Planning and Community Development Department
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Colorado Springs, Colorado 80910
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DEVIATION REQUEST AND DECISION FORM

Updated: 6/26/2019

PROJECT INFORMATION

Project Name :	Waterbury Filings 1 and 2
Schedule No.(s) :	4200000417
Legal Description :	TR IN NW4, SW4 SEC 28, E2SE4 SEC 29, NW4 SEC 33-12-64 DESC AS FOLS: COM AT NW COR OF SD SEC 28, TH S 00<30'55" E 1319.39 FT TO NW COR OF S2NW4, S 89<47'08" E 588.96 FT TO A PT ON ELY R/W OF EASTONVILLE RD FOR POB, CON S 89<47'08" E 1605.16 FT, S 00<12'59" W 435.00 FT, S 89<47'01" E 139.63 FT, S 00<12'59" W 330.00 FT, N 89<47'01" W 350.00 FT, N 00<12'59" E 30.00 FT, N 89<47'01" W 435.00 FT, S 00<12'59" W 377.02 FT, S 12<05'17" E 298.63 FT, S 25<18'38" E 227.74 FT, S 37<45'39" E 249.37 FT, S 51<48'59" E 239.45 FT, S 24<21'29" W 365.46 FT, TH ALG ARC OF CUR TO THE L HAVING A RAD OF 965.00 FT AN ARC DIST OF 18.61 FT A C/A OF 01<06'18" WHICH CHORD BEARS N 26<38'08" E, TH S 25<31'50" W 699.86 FT, N 28<50'14" W 419.93 FT, S 39<02'37" W 269.86 FT, S 28<43'09" E 182.42 FT, S 20<34'25" E 144.94 FT, S 04<10'28" W 63.70 FT, TH ALG ARC OF CUR TO THE R HAVING A RAD OF 1465.00 FT AN ARC DIST OF 64.34 FT A C/A OF 02<30'59" WHICH CHORD BEARS N 07<06'03" E, S 09<37'02" W 70.00 FT, S 12<40'04" W 679.15 FT, S 10<45'49" E 120.00 FT, TH ALG ARC OF CUR TO THE L HAVING A RAD OF 1280.00 FT AN ARC DIST OF 336.84 FT A C/A OF 15<04'39" WHICH CHORD BEARS S 10<45'49" E, S 64<09'32" W 723.95 FT, N 10<22'31" E 439.41 FT, N 12<01'08" W 399.03 FT, N 18<38'16" W 326.29 FT, N 24<17'51" W 617.25 FT, N 30<04'30" W 382.89 FT, N 18<14'27" W 254.35 FT, N 28<23'01" W 429.55 FT TO A PT ON ELY R/W LN OF EASTONVILLE RD, N 38<15'31" E 549.80 FT TO A PT ON SLY LN OF NE4 SEC 29 S 89<54'34" E 310.49 FT, N 00<30'55" W 389.80 FT TO A PT ON ELY R/W LN OF EASTONVILLE RD, N 38<15'31" E 3.28 FT, N 37<34'53" E 508.84 FT, TH ALG ARC OF CUR TO THE L HAVING A RAD OF 1630.00 FT AN ARC DIST OF 589.68 FT A C/A OF 20<43'39" TO POB, EX THAT SLY POR CONV BY REC # 208025323, EX PT DESC BY REC # 217092201

APPLICANT INFORMATION

Company :	4 Way Ranch Joint Venture, LLC
Name :	Mr. Peter Martz
	☒ Owner ☐ Consultant ☐ Contractor
Mailing Address :	P.O. Box 50223 Colorado Springs, CO 80949
Phone Number :	719-491-3150
FAX Number :	
Email Address :	pmartzlrg@comcast.net

ENGINEER INFORMATION

Company :	LSC Transportation Consultants, Inc		
Name :	Jeffrey C. Hodsdon	Colorado P.E. Number :	31684
Mailing Address :	2504 E. Pikes Peak Ave, Suite 304 Colorado Springs, CO 80909		
Phone Number :	719-633-2868		
FAX Number :	719-633-5430		
Email Address :	jeff@LSCtrans.com		

OWNER, APPLICANT, AND ENGINEER DECLARATION

To the best of my knowledge, the information on this application and all additional or supplemental documentation is true, factual and complete. I am fully aware that any misrepresentation of any information on this application may be grounds for denial. I have familiarized myself with the rules, regulations and procedures with respect to preparing and filing this application. I also understand that an incorrect submittal will be cause to have the project removed from the agenda of the Planning Commission, Board of County Commissioners and/or Board of Adjustment or delay review until corrections are made, and that any approval of this application is based on the representations made in the application and may be revoked on any breach of representation or condition(s) of approval.

Signature of owner (or authorized representative) _____ Date 7/21/22

Engineer's Seal, Signature
And Date of Signature

COLORADO LICENSED
JEFFREY C. HODSDON
31684
7-20-22
PROFESSIONAL ENGINEER

DEVIATION REQUEST (Attach diagrams, figures, and other documentation to clarify request)

A deviation from the standards of or in Section **2.2.5.B.1** of the Engineering Criteria Manual (ECM) is requested. The request is to allow a proposed full-movement intersection along Stapleton Road about 2,200 feet from US Highway 24 and 1,345 feet from the future Dumont Drive intersection. The proposed intersection location is shown in Exhibit 1.

The following paragraph from the PUD Development Plan TIS report dated January 10, 2013, referenced the approved deviation.

> Figure 2 also shows the proposed site access points and intersection spacing along Stapleton Drive and Eastonville Road. The access plan includes a new full-movement intersection on Stapleton between Bandanero and Dumont as approved through the deviation request process. The access plan for Eastonville is shown in Figure 3.

A copy of the prior approved deviation **is attached** for reference. **Also attached** is a copy of the April 7, 2011, ***4 Way Ranch – New Stapleton Intersection Technical Memorandum*** that was prepared in support of the deviation request.

Identify the specific ECM standard which a deviation is requested:

Rural and Urban Principal Arterial Spacing
The spacing on Stapleton Road would be about 2,200 feet from US Highway 24 and 1,345 feet from Dumont Drive. The standard is 2,640 feet.

State the reason for the requested deviation:

The Waterbury residential project has limited street frontage on Stapleton Drive and Eastonville Road and there is an existing neighborhood to the east, private property, and no opportunity for access to US Highway 24 to the east. The access to US Highway 24 needs to be via Stapleton.

The implementation of the full-movement intersection at the proposed location would provide much improved access and circulation to the development areas both north and south of Stapleton. It would improve the service to the commercial and mixed-use development on the south side. Also, the overall land use plan would be better served with the location shifted east from the half-mile point on US 24.

Explain the proposed alternative and compare to the ECM standards (May provide applicable regional or national standards used as basis):

The spacing on Stapleton Road would be about 2,200 feet from US Highway 24 and 1,345 feet from Dumont Drive. The standard is 2,640 feet. The intersection would be within 450 feet of the half-mile (from US 24) following a shift east from the half-mile point due to planning considerations. The Dumont/Stapleton signal will be a "shadow" signal and should be considered an extra signal location. This was called out in the Stapleton corridor traffic study. Therefore, from a signal spacing standpoint, the half-mile spacing should be being considered from US 24, not Dumont. The spacing would be more than a half-mile from the next planned signal at Eastonville Road. Bandanero is a current full movement intersection between Eastonville and Saybrook; however, it is unlikely that this intersection would be signalized.

LIMITS OF CONSIDERATION

(At least one of the conditions listed below must be met for this deviation request to be considered.)

☐ The ECM standard is inapplicable to the particular situation.

☒ Topography, right-of-way, or other geographical conditions or impediments impose an undue hardship and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility.

☐ A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.

Provide justification:

The Waterbury residential project has limited street frontage on Stapleton Drive and Eastonville Road and there is an existing neighborhood to the east, private property, and no opportunity for access to US Highway 24 to the east. The access to US Highway 24 needs to be via Stapleton.

CRITERIA FOR APPROVAL

Per ECM section 5.8.7 the request for a deviation may be considered if the request is **not based exclusively on financial considerations**. The deviation must not be detrimental to public safety or surrounding property. The applicant must include supporting information demonstrating compliance with **all of the following criteria**:

The deviation will achieve the intended result with a comparable or superior design and quality of improvement.

The deviation is requested to improve the overall plan for access and circulation for the areas both north and south of Stapleton, shift some traffic demand from the Dumont/Stapleton intersection and provide a good alternative to minimize use of the local road within the neighborhood to the west.

The deviation will not adversely affect safety or operations.

The addition of a future signal at this intersection would not affect/reduce the through-band procession efficiency along Stapleton (see the April 7, 2011, 4 Way Ranch – New Stapleton Intersection Technical Memorandum that was prepared in support of the previously-approved deviation for details). Auxiliary turn lanes could be accommodated, and the intersection approach grades, and the intersection sight distance would be confirmed through the CD plan review.

The deviation will not adversely affect maintenance and its associated cost.

The maintenance cost would likely be comparable regardless of location.

The deviation will not adversely affect aesthetic appearance.

The aesthetic appearance would likely be comparable regardless of location.

The deviation meets the design intent and purpose of the ECM standards.

The implementation of the full-movement intersection would provide good access to development areas both north and south of Stapleton. It would allow a shift of some of the left-turn demand from Dumont/Stapleton to this intersection. This would result in better operations at the Dumont intersection. This would not only reduce delay but would also reduce queue length potential for left-turning movements at Dumont. A signal at this location would provide a future controlled pedestrian crossing location across Stapleton. With this additional full-movement intersection, Bandanero could potentially be converted to a right-in/right-out. This intersection would direct higher-density traffic demand from the planned higher density next phases of Waterbury to the street connecting to the new intersection and away from Bandenero (and the lower-density lots along this street). The addition of this intersection would provide a good secondary access to the 4 Way Ranch commercial and mixed-use development areas south of Stapleton.

The deviation meets the control measure requirements of Part I.E.3 and Part I.E.4 of the County's MS4 permit, as applicable.

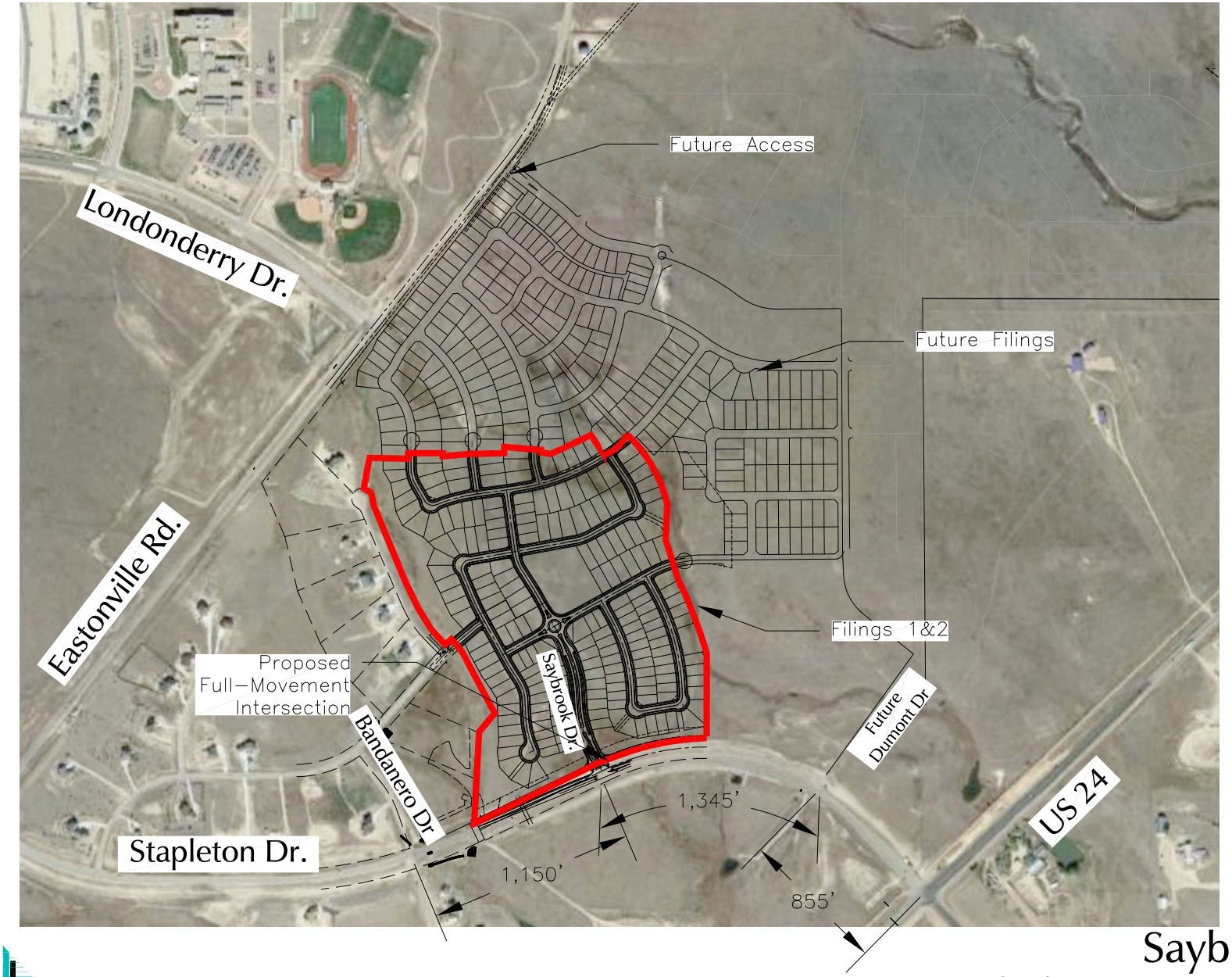
Water quality will be provided

Review and Recommendation:

Approved by the ECM Administrator
This request has been determined to have met the criteria for approval. A deviation from Section _____ of the ECM is hereby granted based on the justification provided.

Denied by the ECM Administrator
This request has been determined not to have met criteria for approval. A deviation from Section _____ of the ECM is hereby denied.

ECM ADMINISTRATOR COMMENTS/CONDITIONS:



Approximate Scale
Scale: NTS

Exhibit 1

Saybrook Drive
Deviation Request Location

Waterbury Filing Nos 1 and 2 (LSC #204220)

LSC TRANSPORTATION CONSULTANTS, INC.

Development Services Department
2880 International Circle
Colorado Springs, Colorado 80910

Phone: 719.520.6300
Fax: 719.520.6695
Website www.elpasoco.com

DEVIATION REVIEW AND DECISION FORM

Procedure # R-FM-051-07
Issue Date: 12/31/07
Revision Issued: 00/00/00
DSD FILE NO.:

D	E	V	1	1	0	0	5

General Property Information:
Address of Subject Property (Street Number/Name):
Tax Schedule ID(s) #: 4200000367, 4200000366 , 4200000349
Legal Description of Property: Please refer to Public Record Property Information by Schedule No.

Subdivision or Project Name: 4 Way Ranch

Section of ECM from Which Deviation is Sought: 2.2.5.B.1
Specific Criteria from Which a Deviation is Sought: Rural and Urban Principal Arterial Spacing

Proposed Nature and Extent of Deviation: Allow a proposed full-movement intersection on Stapleton Road about 2,200 feet from US Highway 24 and 1,345 feet from Dumont.

Applicant Information:
Applicant: 4 Way Ranch Joint Venture, LLC Email Address: pmartzlrg@integra.net
Applicant is: __X___ Owner _____ Consultant _____ Contractor
Mailing Address: P.O. Box 50223, Colorado Springs State: CO Postal Code: 80949
Telephone Number: (719) 491-3150 Fax Number:_____

Engineer Information:
Engineer: Jeffrey C. Hodsdon Email Address: jchodsdon@lsccs.com
Company Name: LSC Transportation Consultants, Inc.
Mailing Address: 516 North Tejon State: CO Postal Code: 80903
Registration Number: 31684 State of Registration: CO
Telephone Number: (719) 633-2868 Fax Number: (719) 633-5430

Explanation of Request (Attached diagrams, figures and other documentation to clarify request):
Section of ECM from Which Deviation is Sought: 2.2.5.B.1
Specific Criteria from Which a Deviation is Sought: Rural and Urban Principal Arterial Spacing
Proposed Nature and Extent of Deviation: Allow a proposed full-movement intersection on Stapleton Road about 2,200 feet from US Highway 24 and 1,345 feet from Dumont

Reason for the Requested Deviation: The deviation is needed as the proposed spacing of intersections is less than one-half mile.

Comparison of Proposed Deviation to ECM Standard: The spacing on Stapleton Road would be about 2,200 feet from US Highway 24 and 1,345 feet from Dumont. The standard is 2,640 feet. The intersection would be within 450 feet of the half-mile (from US 24) following a shift east from the half-mile point due to planning considerations. The Dumont/Stapleton signal will be a "shadow" signal and should be considered an extra signal location. Therefore, from a signal spacing standpoint, the half-mile spacing is being considered from US 24, not Dumont. The spacing would be more than a half-mile from the next planned signal at Eastonville.

Applicable Regional or National Standards used as Basis: CDOT access code contains provisions for deviating from the half-mile spacing.

Application Consideration:

CHECK IF APPLICATION MEETS CRITERIA FOR CONSIDERATION	JUSTIFICATION
☐ The ECM standard is inapplicable to a particular situation.	
☒ Topography, right-of-way, or other geographical conditions or impediments impose an undue hardship on the applicant, and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility.	The implementation of the full-movement intersection at the proposed location would provide much improved access and circulation to development areas both north and south of Stapleton. It would improve the service to the commercial and mixed-use development on the south side. Also, the overall land use plan would be better served with the location shifted east from the half-mile point from US 24.
☐ A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.	

If at least one of the criteria listed above is not met, this application for deviation cannot be considered.

Criteria for Approval:

PLEASE EXPLAIN HOW EACH OF THE FOLLOWING CRITERIA HAVE BEEN SATISFIED BY THIS REQUEST

The request for a deviation is not based exclusively on financial considerations.	The deviation is requested to improve the overall plan for access and circulation for the areas both north and south of Stapleton, as well as to shift some traffic demand from Dumont/Stapleton intersection.
The deviation will achieve the intended result with a comparable or superior design and quality of improvement.	The implementation of the full-movement intersection would provide good access to development areas both north and south of Stapleton. It would allow a shift of some of the left-turn demand from Dumont/Stapleton to this intersection. This would result in better operations at the Dumont intersection. This would not only reduce delay but would also reduce queue length potential for left-turning movements at Dumont. A signal at this location would provide a future controlled pedestrian crossing location across Stapleton. With this additional full-movement intersection, Bandanero could potentially be converted to a right-in/right-out. This intersection would direct higher-density traffic demand from the planned higher-density next phases of 4 Way Ranch to the street connecting to the new intersection and away from Bandanero (and the lower-density lots along this street). The addition of this intersection would provide a good secondary access to the 4 Way Ranch commercial and mixed-use development areas south of Stapleton.
The deviation will not adversely affect safety or operations.	The addition of a future signal at this intersection would not affect/reduce the through-band progression efficiency along Stapleton (see traffic report for details). Auxiliary turn lanes could be accommodated and we will confirm that the intersection approach grades and the intersection sight distance would be acceptable for an intersection at this location.
The deviation will not adversely affect maintenance and its associated cost.	The maintenance cost would likely be comparable regardless of location.
The deviation will not adversely affect aesthetic appearance.	The aesthetic appearance would likely be comparable regardless of location.

*April 7, 2011 ***4 Way Ranch - New Stapleton Intersection Technical Memorandum***

Owner, Applicant and Engineer Declaration:
To the best of my knowledge, the information on this application and all additional or supplemental documentation is true, factual and complete. I am fully aware that any misrepresentation of any information on this application may be grounds for denial. I have familiarized myself with the rules, regulations and procedures with respect to preparing and filing this application. I also understand that an incorrect submittal will be cause to have the project removed from the agenda of the Planning Commission, Board of County Commissioners and/or Board of Adjustment or delay review, and that any approval of this application is based on the representations made in the application and may be revoked on any breach of representation or condition(s) of approval.

Signature of owner (or authorized representative) _____ Date 4/11/11

Signature of applicant (if different from owner) _____ Date _____

Signature of Engineer _____ Date 4-11-11

Engineer's Seal

COLORADO REGISTERED PROFESSIONAL ENGINEER
JEFFREY C HODSDON
31684

Review and Recommendation:
APPROVED by the ECM Administrator

_____ Date 4-21-2011

This request has been determined to have met the criteria for approval. A deviation from Section 2.2.5.B1 of ECM is hereby granted based on the justification provided. Comments:

____ Additional comments or information are attached.

DENIED by the ECM Administrator

_____ Date _____

This request has been determined not to have met criteria for approval. A deviation from Section _____ of ECM is hereby denied. Comments:

____ Additional comments or information are attached.

April 7, 2011

4 Way Ranch Joint Venture, LLC
c/o Mr. Peter Martz
P.O. Box 50223
Colorado Springs, CO 80949

RE: 4 Way Ranch - New Stapleton Intersection
Technical Memorandum
El Paso County, Colorado
LSC #114220

Dear Peter:

In response to your request, LSC Transportation Consultants, Inc. has prepared this technical memorandum for the proposed new full-movement intersection to Stapleton Road. The intersection location is shown in Figure 1 and be located about 3,725 feet east of Eastonville Road. The purpose of this analysis and report is to request preliminary approval for the access, as the remainder of the planning for 4 Way Ranch is dependent upon this proposed full-movement intersection.

REPORT CONTENTS

This report presents analysis of the projected traffic volumes and levels of service at this intersection for the long term based on the buildout of the land uses the intersection would serve; an analysis of the intersection spacing along Stapleton Drive; an arterial progression analysis; a traffic signal warrant analysis; and auxiliary turn-lane improvement requirements. The report explains the benefits of a full-movement intersection at this location.

SITE DEVELOPMENT AND LAND USE

Figure 2 shows the 4 Way Ranch plan divided into traffic analysis zones (TAZs). The land use assumptions are shown in Table 1. The land uses served by the proposed new intersection include previously platted low density lots north of Stapleton, 4 Way Ranch commercial parcels south of Stapleton, and the remaining 300 acres of residential development north of Stapleton. The figure also shows the general plan for circulation and access.

PROPOSED INTERSECTION LOCATION

Figure 3 shows the proposed intersection spacing along Stapleton Road relative to other nearby intersections in the corridor. This location has been selected as it is close to the half-mile point and

it is in the best location to serve the land uses to the north and south. We will confirm that the intersection approach grades and the intersection sight distance would be acceptable for an intersection at this location.

TRIP GENERATION

In order to estimate the buildout peak-hour vehicle turning movements at the new proposed full-movement intersection, estimates of total TAZ trip generation have been developed. TAZ trip generation has been made using the nationally published trip generation rates found in *Trip Generation, 8th Edition, 2008* by the Institute of Transportation Engineers (ITE). Table 1 shows the results of the trip generation estimates. The estimates for the 4 Way Ranch commercial parcels have been taken directly from the most recent traffic report for the commercial.

The table shows average weekday and peak-hour trips for each TAZ. This table shows the total trip generation for all TAZs. Not all trips generated would use the proposed intersection for access/egress (or even pass through the intersection on Stapleton). In fact, for outlying zones such as TAZ 11, no trips are expected to use this proposed intersection for access even though the total trip generation for the entire zone is shown in the table. Trips from each TAZ using the proposed intersection for access/egress onto Stapleton is based on estimates of trip distribution and trip assignment for each TAZ.

TRIP DISTRIBUTION AND ASSIGNMENT

The determination of trips from each of the TAZs that would use the proposed new Stapleton intersection for access/egress is based on both the overall directional distribution of trips to the area transportation system and the local routing of trips internal and adjacent to the site based on the local street network, other access points, estimates of driver route preferences etc. The directional distribution percentages contained in previous 4 Way Ranch reports for the residential and commercial developments were used in this analysis. This report scope is limited to the estimate of trips using the proposed new intersection for access/egress and identifying the level of traffic demand that would shift from certain turning movements at Dumont/Stapleton to this intersection if this intersection were approved and added to the plan. Figure 4 shows the resulting forecast volumes at the proposed new Stapleton full-movement intersection for buildout/2035. Figure 5 shows the reduced traffic turning movement demand from certain turning movements at the Dumont/Stapleton intersection due to a volume shift to this new proposed intersection if implemented. For example, the northeast-bound left-turn movement is shown to be 84 vehicles lower per hour in the afternoon peak hour if the proposed full-movement intersection is implemented.

PROJECTED LEVELS OF SERVICE

The new full-movement intersection on Stapleton has been analyzed to determine the projected levels of service for the 2035/buildout total traffic volumes, based on the unsignalized method of analysis procedures found in the *Highway Capacity Manual, 2000 Edition* by the Transportation Research Board. Figure 4 shows the level of service analysis results.

The stop-sign-controlled approaches to the intersection are projected to operate at LOS F during the morning and afternoon peak hours based on the projected volumes. If a traffic signal were installed at the intersection, the LOS would be B. The level of service reports are attached.

SIGNAL WARRANT ANALYSIS

The projected 2035 morning and afternoon peak-hour volumes for the intersection have been plotted on the Four Hour Vehicular Volume traffic signal warrant chart to provide a preliminary indication if a signal warrant might be met in the future. This is only an indicator, for planning purposes, as four hours would need to be met in the future based on actual volumes (or one of the other warrants would need to be met) in order for the signal to be installed. The 70-percent factor chart was used because Stapleton Road's posted speed limit will be above 40 miles per hour. Analysis has been based on the left-turn movements only from the minor street approaches.

Figure 6 shows the Four Hour Warrant chart for 2035 total traffic. As can be seen in the figure, the peak-hour volume data points fall above the threshold lines on the warrant chart. This indicates that a signal could potentially be met based on the 2035 total traffic volumes.

TRAFFIC SIGNAL PROGRESSION ANALYSIS

An arterial progression analysis has been completed for Stapleton Road from US 24 to Meridian Road to determine if the addition of a signal at this proposed full-movement intersection would change the arterial through-band progression efficiency. The time-space diagram attached to this report shows through-bandwidth for eastbound and westbound directions. The bandwidth values in seconds divided by the cycle length of 120 seconds represents the progression efficiency through the Stapleton intersections between Meridian Road and US 24 for each direction. The higher the bandwidth values, the better the progression efficiency. The progression efficiencies would not be reduced with the addition of a signal at the proposed access and may improve progression efficiencies as operations at Dumont/Stapleton would be better.

As shown, the proposed intersection location is in a location favorable for progression relative to the other intersections as it is sufficiently close to the one-half mile spacing from Eastonville and US 24.

BENEFITS OF PROPOSED FULL-MOVEMENT INTERSECTION

The implementation of the full-movement intersection would provide good access to development areas both north and south of Stapleton. It would allow a shift of some of the left-turn demand from Dumont/Stapleton to this intersection. This would result in better operations at this intersection. This would not only reduce delay but would also reduce queue length potential for left-turning movements at Dumont. The intersection is close to the one-half mile spacing from US 24 and more than one-half mile from Eastonville. It would be within 450 feet of the half-mile (from US 24) criteria following a shift east due to planning considerations. The Dumont/Stapleton signal will be a "shadow" signal and is considered an extra signal location. Therefore, from a signal spacing

standpoint, the half-mile spacing is being considered from US 24, not Dumont. The spacing would be more than a half-mile from the next planned signal at Eastonville.

The addition of a future signal at this intersection would not affect/reduce the through-band progression efficiency along Stapleton. A signal at this location would provide a future controlled pedestrian crossing location across Stapleton. With this additional full-movement intersection, Bandanero could potentially be converted to a right-in/right-out. This intersection would direct higher-density traffic demand from the planned higher-density next phases of 4 Way Ranch to the street connecting to the new intersection and away from Bandanero (and the lower-density lots along this street). The addition of this intersection would provide a good secondary access to the 4 Way Ranch commercial and mixed-use development areas south of Stapleton.

AUXILIARY TURN LANES

Figure 7 shows the auxiliary turn lanes that would be required at the intersection. These would need to be designed and constructed per County ECM standards.

We trust that this traffic analysis will assist you with the planning for the proposed new full-movement intersection. Please contact me if you have any questions.

Sincerely,

LSC TRANSPORTATION CONSULTANTS, INC.

By _____
Jeffrey C. Hodsdon, P.E., PTOE
Principal

COLORADO REGISTERED
JEFFREY C HODSDON
31684
4-7-11
PROFESSIONAL ENGINEER

JCH:bjwb

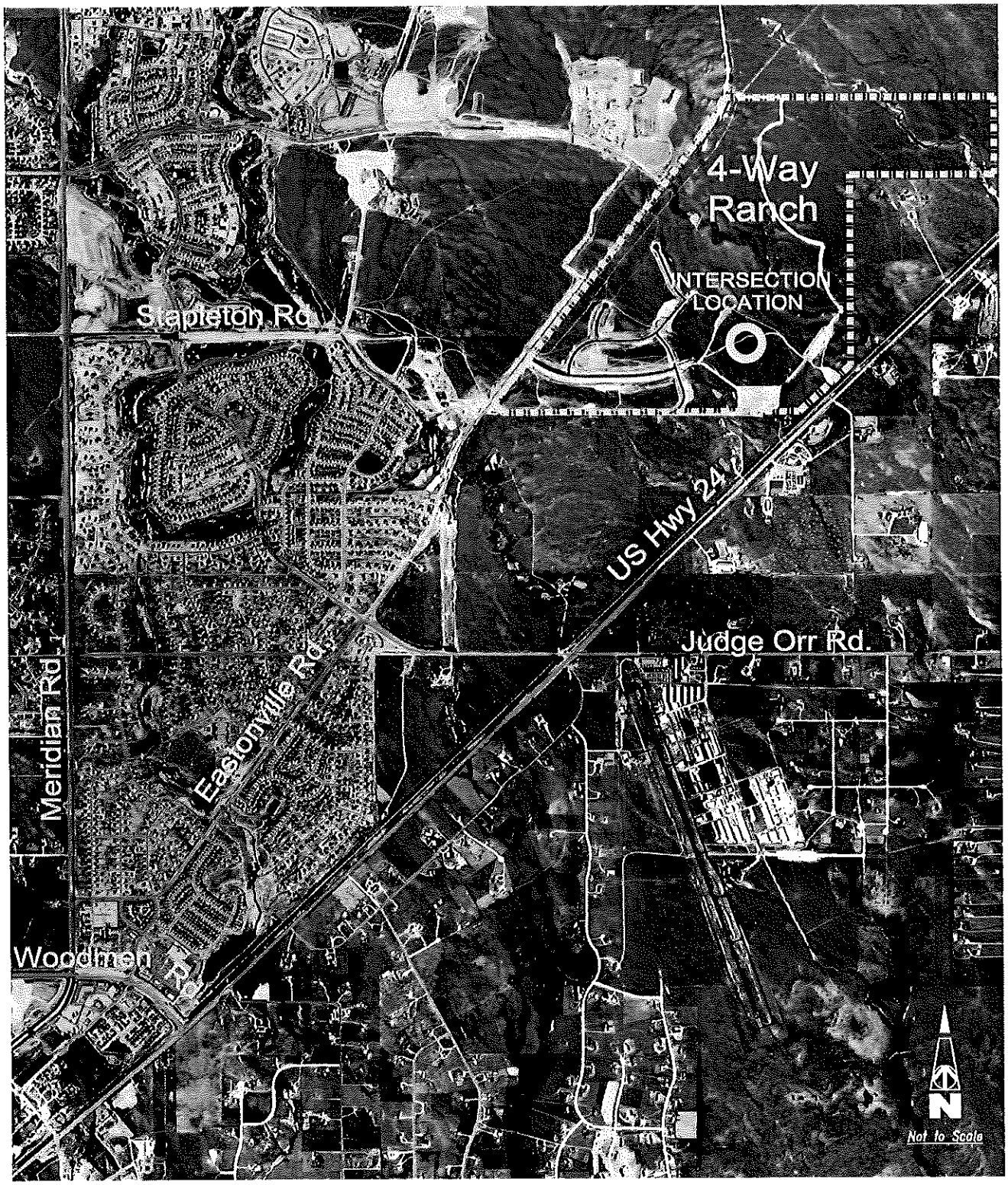
Enclosures: Table 1
Figures 1-7
Level of Service Reports
Time-Space Diagram

Table 1
4 Way Ranch
Trip Generation Estimates

TAZ	Land Use Code	Land Use Description	Trip Generation Units	Trip Generation Rates (1) Average Weekday Traffic	Morning Peak Hour In	Morning Peak Hour Out	Afternoon Peak Hour In	Afternoon Peak Hour Out	Total Trips Generated Average Weekday Traffic	Morning Peak Hour In	Morning Peak Hour Out	Afternoon Peak Hour In	Afternoon Peak Hour Out	Internal Trips	Total External Trips Generated Average Weekday Traffic	Morning Peak Hour In	Morning Peak Hour Out	Afternoon Peak Hour In	Afternoon Peak Hour Out	Total New Trips Generated Pass-By Trips (2) Daily	AM	PM	Average New Weekday Traffic
Parcel 5	820	Shopping Center	36.5 KSF (3)	50.53	0.69	0.44	2.27	2.46	1,844	25	16	83	90	2%	1,808	25	16	81	88	25%	34%	34%	1,356
Parcel 5	832	High Turnover (Sit-Down) Restaurant	5.8 KSF	130.34	4.82	4.45	6.52	4.34	756	28	26	38	25	5%	718	27	25	36	24	10%	43%	43%	646
Parcel 5	834	Fast-Food Restaurant with Drive-Through Window	3 KSF	496.12	25.43	24.43	17.41	16.07	1,488	76	73	52	48	8%	1,369	70	67	48	44	35%	49%	50%	890
Parcel 5	845	Gas Station with Convenience Store	10 VFP (4)	162.78	5.03	5.03	6.69	6.69	1,628	50	50	67	67	8%	1,498	46	46	62	62	50%	62%	56%	749
TAZ 5 Total									**5,717**	**180**	**166**	**240**	**230**		**5,393**	**168**	**154**	**227**	**218**				**3,641**
Parcel 4	720	Medical-Dental Office Building	53.6 KSF	36.88	1.96	0.52	0.89	2.40	1,977	105	28	48	129	6%	1,858	99	26	45	121	0%	0%	0%	1,858
TAZ 4 Total									**1,977**	**105**	**28**	**48**	**129**		**1,858**	**99**	**26**	**45**	**121**				**1,858**
Parcel 1	820	Shopping Center	8 KSF	50.53	0.69	0.44	2.27	2.46	404	6	4	18	20	2%	396	5	3	18	19	25%	34%	34%	297
Parcel 1	834	Fast-Food Restaurant with Drive-Through Window	3 KSF	496.12	25.43	24.43	17.41	16.07	1,488	76	73	52	48	8%	1,369	70	67	48	44	35%	49%	50%	890
Parcel 1	832	High Turnover (Sit-Down) Restaurant	6 KSF	130.34	4.82	4.45	6.52	4.34	782	29	27	39	26	5%	743	27	25	37	25	10%	43%	43%	669
TAZ 1 Total									**2,675**	**111**	**104**	**109**	**94**		**2,508**	**103**	**96**	**103**	**88**				**1,856**
Parcel 3	820	Shopping Center	152.1 KSF	50.53	0.69	0.44	2.27	2.46	7,686	106	68	345	373	2%	7,532	104	66	338	366	25%	34%	34%	5,649
Parcel 3	834	Fast-Food Restaurant with Drive-Through Window	3 KSF	496.12	25.43	24.43	17.41	16.07	1,488	76	73	52	48	8%	1,369	70	67	48	44	35%	49%	50%	890
TAZ 3 Total									**9,174**	**182**	**141**	**397**	**422**		**8,901**	**174**	**134**	**386**	**410**				**6,539**
Parcel 6	130	Industrial Park	35 KSF	6.96	0.73	0.16	0.19	0.73	244	26	6	7	25	2%	239	25	5	7	25	0%	0%	0%	239
Parcel 6	820	Shopping Center	7.9 KSF	50.53	0.69	0.44	2.27	2.46	399	5	4	18	19	2%	391	5	3	18	19	25%	34%	34%	293
Parcel 6	230	Residential Condominium/Townhouse	200 DU (5)	5.86	0.07	0.37	0.35	0.17	1,172	15	73	70	34	7%	1,090	14	68	65	32	0%	0%	0%	1,090
TAZ 6 Total									**1,815**	**46**	**82**	**94**	**79**		**1,720**	**44**	**77**	**89**	**76**				**1,622**
Parcel 2	150	Warehousing	18 KSF	4.96	0.37	0.08	0.12	0.35	89	7	1	2	6	6%	84	6	1	2	6	0%	0%	0%	84
7	210	Single-Family Detached Housing	28 DU	9.57	0.19	0.56	0.64	0.37	268	5	16	18	10	0%	268	5	16	18	10	0%	0%	0%	268
8	210	Single-Family Detached Housing	283 DU	9.57	0.19	0.56	0.64	0.37	2,708	53	159	180	106	0%	2,708	53	159	180	106	0%	0%	0%	2,708
10	210	Single-Family Detached Housing	145 DU	9.57	0.19	0.56	0.64	0.37	1,388	27	82	92	54	0%	1,388	27	82	92	54	0%	0%	0%	1,388
13	210	Single-Family Detached Housing	73 DU	9.57	0.19	0.56	0.64	0.37	699	14	41	46	27	0%	699	14	41	46	27	0%	0%	0%	699
9	210	Single-Family Detached Housing	55 DU	9.57	0.19	0.56	0.64	0.37	526	10	31	35	21	0%	526	10	31	35	21	0%	0%	0%	526
11	210	Single-Family Detached Housing	317 DU	9.57	0.19	0.56	0.64	0.37	3,034	59	178	202	118	0%	3,034	59	178	202	118	0%	0%	0%	3,034
12	210	Single-Family Detached Housing	127 DU	9.57	0.19	0.56	0.64	0.37	1,215	24	71	81	47	0%	1,215	24	71	81	47	0%	0%	0%	1,215
14	520	Elementary School	500 Students	1.29	0.25	0.20	0.07	0.08	645	124	101	37	38	65%	226	43	35	13	13	0%	0%	0%	226
Buildout Total									**31,929**	**947**	**1,201**	**1,581**	**1,382**		**30,528**	**830**	**1,102**	**1,518**	**1,317**				**25,664**

Notes:
(1) Source: "Trip Generation, 6th Edition, 1997" by the Institute of Transportation Engineers (ITE)
(2) Source: "Trip Generation Handbook, 2nd Edition, June 2004" by ITE
(3) KSF = thousand square feet
(4) VHP = vehicle fueling position
(5) DU = dwelling unit

Source: LSC Transportation Consultants, Inc.



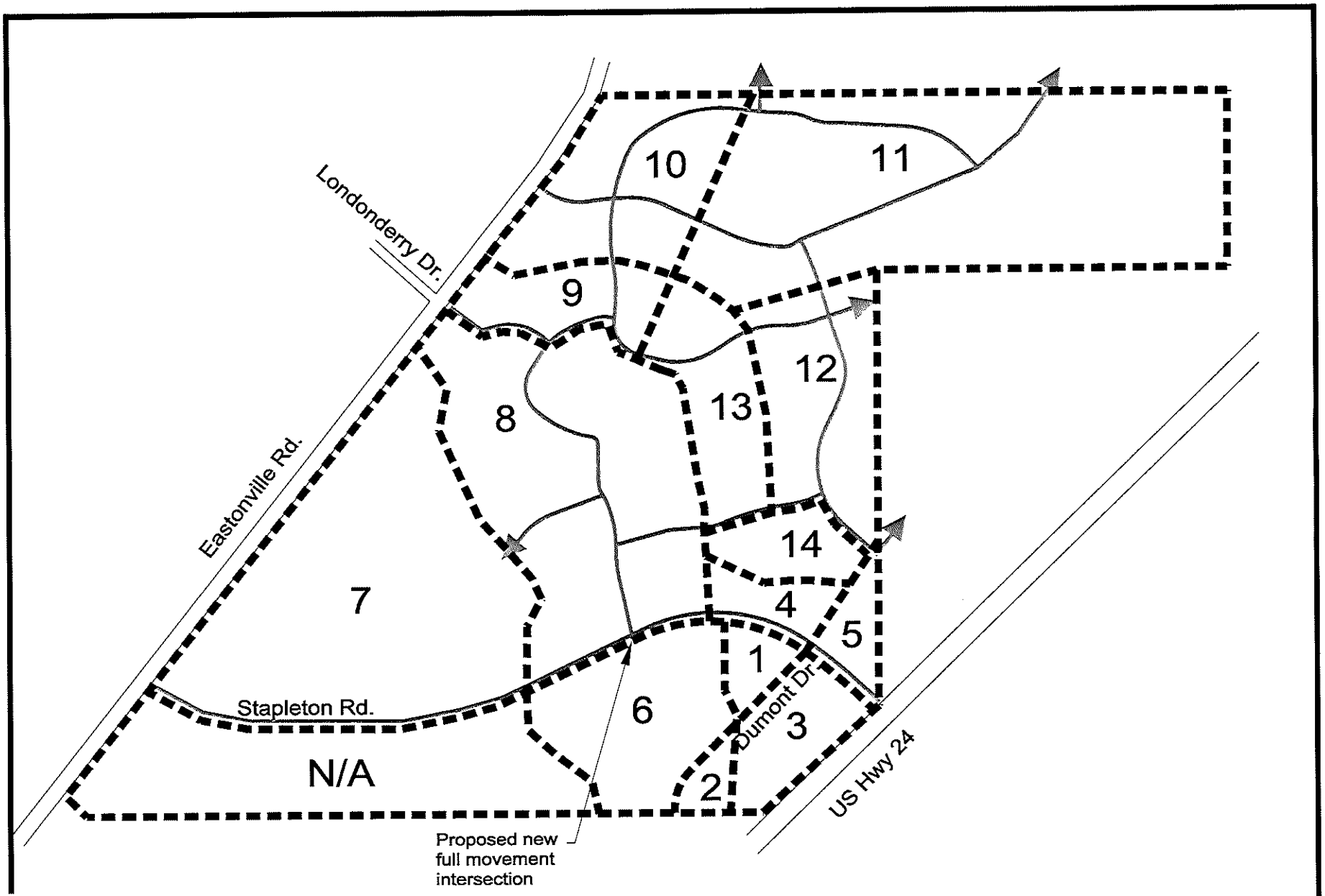
TRANSPORTATION CONSULTANTS, INC.

Vicinity Map

4 Way Ranch - Stapleton Full Movement Intersection Analysis

Figure 1

LSC # 114220



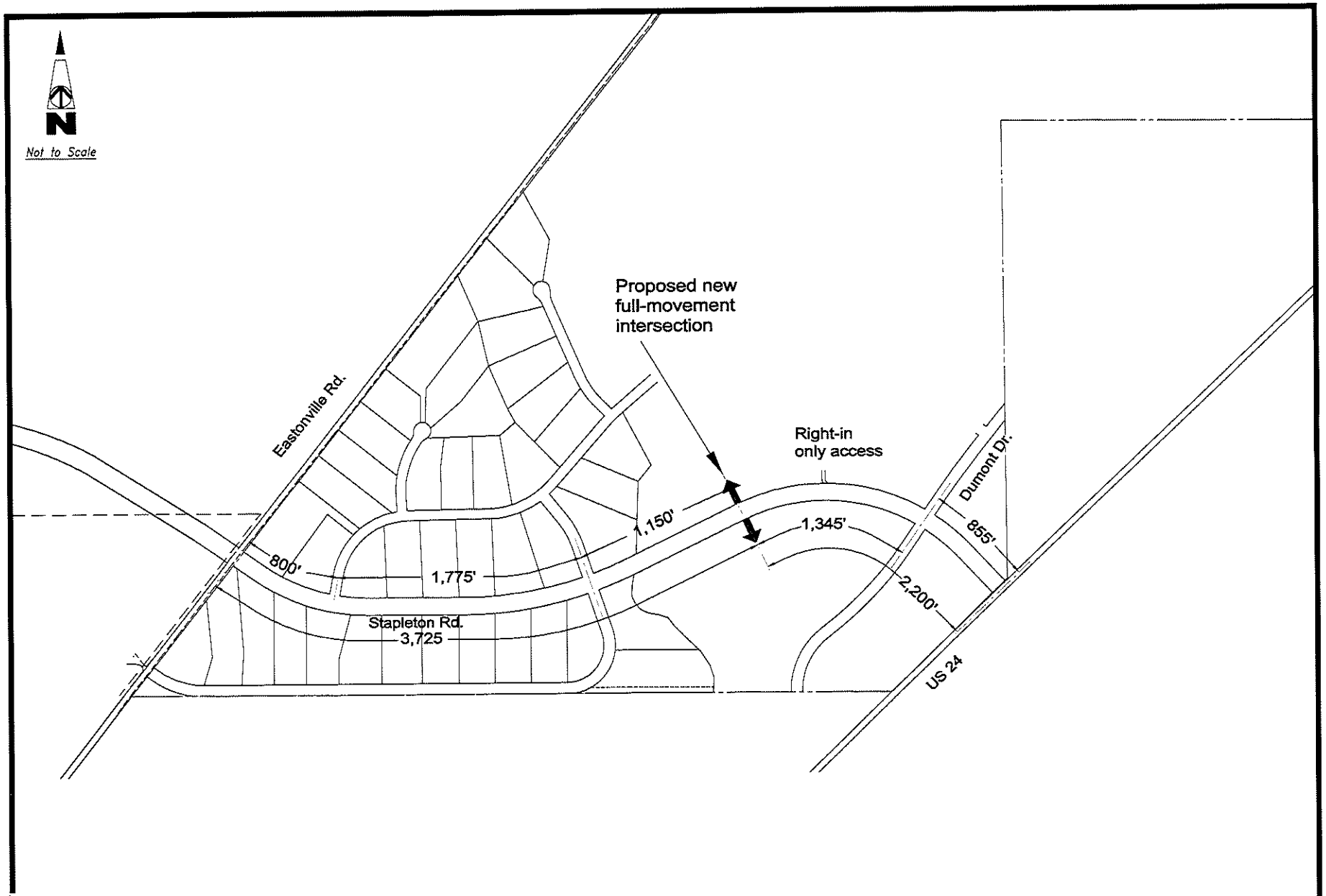
Traffic Analysis Zones

4 Way Ranch - Stapleton Full Movement Intersection Analysis

Figure 2

LSC # 114220

TRANSPORTATION CONSULTANTS, INC.



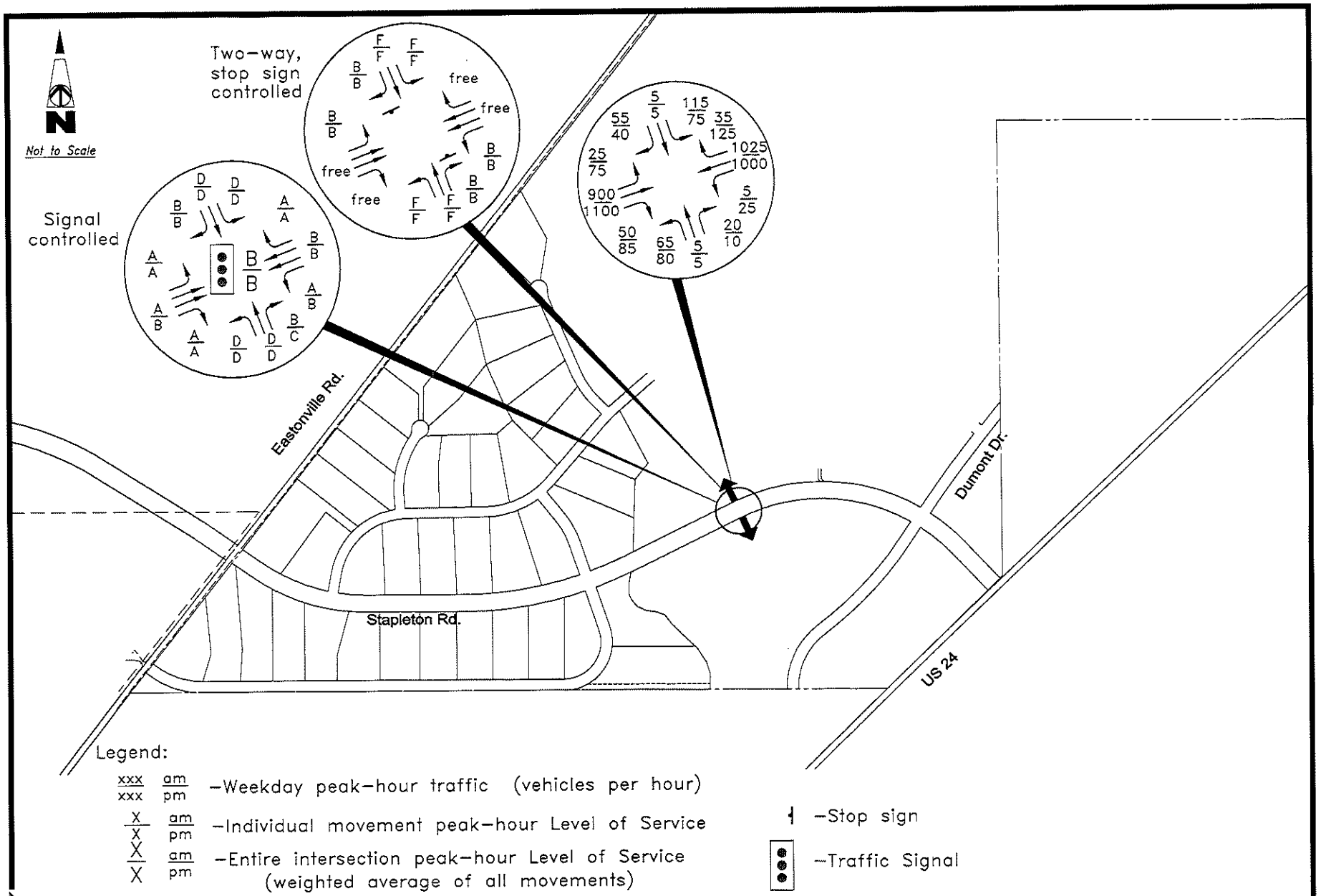
TRANSPORTATION CONSULTANTS, INC.

Stapleton Road Intersection Spacing

4 Way Ranch - Stapleton Full Movement Intersection Analysis

Figure 3

LSC # 114220



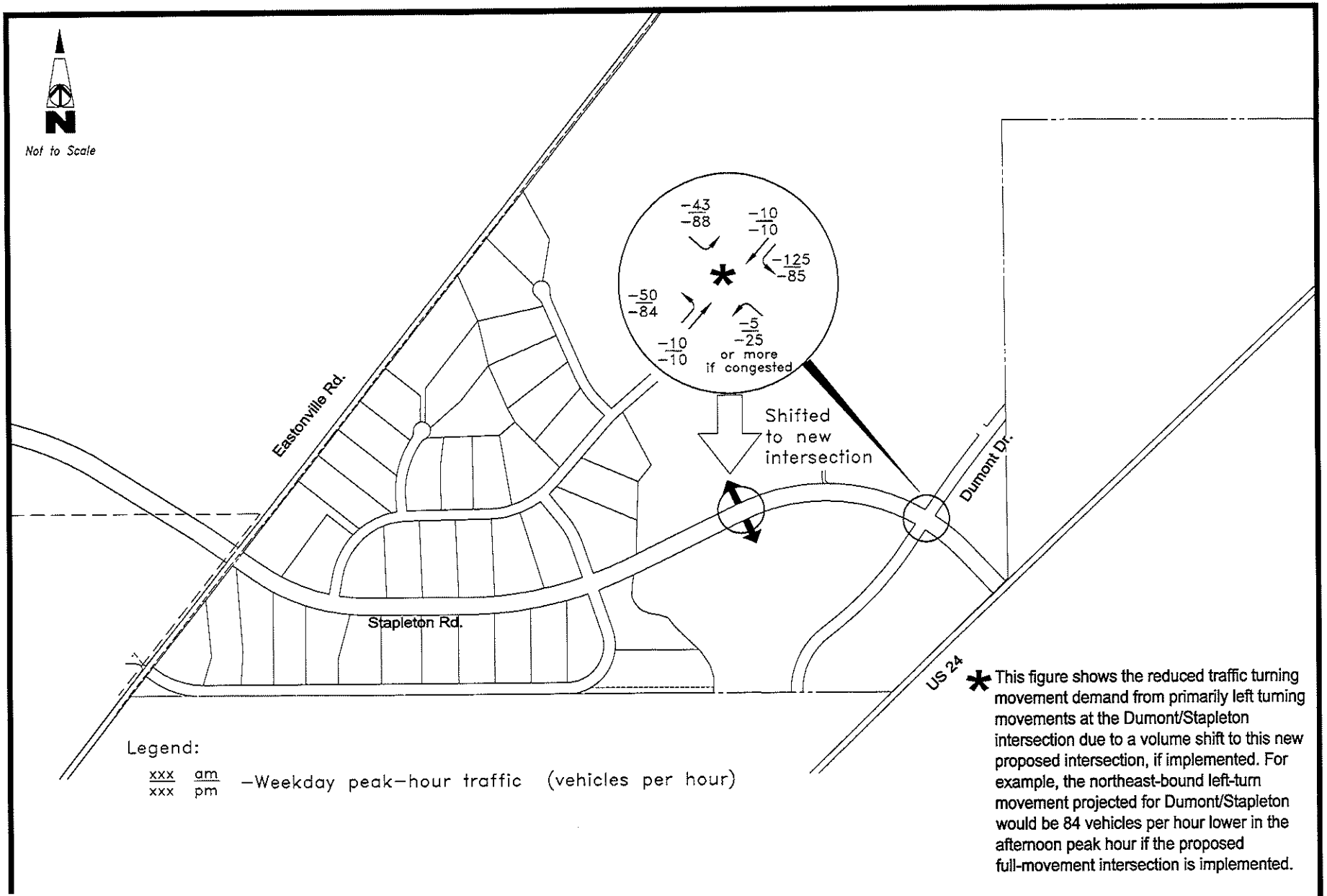
2035 Total Traffic, Lane Geometry, Traffic Control and Level of Service

Figure 4

4 Way Ranch - Stapleton Full Movement Intersection Analysis

LSC # 114220

TRANSPORTATION CONSULTANTS, INC.



* This figure shows the reduced traffic turning movement demand from primarily left turning movements at the Dumont/Stapleton intersection due to a volume shift to this new proposed intersection, if implemented. For example, the northeast-bound left-turn movement projected for Dumont/Stapleton would be 84 vehicles per hour lower in the afternoon peak hour if the proposed full-movement intersection is implemented.

TRANSPORTATION CONSULTANTS, INC.

Estimated Traffic Volume/Turning Movement Reductions at Dumont/Stapleton

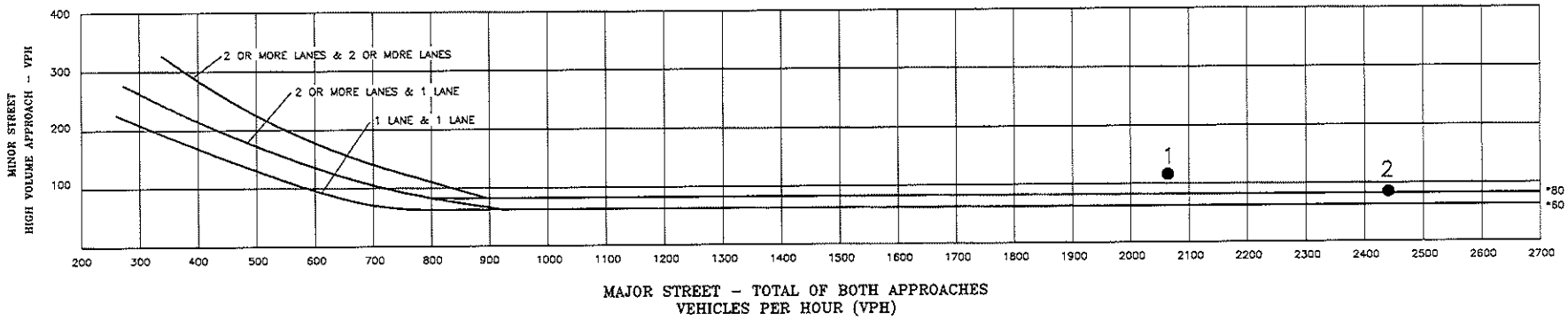
Figure 5

4 Way Ranch - Stapleton Full Movement Intersection Analysis

LSC # 114220

Figure 4C-2 Warrant 2, Four-Hour Vehicular Volume (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 70 km/h (40mph) ON MAJOR STREET)



* Note: 80 vph applies as the lower threshold volumes for a minor-street approach with two or more lanes and 60 vph applies as the lower threshold volume for a minor-street approach with one lane.

1. AM Peak Hour (2035)
2. PM Peak Hour (2035)

(Includes left turns only on minor street for comparison to 60vph threshold volume for a minor street approach with one lane.)

*Chart taken from MUTCD 2009 Edition, page 440

N

Not to Scale

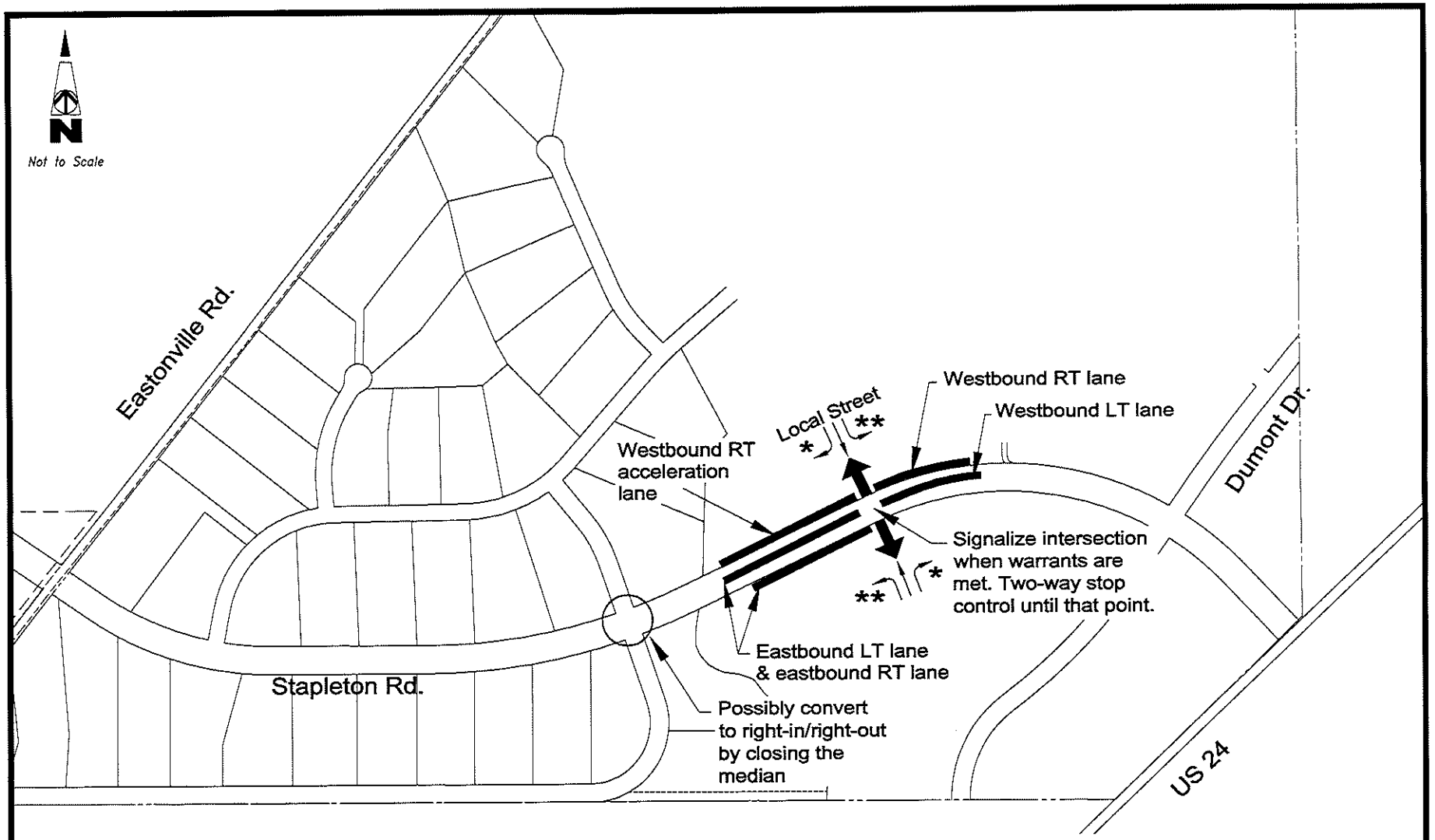
Signal Warrant Chart
Stapleton/Proposed Full Movement Intersection

4 Way Ranch - Stapleton Full Movement Intersection Analysis

Figure 6

LSC # 114220

TRANSPORTATION CONSULTANTS, INC.



* Minor street approach right turn lanes should be of sufficient length not to block through traffic

** Minor street approach left turn lanes should be of sufficient length to accommodate left turn queues

TRANSPORTATION CONSULTANTS, INC.

Recommended Lane Geometry

4 Way Ranch - Stapleton Full Movement Intersection Analysis

Figure 7

LSC # 114220

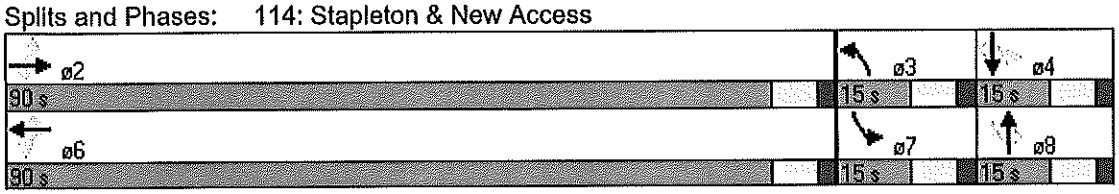
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.229			0.270			0.754			0.754		
Satd. Flow (perm)	427	3539	1583	503	3539	1583	1405	1863	1583	1405	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			53			37			21			58
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		3726			1346			791			826	
Travel Time (s)		56.5			20.4			18.0			18.8	
Volume (vph)	25	900	50	5	1025	35	65	5	20	115	5	55
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	947	53	5	1079	37	68	5	21	121	5	58
Lane Group Flow (vph)	26	947	53	5	1079	37	68	5	21	121	5	58
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		4
Detector Phases	2	2	2	6	6	6	3	8	8	7	4	4
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	23.0	23.0	23.0	23.0	23.0	23.0	11.0	23.0	23.0	11.0	23.0	23.0
Total Split (s)	90.0	90.0	90.0	90.0	90.0	90.0	15.0	15.0	15.0	15.0	15.0	15.0
Total Split (%)	75.0%	75.0%	75.0%	75.0%	75.0%	75.0%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	Min	Min	None	Min	Min
Act Effct Green (s)	87.6	87.6	87.6	87.6	87.6	87.6	19.9	9.4	9.4	21.2	12.4	12.4
Actuated g/C Ratio	0.73	0.73	0.73	0.73	0.73	0.73	0.17	0.08	0.08	0.18	0.10	0.10
v/c Ratio	0.08	0.37	0.05	0.01	0.42	0.03	0.26	0.03	0.15	0.43	0.03	0.27
Control Delay	5.2	5.5	1.3	5.8	11.9	3.6	42.1	50.8	21.8	46.0	50.6	16.3
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	5.2	5.5	1.3	5.8	11.9	3.6	42.1	50.8	21.8	46.0	50.6	16.3
LOS	A	A	A	A	B	A	D	D	C	D	D	B
Approach Delay		5.3			11.6			38.0			36.8	
Approach LOS		A			B			D			D	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120

Offset: 21 (18%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.43
Intersection Signal Delay: 11.9 Intersection LOS: B
Intersection Capacity Utilization 48.0% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 114: Stapleton & New Access



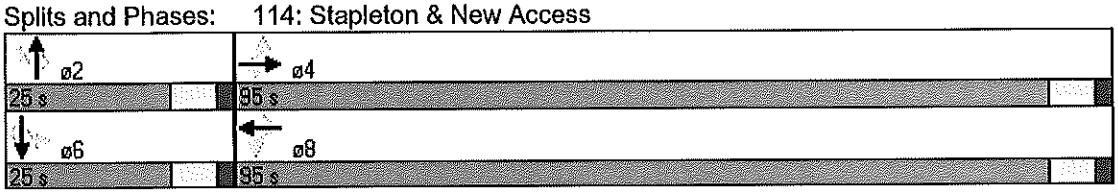
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Leading Detector (ft)	50	50	50	50	50	50	50	50	50	50	50	50
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Turning Speed (mph)	15		9	15		9	15		9	15		9
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.245			0.216			0.754			0.754		
Satd. Flow (perm)	456	3539	1583	402	3539	1583	1405	1863	1583	1405	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			89			132			11			42
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Link Speed (mph)		45			45			30			30	
Link Distance (ft)		3726			1346			791			826	
Travel Time (s)		56.5			20.4			18.0			18.8	
Volume (vph)	75	1100	85	24	1000	125	80	5	10	75	5	40
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	79	1158	89	25	1053	132	84	5	11	79	5	42
Lane Group Flow (vph)	79	1158	89	25	1053	132	84	5	11	79	5	42
Turn Type	Perm		Perm	Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phases	4	4	4	8	8	8	2	2	2	6	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Total Split (s)	95.0	95.0	95.0	95.0	95.0	95.0	25.0	25.0	25.0	25.0	25.0	25.0
Total Split (%)	79.2%	79.2%	79.2%	79.2%	79.2%	79.2%	20.8%	20.8%	20.8%	20.8%	20.8%	20.8%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	C-Min	C-Min	C-Min	C-Min	C-Min	C-Min
Act Effct Green (s)	73.6	73.6	73.6	73.6	73.6	73.6	38.4	38.4	38.4	38.4	38.4	38.4
Actuated g/C Ratio	0.61	0.61	0.61	0.61	0.61	0.61	0.32	0.32	0.32	0.32	0.32	0.32
v/c Ratio	0.28	0.53	0.09	0.10	0.49	0.13	0.19	0.01	0.02	0.18	0.01	0.08
Control Delay	8.9	12.0	1.1	11.8	19.5	5.9	37.2	37.6	19.5	37.2	37.6	12.4
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	8.9	12.0	1.1	11.8	19.5	5.9	37.2	37.6	19.5	37.2	37.6	12.4
LOS	A	B	A	B	B	A	D	D	B	D	D	B
Approach Delay		11.0			17.8			35.3			28.9	
Approach LOS		B			B			D			C	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120

Offset: 12 (10%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.53
Intersection Signal Delay: 15.7 Intersection LOS: B
Intersection Capacity Utilization 54.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 114: Stapleton & New Access



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	25	900	50	5	1025	35	65	5	20	115	5	55
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	26	947	53	5	1079	37	68	5	21	121	5	58
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1116			1000			1611	2126	474	1639	2142	539
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1116			1000			1611	2126	474	1639	2142	539
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			99			0	89	96	0	88	88
cM capacity (veh/h)	622			688			54	47	537	56	46	486

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1	NB 2	NB 3	SB 1
Volume Total	26	474	474	53	5	539	539	37	68	5	21	121
Volume Left	26	0	0	0	5	0	0	0	68	0	0	121
Volume Right	0	0	0	53	0	0	0	37	0	0	21	0
cSH	622	1700	1700	1700	688	1700	1700	1700	54	47	537	56
Volume to Capacity	0.04	0.28	0.28	0.03	0.01	0.32	0.32	0.02	1.27	0.11	0.04	2.16
Queue Length 95th (ft)	3	0	0	0	1	0	0	0	151	9	3	298
Control Delay (s)	11.0	0.0	0.0	0.0	10.3	0.0	0.0	0.0	337.5	91.4	12.0	692.7
Lane LOS	B				B				F	F	B	F
Approach Delay (s)	0.3				0.0				251.5			462.1
Approach LOS									F			F

Intersection Summary			
Average Delay	45.0		
Intersection Capacity Utilization	48.0%	ICU Level of Service	A
Analysis Period (min)	15		

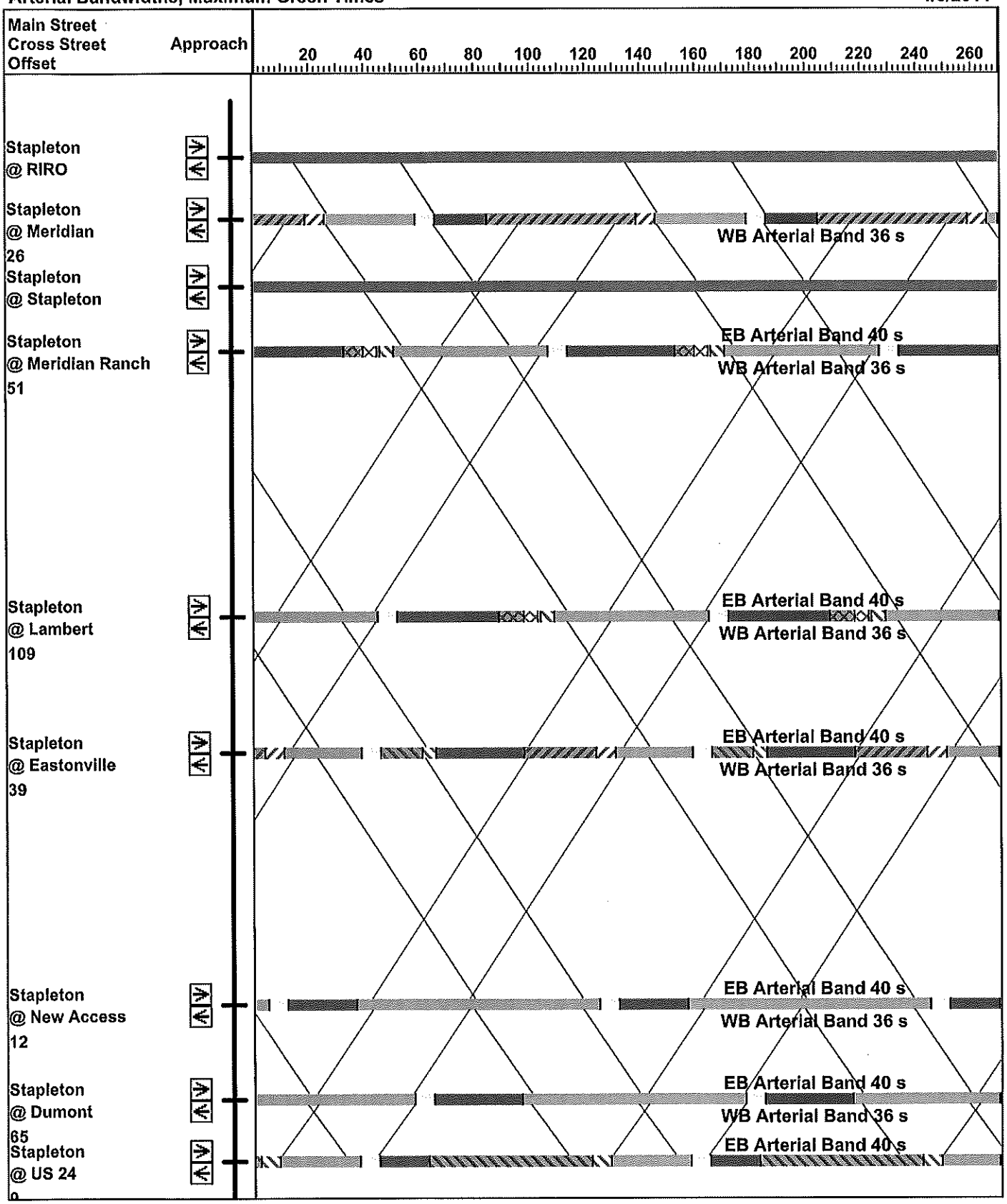
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	75	1100	85	24	1000	125	80	5	10	75	5	40
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	79	1158	89	25	1053	132	84	5	11	79	5	42
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1184			1247			1937	2551	579	1853	2508	526
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1184			1247			1937	2551	579	1853	2508	526
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			95			0	76	98	0	77	92
cM capacity (veh/h)	585			554			26	22	458	32	23	496

Direction, Lane #	EB 1	EB 2	EB 3	EB 4	WB 1	WB 2	WB 3	WB 4	NB 1	NB 2	NB 3	SB 1
Volume Total	79	579	579	89	25	526	526	132	84	5	11	79
Volume Left	79	0	0	0	25	0	0	0	84	0	0	79
Volume Right	0	0	0	89	0	0	0	132	0	0	11	0
cSH	585	1700	1700	1700	554	1700	1700	1700	26	22	458	32
Volume to Capacity	0.13	0.34	0.34	0.05	0.05	0.31	0.31	0.08	3.25	0.24	0.02	2.50
Queue Length 95th (ft)	12	0	0	0	4	0	0	0	Err	18	2	229
Control Delay (s)	12.1	0.0	0.0	0.0	11.8	0.0	0.0	0.0	Err	217.2	13.0	946.4
Lane LOS	B				B				F	F	B	F
Approach Delay (s)	0.7				0.2				8433.0			604.2
Approach LOS									F			F

Intersection Summary			
Average Delay	333.4		
Intersection Capacity Utilization	54.8%	ICU Level of Service	A
Analysis Period (min)	15		

Time-Space Diagram - Stapleton
Arterial Bandwidths, Maximum Green Times

4/5/2011



2035 Total Traffic With Signal at Proposed New Intersection

JCH

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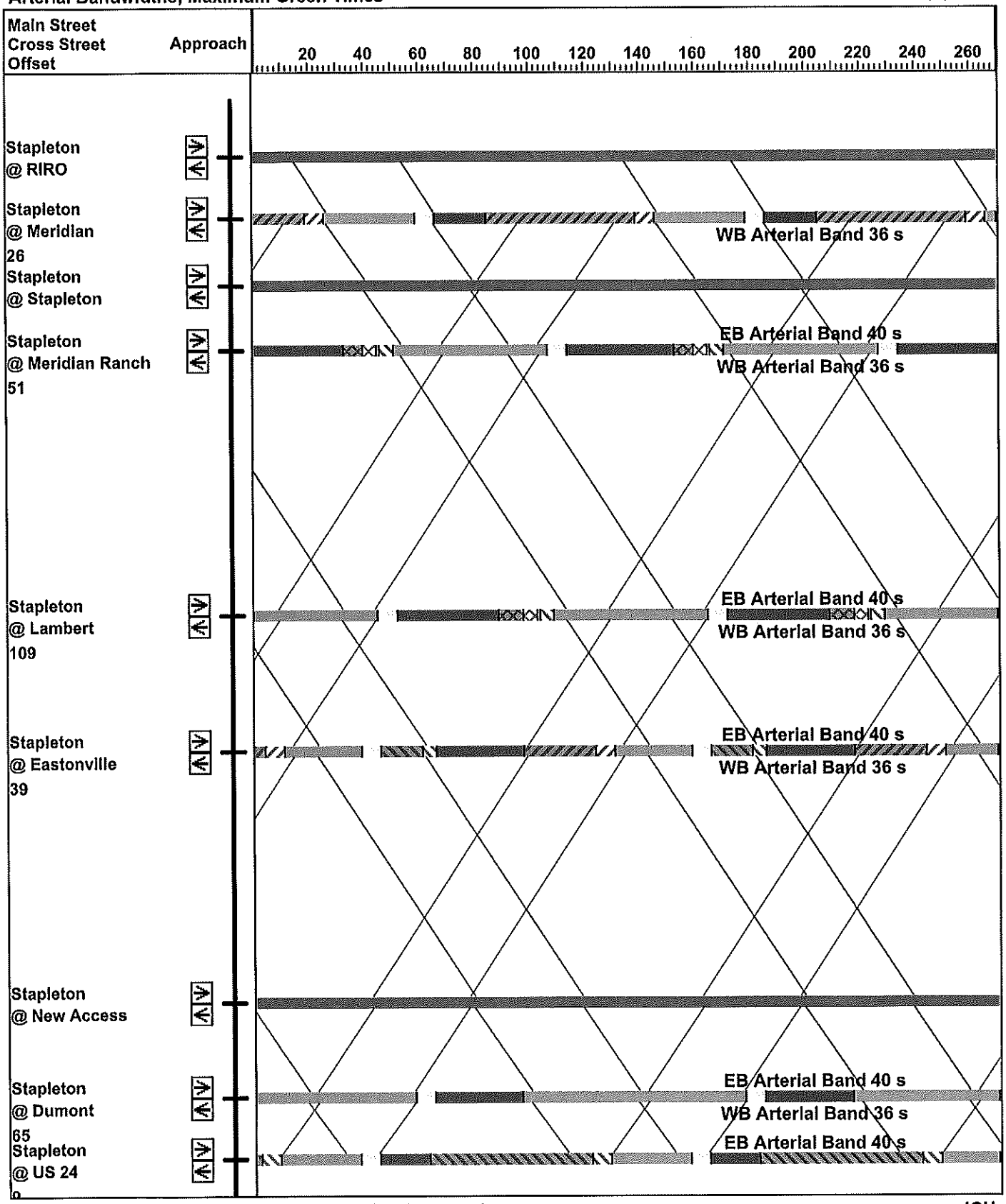
Time-Space Diagram - Stapleton
Arterial Bandwidths, Maximum Green Times

4/5/2011



2035 Total Traffic No Signal at Proposed New Intersection

JCH

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