12.4	10.2	0.4	0	23	0.7	13.5	1.2	0	15.4	4.8	26.1	7.1	0	37.9	2	12.2	9.5	0	23.7	

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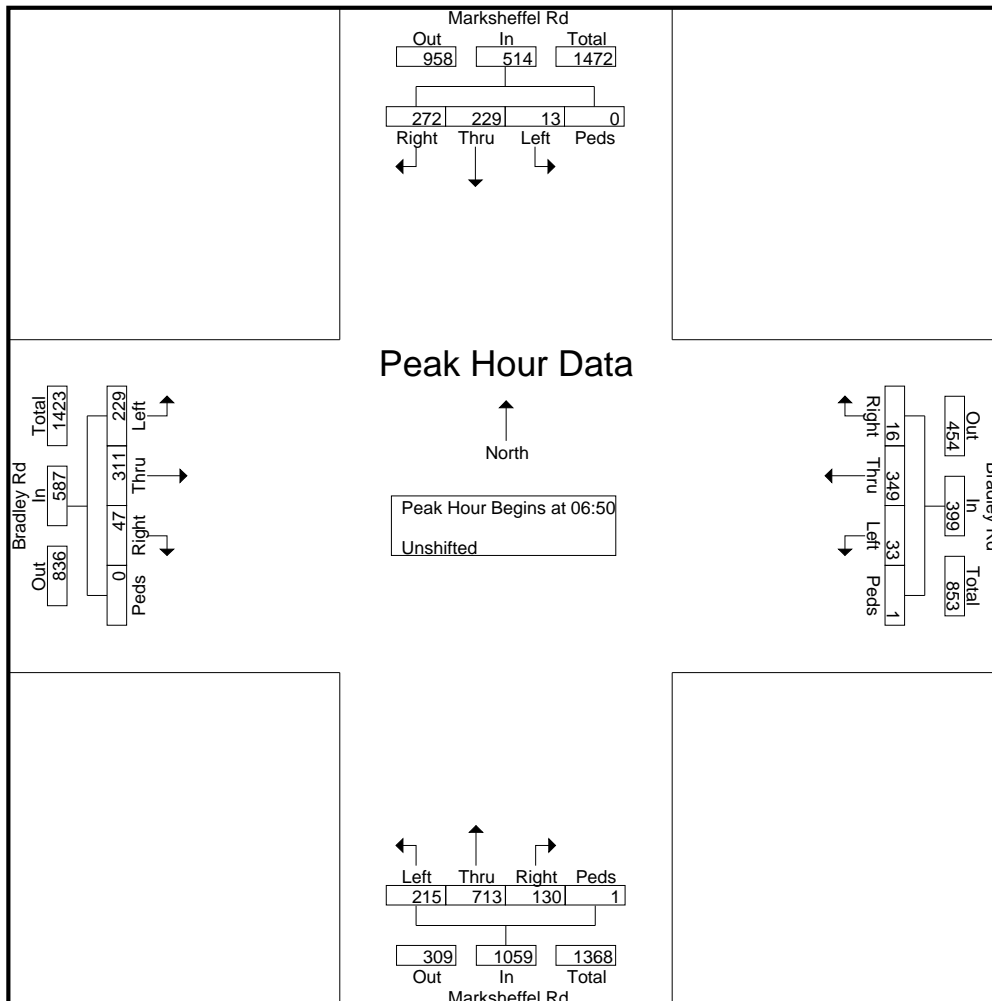
File Name : Marksheffel Rd -Bradley Rd AM

Site Code : S234150

Start Date : 3/21/2023

Page No : 2

Start Time	Marksheffel Rd Southbound					Bradley Rd Westbound					Marksheffel Rd Northbound					Bradley Rd Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 06:30 to 08:25 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 06:50																					
06:50	24	23	1	0	48	0	22	2	0	24	8	43	18	0	69	6	14	20	0	40	181
06:55	20	12	2	0	34	2	36	3	0	41	6	44	13	0	63	4	27	11	0	42	180
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07:10	25	23	1	0	49	1	27	5	0	33	16	70	19	0	105	2	31	22	0	55	242
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07:30	26	18	0	0	44	2	19	0	0	21	11	63	29	1	104	5	29	17	0	51	220
07:35	28	19	0	0	47	0	29	1	0	30	16	65	14	0	95	2	29	17	0	48	220
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07:45	20	12	0	0	32	1	23	3	1	28	8	60	13	0	81	2	23	22	0	47	188
Total Volume	272	229	13	0	514	16	349	33	1	399	130	713	215	1	1059	47	311	229	0	587	2559
% App. Total	52.9	44.6	2.5	0		4	87.5	8.3	0.3		12.3	67.3	20.3	0.1		8	53	39	0		
PHF	.782	.658	.361	.000	.779	.333	.692	.550	.083	.707	.677	.814	.618	.083	.825	.435	.836	.658	.000	.753	.881



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File Name : Marksheffel Rd - Bradley Rd PM 3-23

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	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
16:00	12	50	2	0	64	0	25	8	0	33	2	31	6	0	39	5	19	27	0	51	187
16:05	13	53	0	0	66	2	13	5	0	20	3	36	11	0	50	11	19	22	0	52	188
16:10	22	53	0	0	75	2	18	7	0	27	5	31	7	0	43	6	17	29	0	52	197
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16:40	16	34	0	0	50	2	24	10	0	36	4	27	7	0	38	14	39	46	0	99	223
16:45	20	53	0	0	73	1	25	10	0	36	4	20	2	0	26	10	24	38	0	72	207
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16:55	17	41	2	0	60	1	23	9	0	33	1	27	2	0	30	5	33	46	0	84	207
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17:00	17	61	0	0	78	1	23	5	0	29	4	25	3	0	32	4	16	19	0	39	178
17:05	16	39	1	0	56	1	21	6	0	28	3	23	8	0	34	10	27	38	0	75	193
17:10	20	48	0	0	68	6	8	8	0	22	2	38	7	0	47	6	30	39	0	75	212
17:15	32	48	2	0	82	0	14	7	0	21	8	27	6	0	41	7	30	36	0	73	217
17:20	16	59	6	0	81	0	17	5	0	22	1	33	10	0	44	10	20	37	0	67	214
17:25	19	43	0	0	62	1	9	3	0	13	5	25	6	0	36	5	21	33	0	59	170
17:30	16	38	3	0	57	2	14	0	0	16	1	26	7	0	34	10	22	26	0	58	165
17:35	9	43	0	0	52	2	10	4	0	16	3	30	8	0	41	9	22	35	0	66	175
17:40	19	44	3	0	66	1	7	2	0	10	4	27	6	0	37	12	22	21	0	55	168
17:45	15	44	0	0	59	1	21	4	0	26	5	23	2	0	30	4	18	37	0	59	174
17:50	19	44	2	0	65	0	14	2	0	16	3	27	4	0	34	10	20	18	0	48	163
17:55	8	30	0	0	38	1	10	3	0	14	2	28	4	0	34	10	14	17	0	41	127
Total	206	541	17	0	764	16	168	49	0	233	41	332	71	0	444	97	262	356	0	715	2156
Grand Total	424	1133	32	0	1589	39	448	158	0	645	90	690	148	2	930	219	566	780	1	1566	4730
Apprch %	26.7	71.3	2	0		6	69.5	24.5	0		9.7	74.2	15.9	0.2		14	36.1	49.8	0.1		
Total %	9	24	0.7	0	33.6	0.8	9.5	3.3	0	13.6	1.9	14.6	3.1	0	19.7	4.6	12	16.5	0	33.1	

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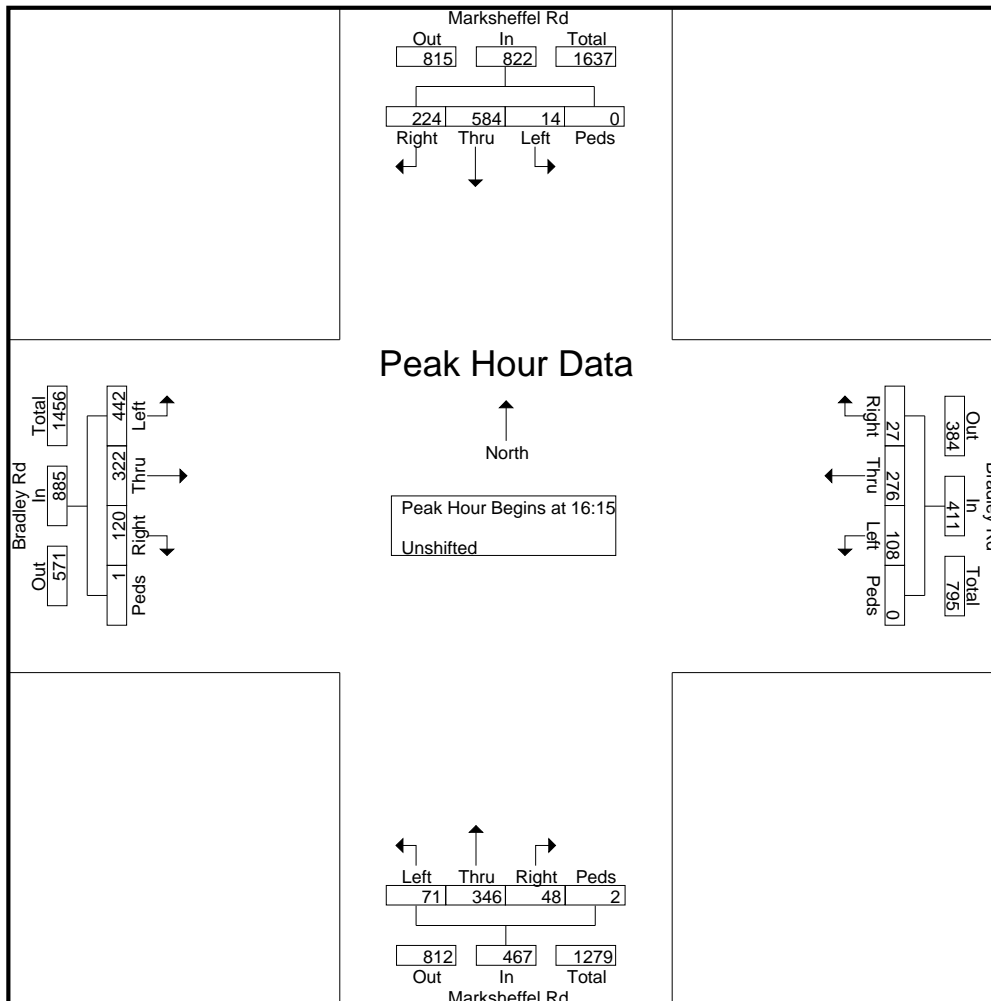
File Name : Marksheffel Rd - Bradley Rd PM 3-23

Site Code : S234150

Start Date : 3/21/2023

Page No : 2

Start Time	Marksheffel Rd Southbound					Bradley Rd Westbound					Marksheffel Rd Northbound					Bradley Rd Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 16:00 to 17:55 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 16:15																					
16:15	23	55	2	0	80	4	31	9	0	44	6	28	6	1	41	5	29	39	0	73	238
16:20	28	48	3	0	79	2	28	8	0	38	2	29	11	0	42	14	24	34	0	72	231
16:25	12	38	3	0	53	1	40	8	0	49	8	32	7	0	47	12	32	37	0	81	230
16:30	20	53	2	0	75	1	16	11	0	28	5	34	8	0	47	12	32	38	0	82	232
16:35	19	66	0	0	85	2	25	15	0	42	2	36	4	1	43	14	17	40	0	71	241
16:40	16	34	0	0	50	2	24	10	0	36	4	27	7	0	38	14	39	46	0	99	223
16:45	20	53	0	0	73	1	25	10	0	36	4	20	2	0	26	10	24	38	0	72	207
16:50	16	48	1	0	65	5	12	9	0	26	7	27	6	0	40	14	19	28	1	62	193
16:55	17	41	2	0	60	1	23	9	0	33	1	27	2	0	30	5	33	46	0	84	207
17:00	17	61	0	0	78	1	23	5	0	29	4	25	3	0	32	4	16	19	0	39	178
17:05	16	39	1	0	56	1	21	6	0	28	3	23	8	0	34	10	27	38	0	75	193
17:10	20	48	0	0	68	6	8	8	0	22	2	38	7	0	47	6	30	39	0	75	212
Total Volume	224	584	14	0	822	27	276	108	0	411	48	346	71	2	467	120	322	442	1	885	2585
% App. Total	27.3	71	1.7	0		6.6	67.2	26.3	0		10.3	74.1	15.2	0.4		13.6	36.4	49.9	0.1		
PHF	.667	.737	.389	.000	.806	.375	.575	.600	.000	.699	.500	.759	.538	.167	.828	.714	.688	.801	.083	.745	.894



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File Name : Legacy Hill Dr - Bradley Rd AM SW
 Site Code : S214630
 Start Date : 2/8/2023
 Page No : 1

Groups Printed- Unshifted

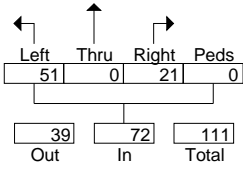
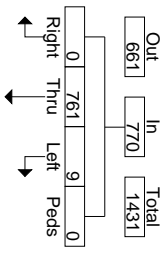
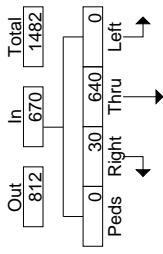
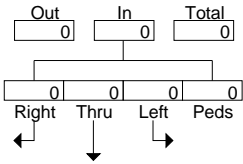
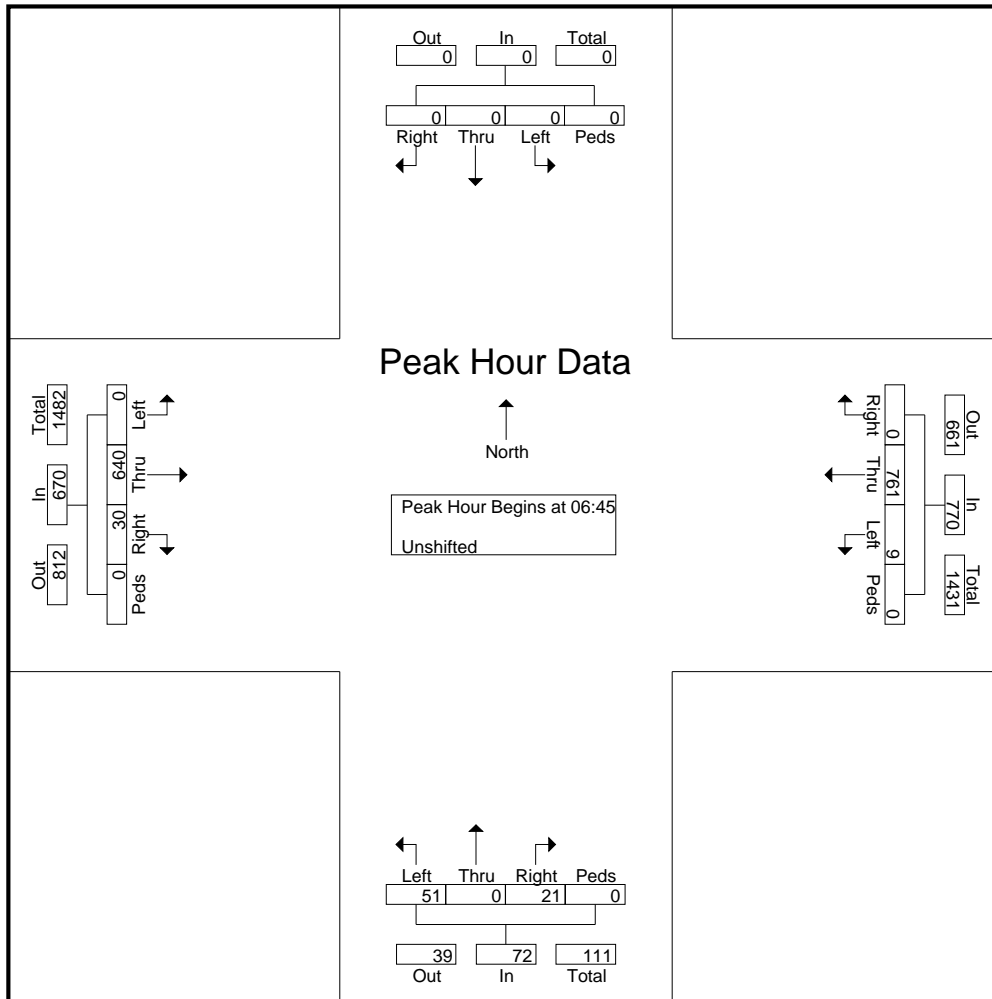
Start Time	Southbound					Westbound					Northbound					Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
06:30	0	0	0	0	0	0	143	5	0	148	5	0	12	0	17	11	131	0	0	142	307
06:45	0	0	0	0	0	0	190	2	0	192	5	0	11	0	16	2	146	0	0	148	356
Total	0	0	0	0	0	0	333	7	0	340	10	0	23	0	33	13	277	0	0	290	663
07:00	0	0	0	0	0	0	185	2	0	187	6	0	10	0	16	8	167	0	0	175	378
07:15	0	0	0	0	0	0	207	4	0	211	4	0	15	0	19	10	154	0	0	164	394
07:30	0	0	0	0	0	0	179	1	0	180	6	0	15	0	21	10	173	0	0	183	384
07:45	0	0	0	0	0	0	155	8	0	163	5	0	8	0	13	9	132	0	1	142	318
Total	0	0	0	0	0	0	726	15	0	741	21	0	48	0	69	37	626	0	1	664	1474
08:00	0	0	0	0	0	0	172	7	0	179	4	0	9	0	13	15	95	0	0	110	302
08:15	0	0	0	0	0	0	150	6	1	157	4	0	12	0	16	16	109	0	0	125	298
Grand Total	0	0	0	0	0	0	1381	35	1	1417	39	0	92	0	131	81	1107	0	1	1189	2737
Apprch %	0	0	0	0	0	0	97.5	2.5	0.1		29.8	0	70.2	0		6.8	93.1	0	0.1		
Total %	0	0	0	0	0	0	50.5	1.3	0	51.8	1.4	0	3.4	0	4.8	3	40.4	0	0	43.4	

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File Name : Legacy Hill Dr - Bradley Rd AM SW
 Site Code : S214630
 Start Date : 2/8/2023
 Page No : 2

Start Time	Southbound					Westbound					Northbound					Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 6:30:00 AM to 8:15:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 6:45:00 AM																					
6:45:00 AM	0	0	0	0	0	0	190	2	0	192	5	0	11	0	16	2	146	0	0	148	356
7:00:00 AM	0	0	0	0	0	0	185	2	0	187	6	0	10	0	16	8	167	0	0	175	378
7:15:00 AM	0	0	0	0	0	0	207	4	0	211	4	0	15	0	19	10	154	0	0	164	394
7:30:00 AM	0	0	0	0	0	0	179	1	0	180	6	0	15	0	21	10	173	0	0	183	384
Total Volume	0	0	0	0	0	0	761	9	0	770	21	0	51	0	72	30	640	0	0	670	1512
% App. Total	0	0	0	0	0	0	98.8	1.2	0		29.2	0	70.8	0		4.5	95.5	0	0		
PHF	.000	.000	.000	.000	.000	.000	.919	.563	.000	.912	.875	.000	.850	.000	.857	.750	.925	.000	.000	.915	.959



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2504 E. Pikes Peak Ave, Suite 304
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File Name : Legacy Hill Dr - Bradley Rd Mid SW
 Site Code : S214630
 Start Date : 2/8/2023
 Page No : 1

Groups Printed- Unshifted

Start Time	Southbound					Bradley Rd Westbound					Legacy Hill Dr Northbound					Bradley Rd Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
11:30	0	0	0	0	0	0	59	3	0	62	5	0	10	0	15	12	71	0	0	83	160
11:45	0	0	0	0	0	0	50	1	0	51	8	0	9	0	17	10	69	0	0	79	147
Total	0	0	0	0	0	0	109	4	0	113	13	0	19	0	32	22	140	0	0	162	307
12:00	0	0	0	0	0	0	80	8	0	88	3	0	9	0	12	6	53	0	1	60	160
12:15	0	0	0	0	0	0	66	2	1	69	4	0	14	0	18	9	78	0	0	87	174
12:30	0	0	0	0	0	0	66	0	0	66	1	0	6	0	7	13	63	0	0	76	149
12:45	0	0	0	0	0	0	58	2	0	60	3	0	9	0	12	12	59	0	0	71	143
Total	0	0	0	0	0	0	270	12	1	283	11	0	38	0	49	40	253	0	1	294	626
13:00	0	0	0	0	0	0	54	3	0	57	3	0	9	0	12	2	65	0	0	67	136
13:15	0	0	0	0	0	0	66	3	0	69	2	0	7	0	9	13	88	0	0	101	179
13:30	0	0	0	0	0	0	49	4	0	53	2	0	9	0	11	11	61	0	0	72	136
13:45	0	0	0	0	0	0	59	9	0	68	2	0	8	0	10	11	92	0	0	103	181
Total	0	0	0	0	0	0	228	19	0	247	9	0	33	0	42	37	306	0	0	343	632
14:00	0	0	0	0	0	0	86	4	0	90	6	0	6	0	12	22	70	0	0	92	194
14:15	0	0	0	0	0	0	110	2	0	112	5	0	7	0	12	9	87	0	0	96	220
Grand Total	0	0	0	0	0	0	803	41	1	845	44	0	103	0	147	130	856	0	1	987	1979
Apprch %	0	0	0	0	0	0	95	4.9	0.1		29.9	0	70.1	0		13.2	86.7	0	0.1		
Total %	0	0	0	0	0	0	40.6	2.1	0.1	42.7	2.2	0	5.2	0	7.4	6.6	43.3	0	0.1	49.9	

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2504 E. Pikes Peak Ave, Suite 304
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File Name : Legacy Hill Dr - Bradley Rd PM SW
 Site Code : S214630
 Start Date : 2/8/2023
 Page No : 1

Groups Printed- Unshifted

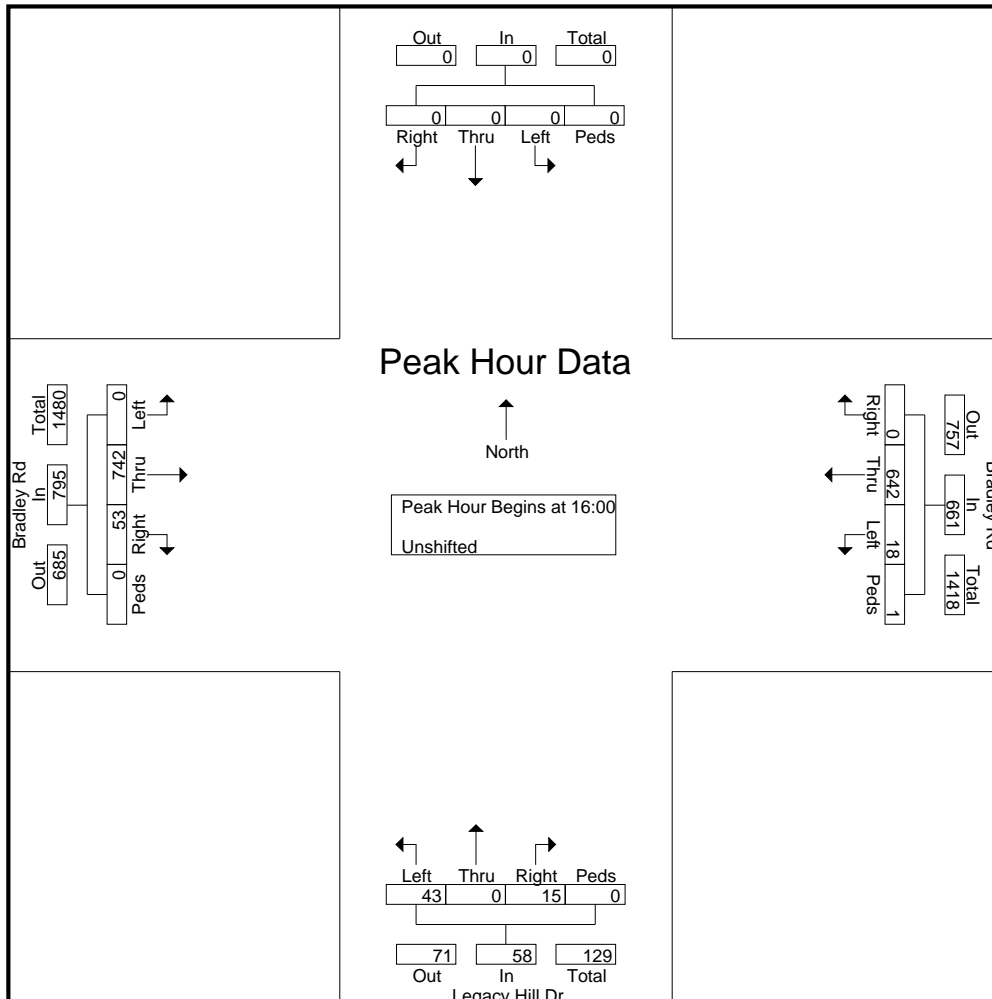
Start Time	Southbound					Bradley Rd Westbound					Legacy Hill Dr Northbound					Bradley Rd Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
15:00	0	0	0	0	0	0	117	3	0	120	7	0	14	0	21	10	121	0	0	131	272
15:15	0	0	0	0	0	0	134	4	0	138	5	0	17	0	22	7	116	0	0	123	283
15:30	0	0	0	0	0	0	123	4	0	127	4	0	4	0	8	15	150	0	1	166	301
15:45	0	0	0	0	0	0	137	5	0	142	4	0	13	0	17	7	178	0	0	185	344
Total	0	0	0	0	0	0	511	16	0	527	20	0	48	0	68	39	565	0	1	605	1200
16:00	0	0	0	0	0	0	157	4	0	161	5	0	13	0	18	9	195	0	0	204	383
16:15	0	0	0	0	0	0	160	4	0	164	3	0	5	0	8	17	193	0	0	210	382
16:30	0	0	0	0	0	0	174	7	1	182	3	0	10	0	13	19	172	0	0	191	386
16:45	0	0	0	0	0	0	151	3	0	154	4	0	15	0	19	8	182	0	0	190	363
Total	0	0	0	0	0	0	642	18	1	661	15	0	43	0	58	53	742	0	0	795	1514
17:00	0	0	0	0	0	0	110	2	1	113	3	0	21	0	24	17	170	0	0	187	324
17:15	0	0	0	0	0	0	119	3	0	122	0	0	10	0	10	13	171	0	0	184	316
17:30	0	0	0	0	0	0	121	2	0	123	5	0	9	0	14	16	145	0	0	161	298
17:45	0	0	0	0	0	0	89	4	0	93	0	0	6	0	6	3	146	0	1	150	249
Total	0	0	0	0	0	0	439	11	1	451	8	0	46	0	54	49	632	0	1	682	1187
Grand Total	0	0	0	0	0	0	1592	45	2	1639	43	0	137	0	180	141	1939	0	2	2082	3901
Apprch %	0	0	0	0	0	0	97.1	2.7	0.1	42	23.9	0	76.1	0	4.6	6.8	93.1	0	0.1	53.4	
Total %	0	0	0	0	0	0	40.8	1.2	0.1	42	1.1	0	3.5	0	4.6	3.6	49.7	0	0.1	53.4	

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2504 E. Pikes Peak Ave, Suite 304
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File Name : Legacy Hill Dr - Bradley Rd PM SW
 Site Code : S214630
 Start Date : 2/8/2023
 Page No : 2

Start Time	Southbound					Bradley Rd Westbound					Legacy Hill Dr Northbound					Bradley Rd Eastbound					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 3:00:00 PM to 5:45:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 4:00:00 PM																					
4:00:00 PM	0	0	0	0	0	0	157	4	0	161	5	0	13	0	18	9	195	0	0	204	383
4:15:00 PM	0	0	0	0	0	0	160	4	0	164	3	0	5	0	8	17	193	0	0	210	382
4:30:00 PM	0	0	0	0	0	0	174	7	1	182	3	0	10	0	13	19	172	0	0	191	386
4:45:00 PM	0	0	0	0	0	0	151	3	0	154	4	0	15	0	19	8	182	0	0	190	363
Total Volume	0	0	0	0	0	0	642	18	1	661	15	0	43	0	58	53	742	0	0	795	1514
% App. Total	0	0	0	0	0	0	97.1	2.7	0.2		25.9	0	74.1	0		6.7	93.3	0	0		
PHF	.000	.000	.000	.000	.000	.000	.922	.643	.250	.908	.750	.000	.717	.000	.763	.697	.951	.000	.000	.946	.981



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2504 E Pikes Peak Ave, Suite 304
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File Name : Powers Blvd - Bradley Rd AM
 Site Code : S214180
 Start Date : 3/16/2021
 Page No : 1

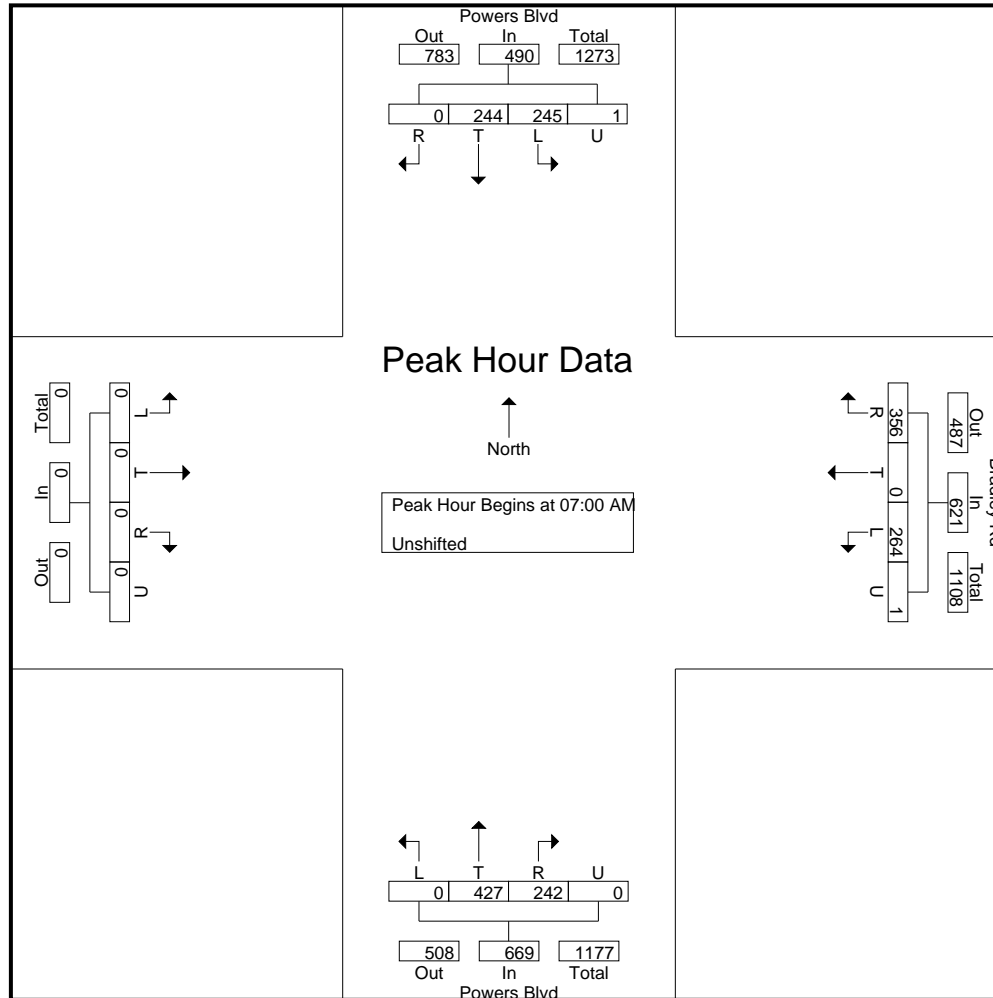
Groups Printed- Unshifted

Start Time	Powers Blvd Southbound					Bradley Rd Westbound					Powers Blvd Northbound					Eastbound					Int. Total
	L	T	R	U	App. Total	L	T	R	U	App. Total	L	T	R	U	App. Total	L	T	R	U	App. Total	
07:00 AM	65	72	0	0	137	62	0	89	0	151	0	117	67	0	184	0	0	0	0	0	472
07:15 AM	60	45	0	1	106	71	0	99	0	170	0	115	58	0	173	0	0	0	0	0	449
07:30 AM	64	60	0	0	124	64	0	89	1	154	0	101	70	0	171	0	0	0	0	0	449
07:45 AM	56	67	0	0	123	67	0	79	0	146	0	94	47	0	141	0	0	0	0	0	410
Total	245	244	0	1	490	264	0	356	1	621	0	427	242	0	669	0	0	0	0	0	1780
08:00 AM	55	57	0	0	112	92	0	53	0	145	0	104	57	0	161	0	0	0	0	0	418
08:15 AM	60	67	0	0	127	74	0	46	2	122	0	97	55	0	152	0	0	0	0	0	401
08:30 AM	62	59	0	1	122	67	0	55	0	122	0	71	56	0	127	0	0	0	0	0	371
08:45 AM	59	74	0	0	133	48	0	48	0	96	0	63	38	1	102	0	0	0	0	0	331
Total	236	257	0	1	494	281	0	202	2	485	0	335	206	1	542	0	0	0	0	0	1521
Grand Total	481	501	0	2	984	545	0	558	3	1106	0	762	448	1	1211	0	0	0	0	0	3301
Apprch %	48.9	50.9	0	0.2		49.3	0	50.5	0.3		0	62.9	37	0.1		0	0	0	0		
Total %	14.6	15.2	0	0.1	29.8	16.5	0	16.9	0.1	33.5	0	23.1	13.6	0	36.7	0	0	0	0	0	

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2504 E Pikes Peak Ave, Suite 304
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File Name : Powers Blvd - Bradley Rd AM
 Site Code : S214180
 Start Date : 3/16/2021
 Page No : 3



LSC Transportation Consultants, Inc.

2504 E Pikes Peak Ave, Suite 304
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 719-633-2868

File Name : Powers Blvd - Bradley Rd PM
 Site Code : S214180
 Start Date : 3/16/2021
 Page No : 1

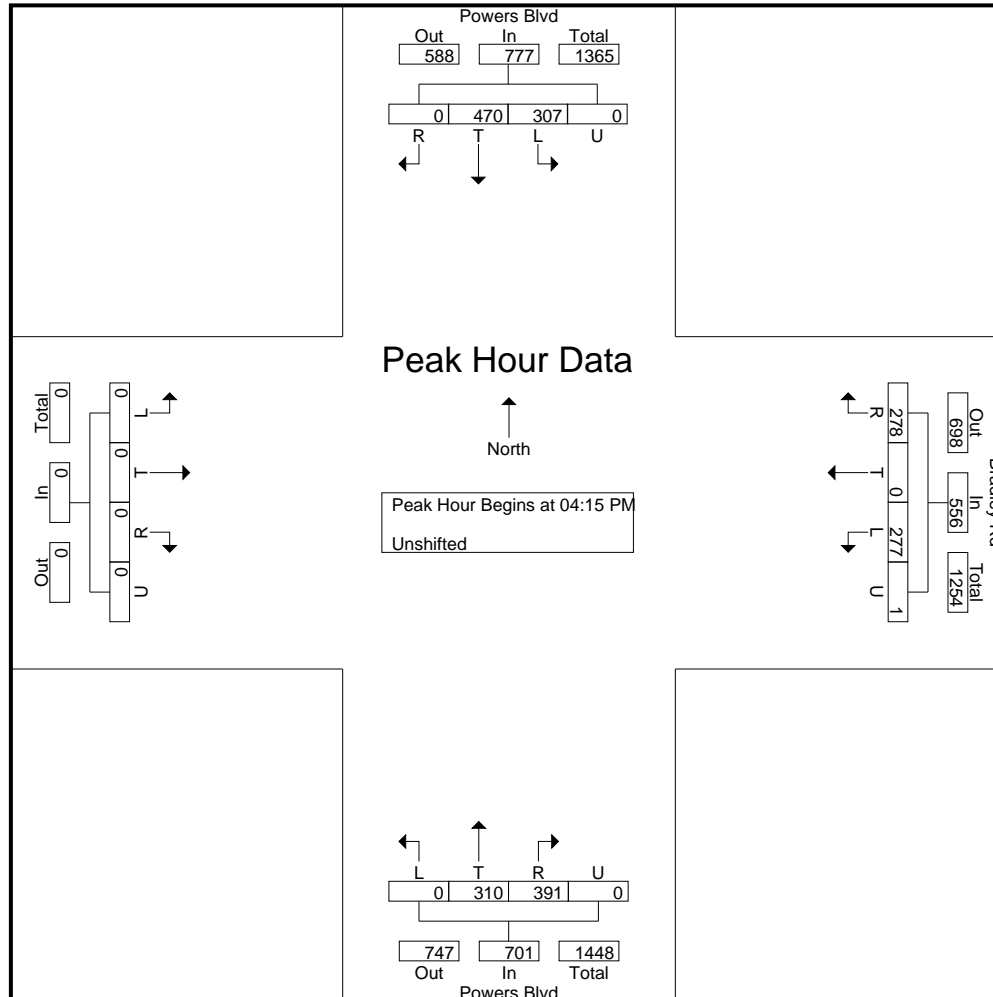
Groups Printed- Unshifted

Start Time	Powers Blvd Southbound					Bradley Rd Westbound					Powers Blvd Northbound					Eastbound					Int. Total
	L	T	R	U	App. Total	L	T	R	U	App. Total	L	T	R	U	App. Total	L	T	R	U	App. Total	
04:00 PM	72	109	0	0	181	54	0	75	0	129	0	72	75	0	147	0	0	0	0	0	457
04:15 PM	68	105	0	0	173	74	0	82	0	156	0	85	102	0	187	0	0	0	0	0	516
04:30 PM	87	110	0	0	197	72	0	73	1	146	0	78	111	0	189	0	0	0	0	0	532
04:45 PM	69	128	0	0	197	71	0	60	0	131	0	73	100	0	173	0	0	0	0	0	501
Total	296	452	0	0	748	271	0	290	1	562	0	308	388	0	696	0	0	0	0	0	2006
05:00 PM	83	127	0	0	210	60	0	63	0	123	0	74	78	0	152	0	0	0	0	0	485
05:15 PM	75	110	0	0	185	58	0	45	0	103	0	76	102	0	178	0	0	0	0	0	466
05:30 PM	61	111	0	0	172	55	0	49	0	104	0	69	106	0	175	0	0	0	0	0	451
05:45 PM	59	97	0	0	156	52	0	44	0	96	0	86	73	0	159	0	0	0	0	0	411
Total	278	445	0	0	723	225	0	201	0	426	0	305	359	0	664	0	0	0	0	0	1813
Grand Total	574	897	0	0	1471	496	0	491	1	988	0	613	747	0	1360	0	0	0	0	0	3819
Apprch %	39	61	0	0		50.2	0	49.7	0.1		0	45.1	54.9	0		0	0	0	0		
Total %	15	23.5	0	0	38.5	13	0	12.9	0	25.9	0	16.1	19.6	0	35.6	0	0	0	0	0	

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2504 E Pikes Peak Ave, Suite 304
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 719-633-2868

File Name : Powers Blvd - Bradley Rd PM
 Site Code : S214180
 Start Date : 3/16/2021
 Page No : 3



Levels of Service



Timings
1: Powers Blvd & Bradley Rd.

Existing Traffic
AM Peak Hour

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖↖	↖	↖↖	↖	↖	↖↖
Traffic Volume (vph)	346	466	427	349	321	244
Future Volume (vph)	346	466	427	349	321	244
Turn Type	Prot	Free	NA	Free	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		Free		Free	6	
Detector Phase	8		2		1	6
Switch Phase						
Minimum Initial (s)	4.0		4.0		4.0	4.0
Minimum Split (s)	9.0		9.0		9.0	9.0
Total Split (s)	20.0		60.0		20.0	80.0
Total Split (%)	20.0%		60.0%		20.0%	80.0%
Yellow Time (s)	3.0		3.0		3.0	3.0
All-Red Time (s)	2.0		2.0		2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.0		5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None		None		None	None
Act Effct Green (s)	10.9	50.3	12.4	50.3	29.2	29.2
Actuated g/C Ratio	0.22	1.00	0.25	1.00	0.58	0.58
v/c Ratio	0.51	0.32	0.54	0.24	0.58	0.13
Control Delay	20.9	0.5	19.6	0.4	9.9	5.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.9	0.5	19.6	0.4	9.9	5.1
LOS	C	A	B	A	A	A
Approach Delay	9.2		11.0			7.8
Approach LOS	A		B			A

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 50.3
 Natural Cycle: 40
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.58
 Intersection Signal Delay: 9.5
 Intersection LOS: A
 Intersection Capacity Utilization 52.0%
 ICU Level of Service A
 Analysis Period (min) 15

Splits and Phases: 1: Powers Blvd & Bradley Rd.



Timings
101: Marksheffel Rd & Bradley Rd

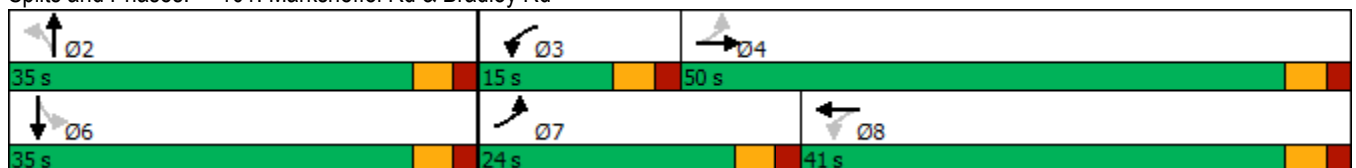
Existing Traffic
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	229	311	47	33	349	16	215	713	130	13	229	272
Future Volume (vph)	229	311	47	33	349	16	215	713	130	13	229	272
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		Free	8		Free	2		Free	6		Free
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	4.0		5.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	11.0	21.0		10.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	24.0	50.0		15.0	41.0		35.0	35.0		35.0	35.0	
Total Split (%)	24.0%	50.0%		15.0%	41.0%		35.0%	35.0%		35.0%	35.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	32.5	28.0	72.8	19.5	13.2	72.8	30.2	30.2	72.8	30.2	30.2	72.8
Actuated g/C Ratio	0.45	0.38	1.00	0.27	0.18	1.00	0.41	0.41	1.00	0.41	0.41	1.00
v/c Ratio	0.50	0.25	0.03	0.11	0.63	0.01	0.51	0.53	0.09	0.07	0.17	0.19
Control Delay	16.3	16.9	0.0	13.0	32.6	0.0	22.4	18.7	0.1	16.8	15.0	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.3	16.9	0.0	13.0	32.6	0.0	22.4	18.7	0.1	16.8	15.0	0.3
LOS	B	B	A	B	C	A	C	B	A	B	B	A
Approach Delay		15.3			29.7			17.2			7.2	
Approach LOS		B			C			B			A	

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 72.8
 Natural Cycle: 60
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.63
 Intersection Signal Delay: 16.8
 Intersection LOS: B
 Intersection Capacity Utilization 62.0%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 101: Marksheffel Rd & Bradley Rd



Timings
1: Powers Blvd & Bradley Rd.

Existing Traffic
PM Peak Hour

	↙	↖	↑	↗	↘	↓
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖↗	↖	↖↗	↖	↖	↖↗
Traffic Volume (vph)	292	393	310	469	326	470
Future Volume (vph)	292	393	310	469	326	470
Turn Type	Prot	Free	NA	Free	pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases		Free		Free	6	
Detector Phase	8		2		1	6
Switch Phase						
Minimum Initial (s)	4.0		4.0		4.0	4.0
Minimum Split (s)	9.0		9.0		9.0	9.0
Total Split (s)	30.0		37.0		33.0	70.0
Total Split (%)	30.0%		37.0%		33.0%	70.0%
Yellow Time (s)	3.0		3.0		3.0	3.0
All-Red Time (s)	2.0		2.0		2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.0		5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None		None		None	None
Act Effct Green (s)	10.2	47.3	10.3	47.3	26.9	26.9
Actuated g/C Ratio	0.22	1.00	0.22	1.00	0.57	0.57
v/c Ratio	0.43	0.27	0.43	0.32	0.54	0.25
Control Delay	19.0	0.4	18.8	0.5	9.0	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.0	0.4	18.8	0.5	9.0	5.6
LOS	B	A	B	A	A	A
Approach Delay	8.3		7.8			7.0
Approach LOS	A		A			A

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 47.3
 Natural Cycle: 40
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.54
 Intersection Signal Delay: 7.7
 Intersection Capacity Utilization 47.5%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service A

Splits and Phases: 1: Powers Blvd & Bradley Rd.



Timings
101: Marksheffel Rd & Bradley Rd

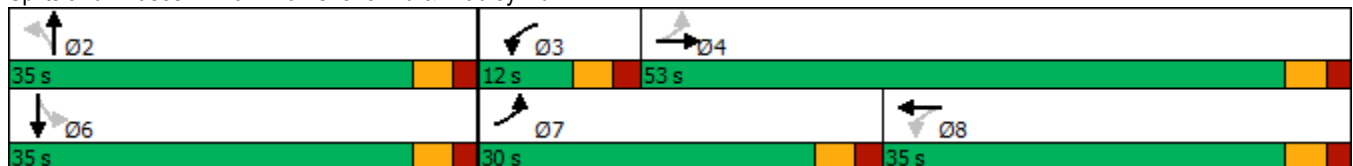
Existing Traffic
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	442	322	120	108	276	27	71	346	48	14	584	224
Future Volume (vph)	442	322	120	108	276	27	71	346	48	14	584	224
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	Perm	NA	Free	Perm	NA	Free
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		Free	8		Free	2		Free	6		Free
Detector Phase	7	4		3	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	4.0		5.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	10.0	21.0		10.0	21.0		21.0	21.0		21.0	21.0	
Total Split (s)	30.0	53.0		12.0	35.0		35.0	35.0		35.0	35.0	
Total Split (%)	30.0%	53.0%		12.0%	35.0%		35.0%	35.0%		35.0%	35.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	40.3	28.4	80.6	20.0	13.1	80.6	30.2	30.2	80.6	30.2	30.2	80.6
Actuated g/C Ratio	0.50	0.35	1.00	0.25	0.16	1.00	0.37	0.37	1.00	0.37	0.37	1.00
v/c Ratio	0.78	0.28	0.08	0.44	0.62	0.02	0.33	0.29	0.03	0.04	0.45	0.15
Control Delay	23.9	19.0	0.1	18.5	36.8	0.0	25.2	19.6	0.0	19.1	21.4	0.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.9	19.0	0.1	18.5	36.8	0.0	25.2	19.6	0.0	19.1	21.4	0.2
LOS	C	B	A	B	D	A	C	B	A	B	C	A
Approach Delay		18.9			29.6			18.4			15.6	
Approach LOS		B			C			B			B	

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 80.6
 Natural Cycle: 60
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.78
 Intersection Signal Delay: 19.8
 Intersection Capacity Utilization 68.9%
 Analysis Period (min) 15
 Intersection LOS: B
 ICU Level of Service C

Splits and Phases: 101: Marksheffel Rd & Bradley Rd



Lanes, Volumes, Timings
3: Curtis Rd & Hwy 94

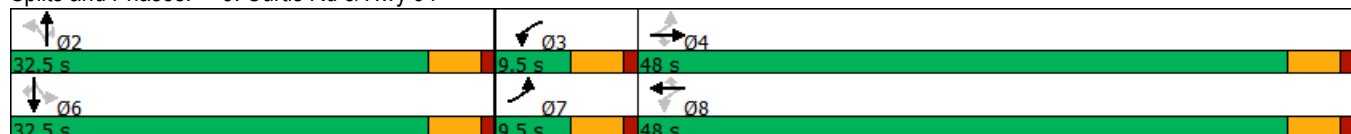
Existing
AM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	665	309	56	342	14	40	15	19	265	219	26
Future Volume (vph)	3	665	309	56	342	14	40	15	19	265	219	26
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.484			0.091			0.487			0.747		
Satd. Flow (perm)	902	1863	1583	170	1863	1583	907	1863	1583	1391	1863	1583
Satd. Flow (RTOR)			364			73			73			73
Peak Hour Factor	0.85	0.85	0.85	0.85	0.90	0.85	0.85	0.94	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	4	782	364	66	380	16	47	16	22	312	258	31
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Total Split (s)	9.5	48.0	48.0	9.5	48.0	48.0	32.5	32.5	32.5	32.5	32.5	32.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	42.9	39.1	39.1	45.4	44.5	44.5	28.5	28.5	28.5	28.5	28.5	28.5
Actuated g/C Ratio	0.51	0.47	0.47	0.54	0.53	0.53	0.34	0.34	0.34	0.34	0.34	0.34
v/c Ratio	0.01	0.90	0.39	0.35	0.39	0.02	0.15	0.03	0.04	0.66	0.41	0.05
Control Delay	7.7	36.3	2.9	13.3	13.1	0.1	24.2	21.8	0.1	34.4	26.1	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.7	36.3	2.9	13.3	13.1	0.1	24.2	21.8	0.1	34.4	26.1	0.5
LOS	A	D	A	B	B	A	C	C	A	C	C	A
Approach Delay		25.6			12.7			17.5			29.1	
Approach LOS		C			B			B			C	

Intersection Summary

Cycle Length: 90	
Actuated Cycle Length: 84	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 23.6	Intersection LOS: C
Intersection Capacity Utilization 73.0%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 3: Curtis Rd & Hwy 94



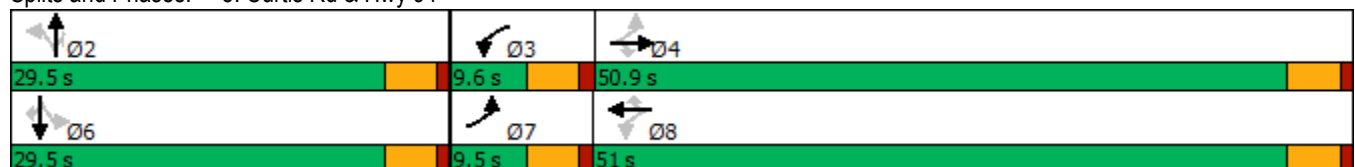
Lanes, Volumes, Timings
3: Curtis Rd & Hwy 94

Existing
PM Peak Hour

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	34	286	33	26	646	252	240	144	46	10	12	14
Future Volume (vph)	34	286	33	26	646	252	240	144	46	10	12	14
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.110			0.503			0.748			0.625		
Satd. Flow (perm)	205	1863	1583	937	1863	1583	1393	1863	1583	1164	1863	1583
Satd. Flow (RTOR)			73			268			73			73
Peak Hour Factor	0.85	0.92	0.85	0.85	0.85	0.94	0.85	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)												
Lane Group Flow (vph)	40	311	39	31	760	268	282	169	54	12	14	16
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2				6
Permitted Phases	4		4	8		8	2		2	6		6
Total Split (s)	9.5	50.9	50.9	9.6	51.0	51.0	29.5	29.5	29.5	29.5	29.5	29.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effect Green (s)	39.5	36.9	36.9	39.6	36.9	36.9	26.0	26.0	26.0	26.0	26.0	26.0
Actuated g/C Ratio	0.51	0.48	0.48	0.51	0.48	0.48	0.34	0.34	0.34	0.34	0.34	0.34
v/c Ratio	0.19	0.35	0.05	0.06	0.85	0.30	0.60	0.27	0.09	0.03	0.02	0.03
Control Delay	9.1	13.9	1.0	7.2	28.6	2.5	32.5	24.5	4.4	24.0	23.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	9.1	13.9	1.0	7.2	28.6	2.5	32.5	24.5	4.4	24.0	23.7	0.1
LOS	A	B	A	A	C	A	C	C	A	C	C	A
Approach Delay		12.1			21.4			26.8			14.8	
Approach LOS		B			C			C			B	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 77.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 20.8	Intersection LOS: C
Intersection Capacity Utilization 62.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Curtis Rd & Hwy 94



Appendix Table 1



**Appendix Table 1
Internal & Passby Trip Calculation
Karman Line**

Land Use	Trip Generation Units		Raw ITE Trip Generation ⁽¹⁾ (Individual Driveway Trips)					Percent Internal Trips ⁽²⁾					Total Internal Trips					Total External Trips					Percent Passby Trips ⁽³⁾	Total Passby Trips						
			Quantity	Unit	Daily	AM		PM		Daily	AM		PM		Daily	AM		PM		Daily	AM			PM		Daily	AM		PM	
						In	Out	In	Out		In	Out	In	Out		In	Out	In	Out		In	Out		In	Out		In	Out		
Residential Uses																														
Single-Family Detached Housing	3,396	DU ⁽⁴⁾	32,025	595	1,781	2,012	1,180	5%	11%	12%	5%	4%	1,761	67	221	93	53	30,264	528	1,560	1,919	1,127	0%	0	0	0	0	0	0	
Multifamily Housing (Low-Rise)	3,104	DU	20,921	299	943	999	584	6%	11%	12%	5%	4%	1,151	34	117	46	26	19,770	265	826	953	558	0%	0	0	0	0	0	0	
6,500 DU			52,946	894	2,724	3,011	1,764						2,912	101	338	139	79	50,034	793	2,386	2,872	1,685		0	0	0	0	0		
Non-Residential Uses																														
Shopping Center (>150 KSF)	754	KSF ⁽⁵⁾	27,906	394	239	1,229	1,335	3%	2%	2%	4%	4%	837	8	5	49	53	27,069	386	234	1,180	1,282	34%	9,203	105	105	419	419		
General Light Industrial	338	KSF	1,646	220	30	31	189	3%	2%	2%	4%	4%	49	4	1	1	8	1,597	216	29	30	181	0%	0	0	0	0	0		
Elementary School	600	Students	1,362	240	204	44	52	75%	75%	25%	25%	75%	1,022	180	51	11	39	340	60	153	33	13	0%	0	0	0	0	0		
Middle School	500	Students	1,050	181	154	36	39	75%	75%	25%	25%	75%	788	136	39	9	29	262	45	115	27	10	0%	0	0	0	0	0		
Community Center	10	KSF	288	13	6	12	13	75%	75%	75%	75%	75%	216	10	5	9	10	72	3	1	3	3	0%	0	0	0	0	0		
Non-Residential Total			32,252	1,048	633	1,352	1,628						2,912	338	101	79	139	29,340	710	532	1,273	1,489		9,203	105	105	419	419		
Graand Total			85,198	1,942	3,357	4,363	3,392						5,824	439	439	218	218	79,374	1,503	2,918	4,145	3,174		9,203	105	105	419	419		

Notes:
(1) See Table 2
(2) Estimates by LSC based on the NCHRP 684 Internal Trip Capture Estimation Tool, the number of residential dwelling units, and the number of students
(3) 34% of the external retail trips were assumed to be pass-by trips based on the percentages shown for Land Use No. 820 - Shopping Center in Table E.9 of the *Trip Generation Handbook - An ITE Proposed Recommended Practice, Third Edition 2017* by ITE
(4) DU = dwelling unit
(5) KSF = thousand square feet of floor area

NCHRP Report 684 Internal Trip Capture Estimation Tool



NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Karman Line	Organization:	LSC Transportation Consultants, Inc.
Project Location:	El Paso County, CO	Performed By:	KDF
Scenario Description:	Buildout	Date:	8/14/2023
Analysis Year:	2043	Checked By:	
Analysis Period:	AM Street Peak Hour	Date:	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				633	394	239
Restaurant				0		
Cinema/Entertainment				0		
Residential				3,618	894	2,724
Hotel				0		
All Other Land Uses ²				1,048	654	394
				5,299	1,942	3,357

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	18	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	27	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	5,299	1,942	3,357
Internal Capture Percentage	2%	2%	1%
External Vehicle-Trips ⁵	5,209	1,897	3,312
External Transit-Trips ⁶	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	7%	8%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	2%	1%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

³Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

⁴Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

⁵Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

⁶Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	Karman Line
Analysis Period:	AM Street Peak Hour

Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	394	394	1.00	239	239
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	894	894	1.00	2724	2724
Hotel	1.00	0	0	1.00	0	0

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	69		31	0	33	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	54	27	545	0		0
Hotel	0	0	0	0	0	

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		126	0	0	0	0
Retail	0		0	0	18	0
Restaurant	0	32		0	45	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	67	0	0		0
Hotel	0	16	0	0	0	

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	27	367	394	367	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	18	876	894	876	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	654	654	654	0	0

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	18	221	239	221	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	27	2697	2724	2697	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	394	394	394	0	0

¹ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
² Person-Trips
³ Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator
*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool			
Project Name:	Karman Line	Organization:	LSC Transportation Consultants, Inc.
Project Location:	El Paso County, CO	Performed By:	KDF
Scenario Description:	Buildout	Date:	8/14/2023
Analysis Year:	2043	Checked By:	
Analysis Period:	PM Street Peak Hour	Date:	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				2,564	1,229	1,335
Restaurant				0		
Cinema/Entertainment				0		
Residential				4,775	3,011	1,764
Hotel				0		
All Other Land Uses ²				416	123	293
				7,755	4,363	3,392

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office					5280	
Retail					5280	
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		0	0	35	0
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	123	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	7,755	4,363	3,392
Internal Capture Percentage	4%	4%	5%
External Vehicle-Trips ⁵	7,439	4,205	3,234
External Transit-Trips ⁵	0	0	0
External Non-Motorized Trips ⁶	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	10%	3%
Restaurant	N/A	N/A
Cinema/Entertainment	N/A	N/A
Residential	1%	7%
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

³Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

⁴Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-P, 6-P, 7-P, and 8-P. Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

⁵Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.

⁶Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Project Name:	Karman Line
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.00	1229	1229	1.00	1335	1335
Restaurant	1.00	0	0	1.00	0	0
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	3011	3011	1.00	1764	1764
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	27		387	53	35	67
Restaurant	0	0		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	71	741	370	0		53
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		98	0	0	120	0
Retail	0		0	0	1385	0
Restaurant	0	615		0	482	0
Cinema/Entertainment	0	49	0		120	0
Residential	0	123	0	0		0
Hotel	0	25	0	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	123	1106	1229	1106	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	35	2976	3011	2976	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	123	123	123	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	35	1300	1335	1300	0	0
Restaurant	0	0	0	0	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	123	1641	1764	1641	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	293	293	293	0	0

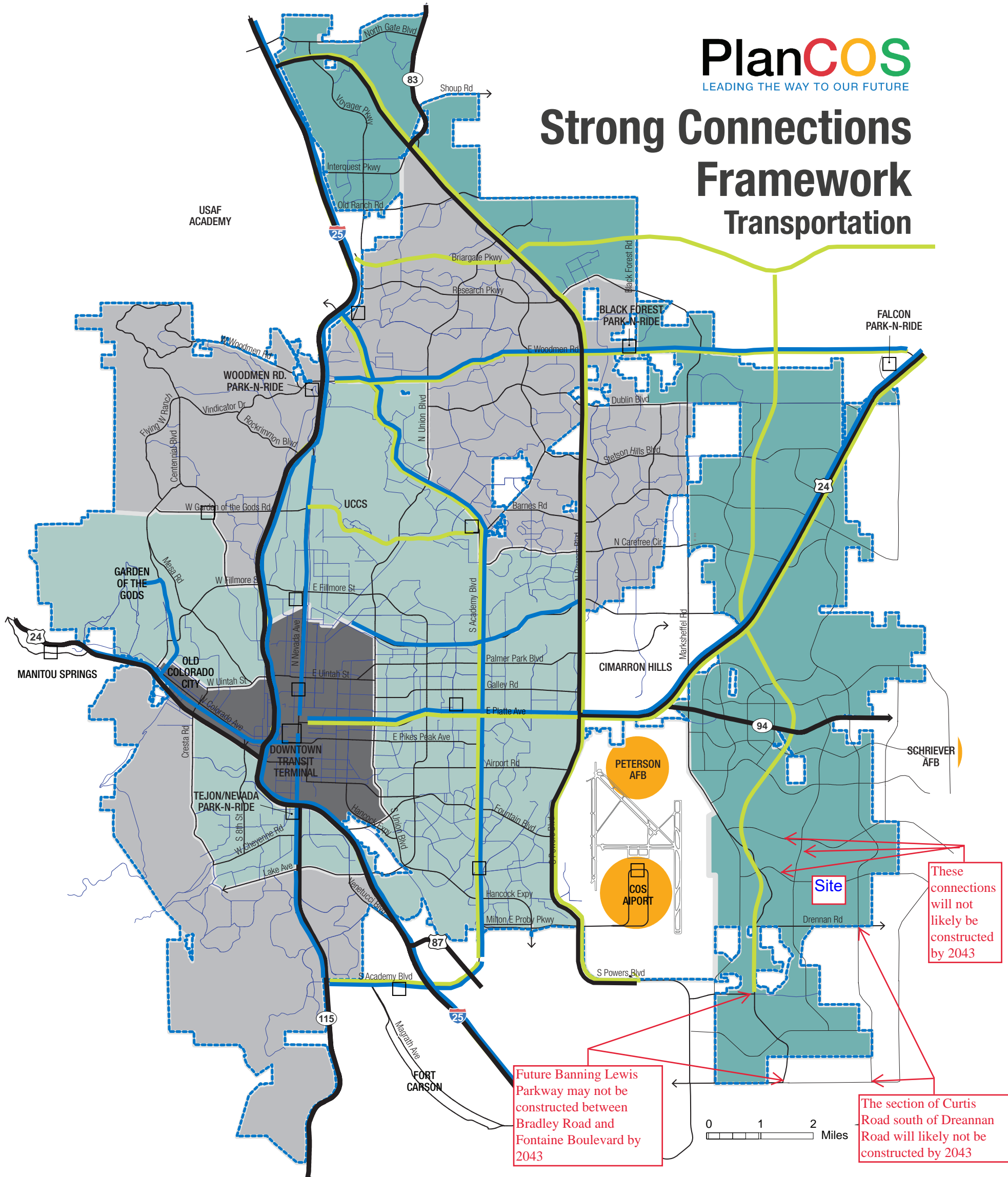
¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

Strong Connections Framework Transportation



Predominant Typology

- Urban Core Streets
- Established Suburban Streets
- Developing Suburban Streets
- Future Streets

- Smart Corridors
- Multimodal Corridors
- Bike Master Plan Network
- Major Destination Areas

- Transportation Hubs
- Park-N-Rides

- City Boundary
- Intercity Corridors
- Major Roads

MOBILITY FRAMEWORK

The Mobility Framework Map provides a high level graphic framework of the transportation vision for Strong Connections. This map is intended to be used as one means of furthering the City's focus on enhancing the multimodal opportunities in the city and on improving the efficiency of the system. This map is expected to be a living and evolving graphic. It is recognized that some major streets combine the characteristics of more than one typology. As a high level city-wide framework, this map is also not able or intended to fully represent the sometimes unique and important conditions associated with specific segments of larger and sometimes multistreet corridors. This map is not intended to strictly define street types for all city streets. More detail will be provided with the City's Intermodal Mobility Plan.