

WATER'S EDGE
TRAFFIC IMPACT STUDY

LOVELAND, COLORADO

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Project #1899



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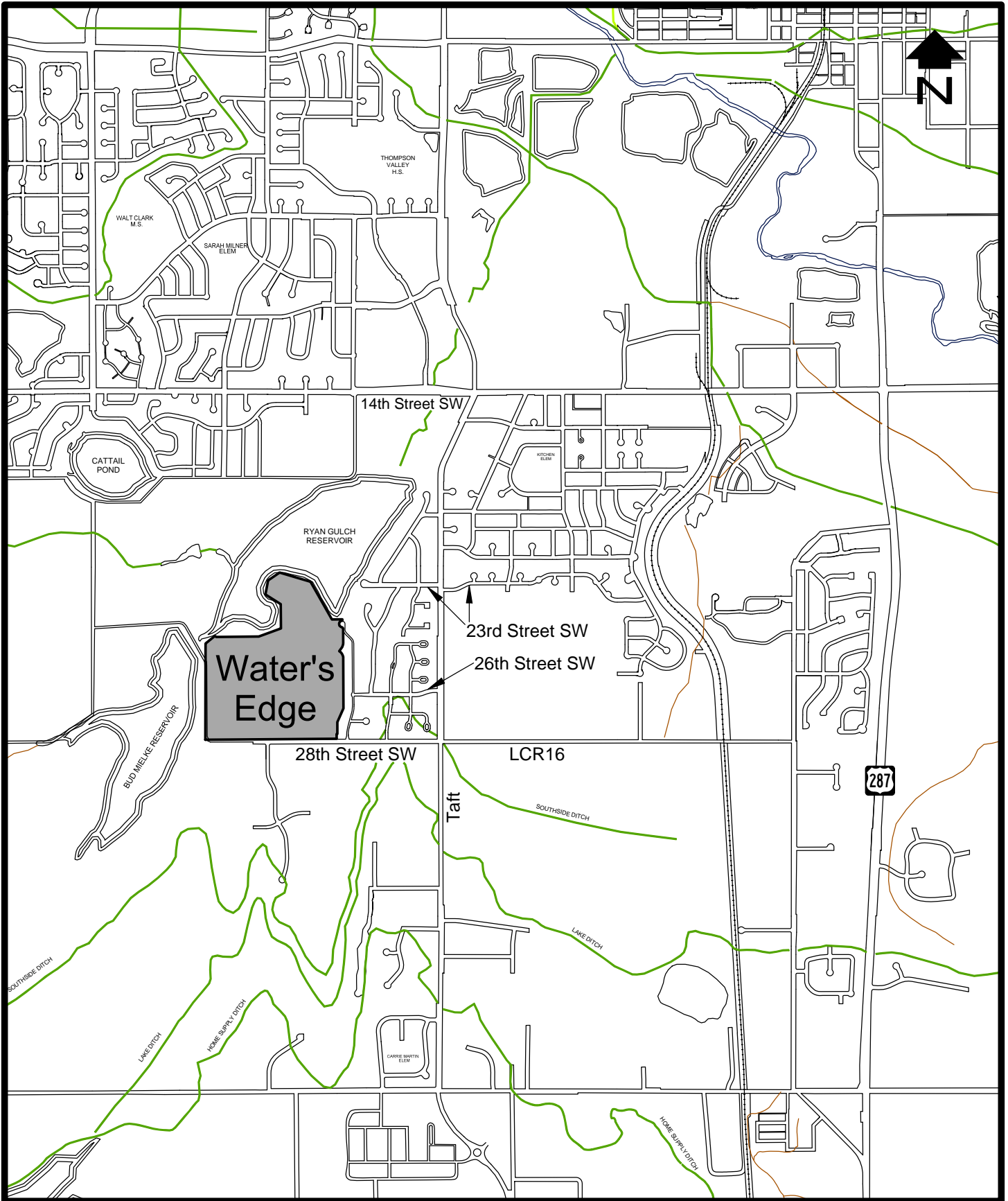
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I. INTRODUCTION

This traffic impact study (TIS) is for the proposed Water's Edge, located in the north of 28th Street SW and west of Taft Avenue in Loveland, Colorado. The location of this site is shown in Figure 1. This TIS addresses the operation at the key intersections for the short range (2023) and long range (2040) futures.

This study involved the collection of data, a review of previous developments and studies in the area, trip generation, trip distribution, trip assignment, and the operation analyses of the key intersections in the area for the existing conditions, the short range (2023) future, and the long range (2040) future. During the course of this analysis, numerous contacts were made with City staff, the project developer (The Landhuis Company), and the project planner (TB Group). Since this land is within the City of Loveland, the traffic impact study guidelines for Loveland, as contained in the "Larimer County Urban Area Street Standards" (LCUASS) were used.

The following intersections, as agreed to in the scoping discussions, were addressed in this traffic study: Taft/23rd Street SW (minor intersection), Taft/26th Street SW (minor intersection), and Taft/28th Street SW (major intersection) intersections. Appendix A contains the Transportation Impact Study Base Assumptions form and related attachments for the Water's Edge.



SCALE: 1"=2000'

SITE LOCATION

Figure 1

II. EXISTING CONDITIONS

Land Use

The project site is currently vacant. The land surrounding the site consists of primarily residential and vacant uses. There are residential uses to the north, south, and east of the site. Land to the west is vacant. The center of Loveland lies to the northeast of the Water's Edge development site.

Roads

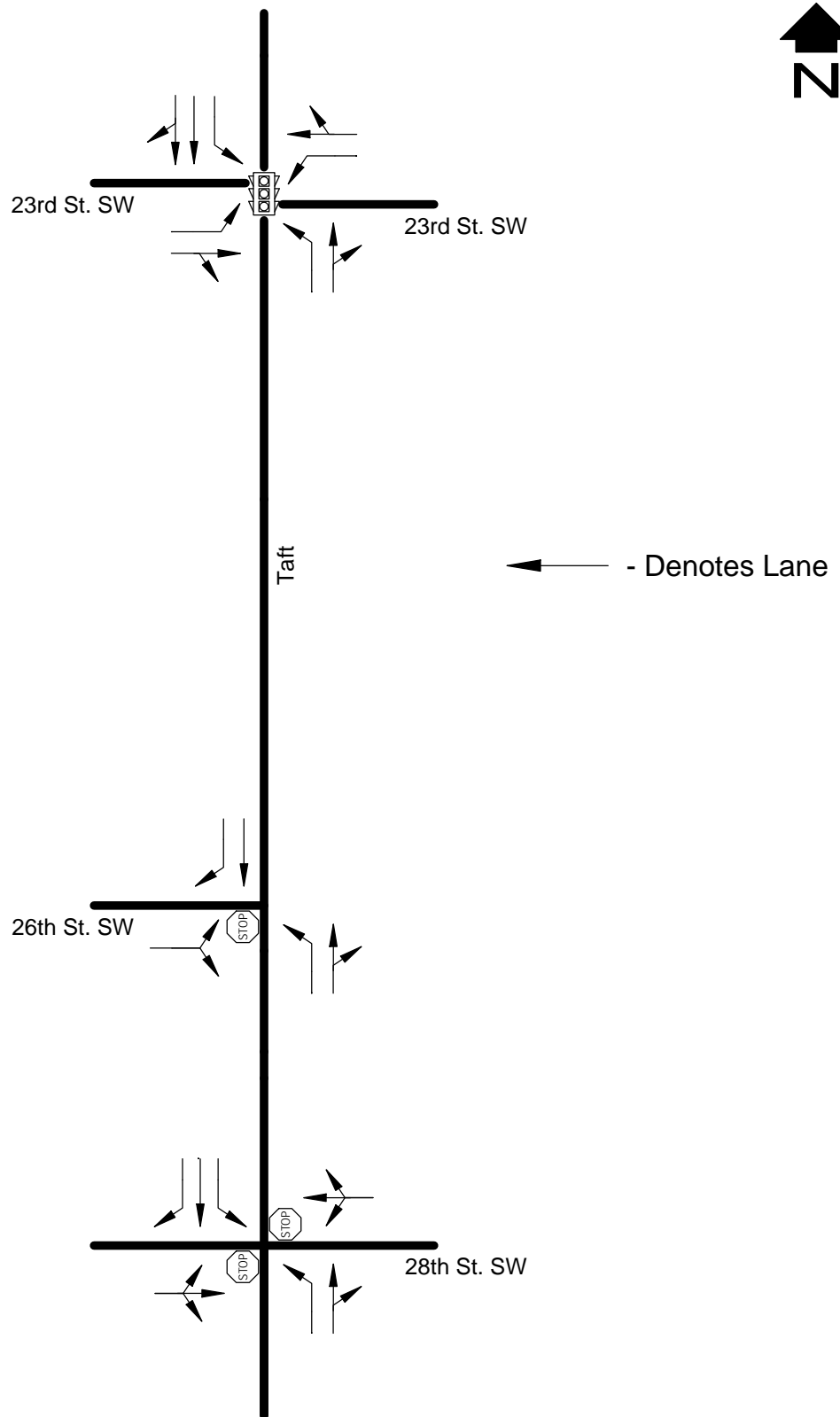
A schematic of the current geometry at the Taft/23rd Street SW, Taft/26th Street SW, and Taft/28th Street SW intersections is shown in Figure 2. The key existing streets are Taft Avenue, 23rd Street SW, 26th Street SW, and 28th Street SW.

Taft Avenue is classified as a four-lane arterial street. Currently, Taft Avenue has a four-lane cross section with auxiliary turn lanes north of 22nd Street SW. Between 22nd Street SW and 26th Street SW, Taft Avenue has two southbound through lanes and one northbound through lane. The right-most southbound through becomes a right-turn deceleration lane approaching 26th Street SW. South of 28th Street SW, Taft Avenue has a two-lane cross section with no center median lane and minimal shoulders. North of 28th Street SW, the posted speed on Taft Avenue is 35 mph. South of 28th Street SW, the posted speed is 40 mph. At the Taft/23rd Street SW intersection, Taft Avenue has northbound and southbound left-turn lanes and two through lanes in each direction. The Taft/23rd Street SW intersection has signal control. The east and west legs of 23rd Street SW are offset such that split phase timing is necessary. At the Taft/26th Street SW intersection, Taft Avenue has a northbound left-turn lane, one through lane in each direction, and a southbound right-turn lane. The Taft/26th Street SW intersection has stop sign control on 26th Street SW. At the Taft/28th Street SW intersection, Taft Avenue has northbound and southbound left-turn lanes, one through lane in each direction, and a southbound right-turn lane. The Taft/28th Street SW intersection has stop sign control on 28th Street SW.

Twenty-Third Street SW is classified as a local street. At the Taft/23rd Street SW intersection, the east and west legs of 23rd Street SW are offset such that split phase timing is necessary. The east and west legs of 23rd Street SW have a striped left-turn lane and a striped right-turn lane. Therefore, vehicles desiring to go through from one leg of 23rd Street SW to the other must do so from the right-turn lane (functions as a combined through/right-turn lane). There is no posted speed on 23rd Street SW.

Twenty-Sixth Street SW is classified as a local street. At the Taft/26th Street SW intersection, 26th Street SW has all eastbound movements combined into a single lane.

Twenty-Eighth Street SW is classified as a major collector street. At the Taft/28th Street SW intersection, 28th Street SW has all eastbound and westbound movements combined into single lanes. The posted speed on 28th Street SW is 40 mph east of Taft Avenue and 30 mph west of Taft Avenue.



EXISTING INTERSECTION GEOMETRY

Figure 2

Existing Traffic

Recent weekday peak hour traffic counts at the Taft/23rd Street SW, Taft/26th Street SW, and Taft/28th Street SW intersections are shown in Figure 3. Raw traffic counts are provided in Appendix B. Traffic counts at the Taft/23rd Street SW and Taft/28th Street SW intersections were obtained in December 2018. Traffic counts at the Taft/26th Street SW intersection were obtained in January 2019. Since traffic counts were performed on different days, the traffic was averaged/balanced between the intersections and is shown in Figure 4.

Existing Operation

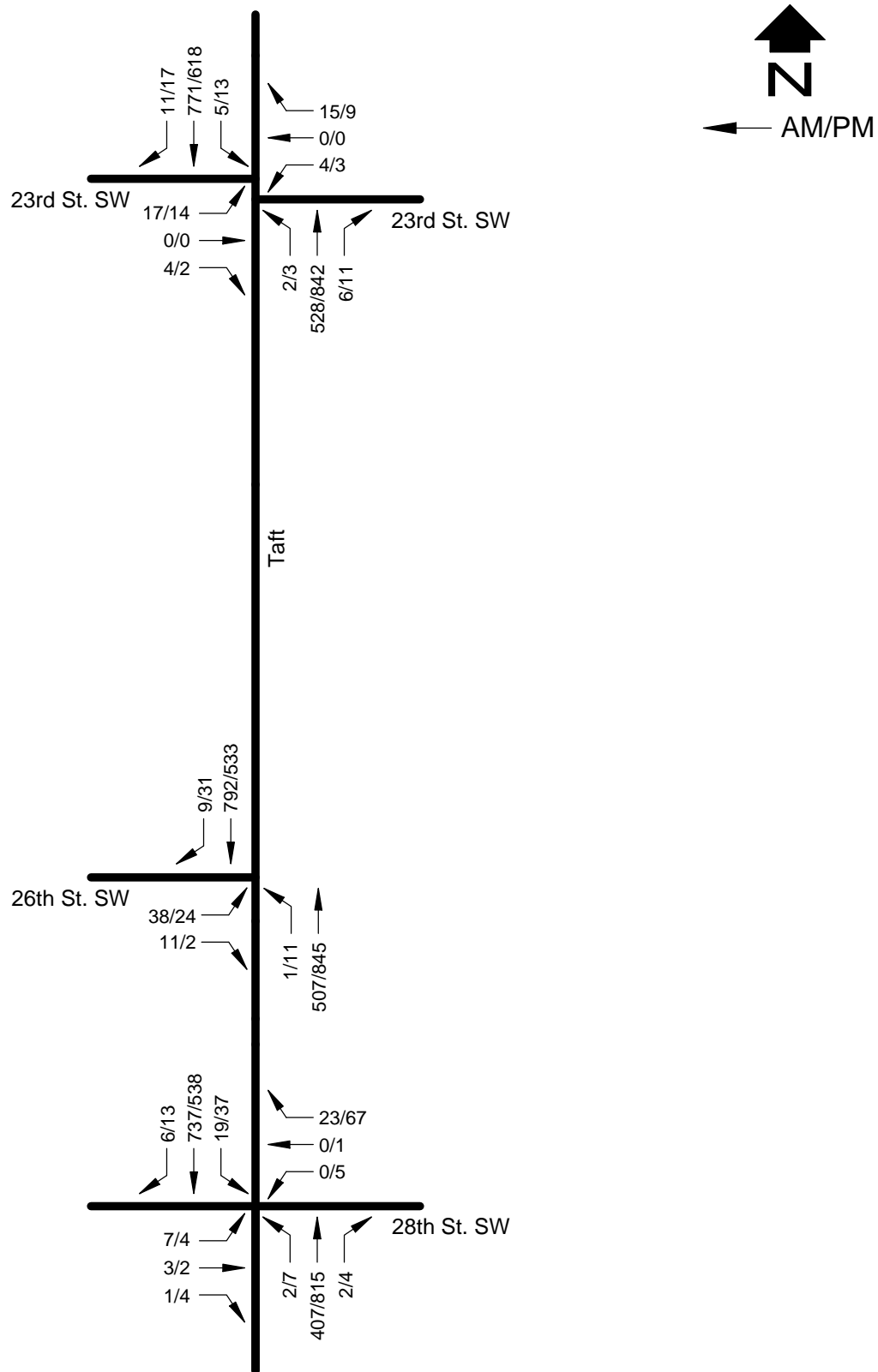
Using the volumes shown in Figure 4, the current peak hour operation at the Taft/23rd Street SW, Taft/26th Street SW, and Taft/28th Street SW intersections is shown in Table 1. Calculation forms for these analyses are provided in Appendix C. The City of Loveland provided information regarding existing signal timing for the Taft/23rd Street SW intersection. The key intersections were analyzed using the signalized and unsignalized intersection techniques from the Highway Capacity Manual, 6th Edition (2016HCM). Acceptable operation is defined by the City of Loveland as level of service (LOS) C or better overall. At major intersections, any leg can operate at level of service D and any movement can operate at level of service E. At minor intersections, any leg can operate at level of service E and any movement can operate at level of service F. A description of level of service at signalized and unsignalized intersections is provided in Appendix C. The Loveland Motor Vehicle LOS Standards are also provided in Appendix C. As can be seen in Table 1, the key intersections are currently meeting the Loveland level of service standards in the peak hours with existing control, signal timing, and geometry, except for the west leg of Taft/28th Street SW intersection during both peak hours.

Existing Pedestrians and Bicycles

During the vehicular traffic counts, pedestrian and bicycle traffic volumes were observed. The number of pedestrians and bicyclists was low. There are sidewalks on the west side of Taft Avenue, north of 23rd Street SW. South of 23rd Street SW, the sidewalk extends on the west side of Taft Avenue for approximately 600 feet. There are sidewalks on both sides of 23rd Street SW, east of Taft Avenue. West of Taft Avenue, there are sidewalks only on the south side of 23rd Street SW. There are no sidewalks along 26th Street SW or 28th Street SW. There are bicycle lanes along Taft Avenue.

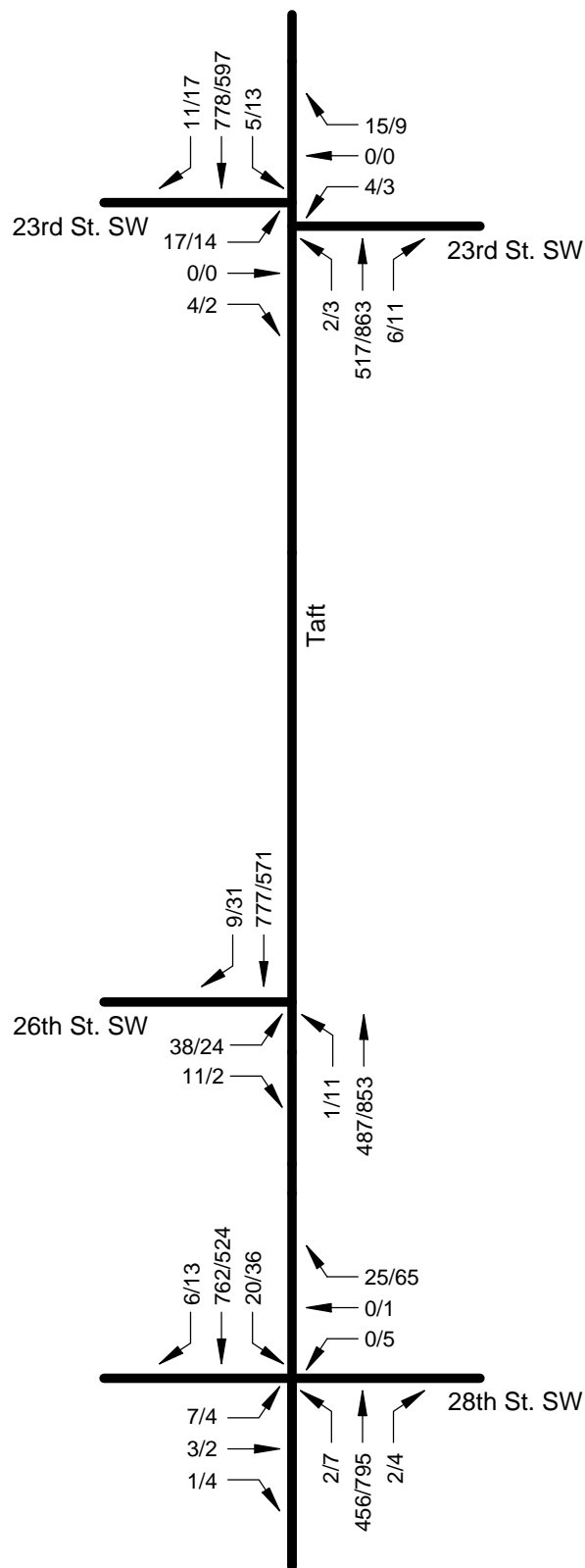
Accident Analysis

Accident data was obtained from the City of Loveland for the Taft/23rd Street SW, Taft/26th Street SW, and Taft/28th Street SW intersections for a three year period (10/1/15 to 9/30/18). At the Taft/23rd Street SW intersection, there were two reported



RECENT PEAK HOUR TRAFFIC

Figure 3



AVERAGED/BALANCED
RECENT PEAK HOUR TRAFFIC

Figure 4

TABLE 1
Current Peak Hour Operation

Intersection	Movement	Level of Service	
		AM	PM
Taft/23 rd Street SW (signal)	EB LT	D	D
	EB T/RT	A	A
	EB APPROACH	D	D
	WB LT	D	D
	WB T/RT	A	A
	WB APPROACH	D	D
	NB LT	D	D
	NB T/RT	A	B
	NB APPROACH	A	B
	SB LT	D	D
	SB T	A	A
	SB T/RT	A	A
	SB APPROACH	A	A
	OVERALL	A	B
Taft/26 th Street SW (stop sign)	EB LT/RT	C	C
	NB LT	A	A
	OVERALL	A	A
Taft/28 th Street SW (stop sign)	EB LT/T/RT	E	E
	WB LT/T/RT	B	C
	NB LT	A	A
	SB LT	A	A
	OVERALL	A	A

accidents: both were sideswipe accidents. At the Taft/26th Street SW intersection, there was one reported accident: a head-on accident or an accident involving a turning vehicle (no crash information). At the Taft/28th Street SW intersection, there was one reported accident: an accident involving turning vehicles. The number and type of accidents at the Taft/23rd Street SW, Taft/26th Street SW, and Taft/28th Street SW intersections are typical and are not considered to be “high” accident locations.

III. PROPOSED DEVELOPMENT

The Water's Edge is a proposed residential development. Figure 5 shows the site plan for the Water's Edge site and the adjacent parcel to the west. The Water's Edge development, as analyzed in this TIS, will consist of a 138 single family dwelling units. The analyses in this TIS assumed that Water's Edge development will be built out over the next 3-4 years, following approval. The analysis year for the short range future was assumed to be the year 2023 and the long range future was assumed to be the year 2040. There will be two full-movement accesses to/from 28th Street SW.

Trip Generation

Trip generation is important in considering the impact of a development on the existing and proposed street system. Trip Generation, 10th Edition, ITE was used to determine the trips that would be generated by the Water's Edge development. A trip is defined as a one-way vehicle movement from origin to destination. Table 2 shows the expected trip generation from the site on a daily and peak hour basis. The full development trip generation resulted in 1,510 daily trip ends, 113 morning peak hour trip ends, and 144 afternoon peak hour trip ends.

Code	Use	Size	AWDTE		AM Peak Hour				PM Peak Hour			
			Rate	Trips	Rate	In	Rate	Out	Rate	In	Rate	Out
210	Single Family Detached	138 D.U.	EQ	1510	EQ	28	EQ	85	EQ	90	EQ	54

Trip Distribution

Trip distribution for the Water's Edge site was estimated using knowledge of the existing and planned street system, existing traffic patterns, development trends, and engineering judgment. Figure 6 shows the trip distribution used in the following analyses. The trip distribution analysis was agreed to in the scoping discussions and is contained in Appendix A.

Traffic Assignment

Trip assignment is the product of both the trip generation and trip distribution processes. Figure 7 shows the site generated peak hour traffic at the key intersections.

Background Traffic Projections

Background traffic projections for the short range (2023) and long range (2040) future horizons were developed by factoring the volumes on the key streets by approximately two percent per year. The background traffic growth was agreed to by City of Loveland staff in the scoping discussions. Figures 8 and 9 show the short range (2023) and long range (2040) background peak hour traffic at the Taft/23rd Street SW, Taft/26th Street SW, and Taft/28th Street SW intersections, respectively. Long range (2040) traffic forecasts included development of Aspen Knolls (NE quadrant of the Taft/28th Street SW intersection), as well as development of other vacant land in the area.

Total Traffic

The traffic volumes generated by the proposed Water's Edge development were added to the background traffic volumes to produce the total traffic volume forecasts for the short range (2023) and long range (2040) futures. Figures 10 and 11 show the short range (2023) and long range (2040) total peak hour traffic, respectively.

Table 3 shows the short range (2023) link volumes for various key street segments with the Water's Edge development. Table 3 also shows the ACF volume thresholds for each street segment and whether that segment meets the Adequate Community Facilities Ordinance. The threshold volumes shown were calculated for this study. Calculations for the ACF threshold volumes are provided in Appendix D. Table 3 indicates that all links meet the requirements of the Adequate Community Facilities Ordinance, except for northbound Taft Avenue (from north of 23rd Street SW through 28th Street SW), and Taft Avenue in both directions, south of 28th Street SW. It is important to note that the ACF threshold volume for northbound Taft Avenue north of 28th Street SW, and for both directions of Taft Avenue south of 28th Street SW, are exceeded with the existing traffic volumes. The ACF Ordinance issues with these street links will be discussed at the end of this TIS in the Adequate Community Facilities section. Access A will have a daily volume of 1050-1100 vehicles. The threshold for a local street is <1000 vehicles per day (vpd). However, the short section of Access A that is over 1000 vpd has no driveways or access points. Therefore, this section of Access A should function adequately as a local street.

Signal Warrants

As a matter of policy, traffic signals are not installed at any location until such time that signal installation warrants are met according to the Manual on Uniform Traffic Control Devices. The Taft/23rd Street SW intersection is currently signalized. For the streets in the vicinity of the Water's Edge, four hour and/or eight hour signal warrants are applicable. These warrants require much data and are applied when the traffic is actually on the area road system. It is acknowledged that peak hour signal warrants should not be applied, but since the peak hour forecasts are readily available in a traffic impact study, it is reasonable to use them to estimate whether other signal warrants may be met. If peak

**TABLE 3
Street Traffic Volume Summary for the Existing and Short Range (2021) Conditions**

Street Segment		Direction	Existing Traffic Volume (AM/PM)	Date Existing Volume Taken	Regional Growth and Traffic from Build-out of Other Proposed Development* (AM/PM)	Site Generated Traffic (AM/PM)	Total Traffic (AM/PM)	ACF Traffic Threshold	ACF Compliance (AM/PM)
1	Taft Avenue north of 23 rd Street SW	NB	549/886	12/2018	760/1084	60/38	820/1122	810	N/N
		SB	794/627	12/2018	956/852	20/63	976/915	1790	Y/Y
2	Taft Avenue south of 23 rd Street SW	NB	525/877	12/2018	736/1075	60/38	796/1113	810	Y/N
		SB	786/602	12/2018	948/827	20/63	968/890	1790	Y/Y
3	Taft Avenue north of 28 th Street SW	NB	488/864	12/2018	699/1062	60/38	759/1100	810	Y/N
		SB	788/573	12/2018	950/798	20/63	970/861	810	N/N
4	Taft Avenue south of 28 th Street SW	NB	460/806	12/2018	668/997	7/22	675/1019	810	Y/N
		SB	763/533	12/2018	923/754	21/13	944/767	810	N/Y
5	28 th Street SW east of Taft Avenue	EB	25/42	12/2018	27/46	4/3	31/49	575	Y/Y
		WB	25/71	12/2018	28/78	1/5	29/83	575	Y/Y
6	28 th Street SW west of Taft Avenue	EB	11/10	12/2018	11/10	85/54	96/64	545	Y/Y
		WB	8/21	12/2018	8/21	28/90	36/111	545	Y/Y
° Approved developments, not yet built:			Heron Pointe, Heron Lakes, Prairie Star & Westhaven						
° Proposed developments, not yet approved:									
Notes/Comments									

hour signal warrants will not be met at a given intersection, it is reasonable to conclude that it is not likely that other signal warrants would be met. If peak hour signal warrants are met, it merely indicates that further evaluation should occur in the future as the development occurs. However, a judgment can be made that some intersections will likely meet other signal warrants.

Using the short range (2023) total peak hour traffic, the Taft/28th Street SW intersection will meet a peak hour signal warrant during the morning peak hour. In addition to this, based upon the traffic volume on Taft Avenue, the legs of 28th Street SW will operate unacceptably. Using the long range (2040) background and total peak hour traffic, the Taft/28th Street SW intersection meets peak hour signal warrants during the afternoon peak hour. Peak hour signal warrants are provided in Appendix E.

Geometric Requirements

Figure 12 shows the short range (2023) approach geometry at the Taft/23rd Street SW, Taft/26th Street SW, Taft/28th Street SW, 28th Street SW/Access A, and 28th Street SW/Access B intersections. As was mentioned earlier, northbound Taft Avenue has only one through lane in this area. An additional northbound through lane is required based upon the link volumes and not due to the operation at the various intersections. With signalization at the Taft/28th Street SW intersection, the east and west legs should have a left-turn lane and a combined through/right-turn lane. No other auxiliary lanes are required at the other key intersections.

Figure 13 shows the long range (2040) approach geometry at the Taft/23rd Street SW, Taft/26th Street SW, Taft/28th Street SW, 28th Street SW/Access A, and 28th Street SW/Access B intersections. The long range (2040) geometry was developed based upon the operation of the key intersections. It is assumed that Taft Avenue would have two through lanes in each direction by/before the long range (2040) future.

Operation Analysis

Operation analyses were performed at the Taft/23rd Street SW, Taft/26th Street SW, Taft/28th Street SW, 28th Street SW/Access A, and 28th Street SW/Access B intersections. The operations analyses were conducted for the short range future, reflecting a year 2023 condition, and long range future, reflecting a year 2040 condition. The long range (2040) operational analyses are used for planning and informational purposes only.

Table 4 shows the short range (2023) background peak hour operation at the Taft/23rd Street SW, Taft/26th Street SW, and Taft/28th Street SW intersections. The key intersections meet the Loveland level of service standards in the peak hours with the existing control, except for the east and west legs of the Taft/28th Street SW intersection with stop sign control. The minor street approaches at the Taft/28th Street SW intersection will experience delays commensurate with level of service E and F with stop

TABLE 4
Short Range (2023) Background Peak Hour Operation

Intersection	Movement	Level of Service	
		AM	PM
Taft/23 rd Street SW (signal)	EB LT	D	D
	EB T/RT	A	A
	EB APPROACH	D	D
	WB LT	D	D
	WB T/RT	A	A
	WB APPROACH	D	D
	NB LT	D	D
	NB T/RT	B	C
	NB APPROACH	B	C
	SB LT	D	D
	SB T	A	A
	SB T/RT	A	A
	SB APPROACH	A	A
	OVERALL	A	B
Taft/26 th Street SW (stop sign)	EB LT/RT	C	D
	NB LT	B	A
	OVERALL	A	A
Taft/28 th Street SW (stop sign)	EB LT/T/RT	F (67.7 secs)	F (89.7 secs)
	WB LT/T/RT	B	E (38.4 secs)
	NB LT	B	A
	SB LT	A	B
	OVERALL	A	A

sign control. The Taft/28th Street SW intersection meets the Loveland operational criteria with signal control. Calculation forms for these analyses are provided in Appendix F.

Table 5 shows the long range (2040) background peak hour operation at the Taft/23rd Street SW, Taft/26th Street SW, and Taft/28th Street SW intersections. Calculation forms are provided in Appendix G.

Using the traffic volumes shown in Figure 10, Table 6 shows the short range (2023) total peak hour operation at the Taft/23rd Street SW, Taft/26th Street SW, Taft/28th Street SW, 28th Street SW/Access A, and 28th Street SW/Access B intersections. Calculation forms for these analyses are provided in Appendix H. The key intersections meet the Loveland level of service standards in the peak hours, except for the east and west legs of the Taft/28th Street SW intersection as discussed in the short range (2023) background operation. The Taft/28th Street SW intersection meets the Loveland operational criteria with signal control.

Using the traffic volumes shown in Figure 11, Table 7 shows the long range (2040) total peak hour operation at the Taft/23rd Street SW, Taft/26th Street SW, Taft/28th Street SW, 28th Street SW/Access A, and 28th Street SW/Access B intersections. Calculation forms for these analyses are provided in Appendix I.

Cut-through Traffic

The City of Loveland requested a discussion regarding the potential of cut-through traffic in the neighborhood adjacent to Water's Edge. As was shown in the previous section, the minor street approaches at the Taft/28th Street SW intersection will experience delays commensurate with level of service E and F with stop sign control. The concern is that with longer delays at the Taft/28th Street SW intersection, drivers may use the adjacent neighborhood to access the Taft/26th Street SW intersection (T-intersection) or the Taft/23rd Street SW intersection (signal). The cut-through will only occur for exiting traffic.

The distance from the Taft/28th Street SW intersection to Access A is approximately 2,200 feet and to Access B is approximately 3,300 feet (on-centers). For analysis purposes, only distances from Access A will be discussed. The distance from the Taft/26th Street SW intersection, through the neighborhood, to Access A is approximately 2,850 feet (on-centers). The distance from the Taft/23rd Street SW intersection to Access A is approximately 4,150 feet (on-centers) and is very circuitous. The posted speed on 28th Street SW is 30 mph. Since the streets in the adjacent neighborhood are very narrow and some lack curb, gutter, and sidewalk, the maximum speed through the neighborhood is likely no more than 15-20 mph. At an average speed of 17.5 mph through the neighborhood, the calculated travel time is approximately 88 seconds to get from Access A to the Taft/26th Street SW intersection. This approximation was checked in the field at approximately 91 seconds. The

TABLE 5
Long Range (2040) Background Peak Hour Operation

Intersection	Movement	Level of Service	
		AM	PM
Taft/23 rd Street SW (signal)	EB LT	D	D
	EB T/RT	D	D
	EB APPROACH	D	D
	WB LT	D	D
	WB T/RT	D	D
	WB APPROACH	D	D
	NB LT	D	D
	NB T	A	A
	NB T/RT	A	A
	NB APPROACH	A	A
	SB LT	D	D
	SB T	B	A
	SB T/RT	A	A
	SB APPROACH	B	B
OVERALL	A	A	
Taft/26 th Street SW (stop sign)	EB LT/RT	D	D
	NB LT	B	B
	OVERALL	A	A
Taft/28 th Street SW (signal)	EB LT	D	D
	EB T/RT	D	D
	EB APPROACH	D	D
	WB LT	D	D
	WB T/RT	D	D
	WB APPROACH	D	D
	NB LT	A	A
	NB T	A	A
	NB RT	A	A
	NB APPROACH	A	A
	SB LT	A	A
	SB T	A	A
	SB RT	A	A
	SB APPROACH	A	A
OVERALL	A	A	

TABLE 6
Short Range (2023) Total Peak Hour Operation

Intersection	Movement	Level of Service	
		AM	PM
Taft/23 rd Street SW (signal)	EB LT	D	D
	EB T/RT	A	A
	EB APPROACH	D	D
	WB LT	D	D
	WB T/RT	A	A
	WB APPROACH	D	D
	NB LT	D	D
	NB T/RT	B	C
	NB APPROACH	B	C
	SB LT	D	D
	SB T	A	A
	SB T/RT	A	A
	SB APPROACH	A	A
OVERALL	B	B	
Taft/26 th Street SW (stop sign)	EB LT/RT	C	D
	NB LT	B	A
	OVERALL	A	A
Taft/28 th Street SW (stop sign)	EB LT/T/RT	F (366.6 secs)	F (770.4 secs)
	WB LT/T/RT	C	F (61.4 secs)
	NB LT	B	A
	SB LT	A	B
	OVERALL	C	D
Taft/28 th Street SW (signal)	EB LT	B	C
	EB T/RT	B	C
	EB APPROACH	B	C
	WB LT	A	C
	WB T/RT	B	C
	WB APPROACH	B	C
	NB LT	B	A
	NB T/RT	A	A
	NB APPROACH	A	A
	SB LT	A	B
	SB T	A	A
	SB RT	A	A
	SB APPROACH	A	A
OVERALL	A	A	
28 th Street SW/Access A (stop sign)	SB LT/RT	A	A
	EB LT/T	A	A
	OVERALL	A	A
28 th Street SW/Access B (stop sign)	SB LT/RT	A	A
	EB LT/T	A	A
	OVERALL	A	A

**TABLE 7
Long Range (2040) Total Peak Hour Operation**

Intersection	Movement	Level of Service	
		AM	PM
Taft/23 rd Street SW (signal)	EB LT	D	D
	EB T/RT	D	D
	EB APPROACH	D	D
	WB LT	D	D
	WB T/RT	D	D
	WB APPROACH	D	D
	NB LT	D	D
	NB T	A	A
	NB T/RT	A	A
	NB APPROACH	A	A
	SB LT	D	D
	SB T	B	B
	SB T/RT	B	B
	SB APPROACH	B	B
OVERALL	A	A	
Taft/26 th Street SW (stop sign)	EB LT/RT	D	D
	NB LT	B	B
	OVERALL	A	A
Taft/28 th Street SW (signal)	EB LT	D	D
	EB T/RT	D	D
	EB APPROACH	D	D
	WB LT	D	D
	WB T/RT	D	D
	WB APPROACH	D	D
	NB LT	A	A
	NB T	A	A
	NB RT	A	A
	NB APPROACH	A	A
	SB LT	A	A
	SB T	A	B
	SB RT	A	A
	SB APPROACH	A	B
OVERALL	A	B	
28 th Street SW/Access A (stop sign)	SB LT/RT	A	A
	EB LT/T	A	A
	OVERALL	A	A
28 th Street SW/Access B (stop sign)	SB LT/RT	A	A
	EB LT/T	A	A
	OVERALL	A	A

calculated travel time is approximately 152 seconds to get from Access A to the Taft/23rd Street SW intersection. This approximation was checked in the field at approximately 148 seconds. The average calculated delay for the eastbound leg at the Taft/26th Street SW intersection is approximately 26.8 seconds in the afternoon peak hour. The average calculated delay for the eastbound leg at the Taft/23rd Street SW intersection is approximately 47.2 seconds in the afternoon peak hour. The total average travel time and intersection delay to the Taft/26th Street SW intersection is approximately 116.3 seconds. The total average travel time and intersection delay to the Taft/23rd Street SW intersection is approximately 197.2 seconds.

The calculated delays for the minor street approaches at the Taft/28th Street SW intersection would indicate that drivers may become impatient and choose an alternative route (neighborhood) to access Taft Avenue. The calculated delay is approximately 547.9 secs in the afternoon peak hour. At an average speed of 30 mph on 28th Street SW, the calculated travel time is approximately 50 seconds to get from Access A to the Taft/28th Street SW intersection. The total average travel time and intersection delay to the Taft/28th Street SW intersection is approximately 597.9 seconds.

Through cursory observations, it is believed that the calculated delay does not adequately represent the actual operation of the Taft/28th Street SW intersection. The calculated delays for the existing eastbound traffic volumes at the Taft/28th Street SW intersection are 35.2 seconds in the morning peak hour and 38.6 seconds in the afternoon peak hour. Recent observations at this intersection indicate that the actual average delay is in the range of 15-20 seconds. One reason for this discrepancy in calculated versus actual delay is that the SYNCHRO analysis does not take into account the platooning of southbound vehicles caused by the signal at the Taft/14th Street SW intersection. This platooning of the southbound traffic causes significant gaps in the flow on Taft Avenue.

With stop sign control at the Taft/28th Street SW intersection, it is acknowledged that some of the exiting traffic (particularly during the peak hours) may choose to cut-through the adjacent neighborhood. There is little that can be done to prevent this with the current geometry and control and the Taft/28th Street SW intersection. The geometry and signal control improvements at the Taft/28th Street SW would reduce/eliminate the likelihood of the cut-through traffic.

Bicycle/Pedestrian Facilities

Bicycle lanes exist along Taft Avenue. It is expected that as streets are built and/or improved, bicycle lanes will be incorporated into the street cross sections where appropriate.

The sidewalk system in this area exists adjacent to developed parcels of land. Sidewalks will be built along the frontage of and within the Water's Edge development. As shown in Appendix J, two potential pedestrian destinations within 1320 feet of the

Water's Edge development were identified: 1) the residential neighborhood to the west of the site and 2) the residential neighborhood to the south of the site. Appendix J contains a graphic depicting the pedestrian influence area and these two pedestrian destinations. A pedestrian level of service worksheet is also provided in Appendix J. This worksheet shows the level of service for each quality indicator. Since the City of Loveland has no minimum level of service criteria, this level of service could not be indicated.

Adequate Community Facilities

All of the key intersections, except the Taft/28th Street SW intersection, meet the City of Loveland criteria of level of service C or better overall during the peak hours with regard to operation. Therefore, these intersections, with the control devices that either exist or will be installed and with the existing geometry, meet requirements of the Loveland Adequate Community Facilities Ordinance. At the Taft/28th Street SW intersection, the east and west legs will experience delays commensurate with level of service E and F with stop sign control with the background traffic. The Taft/28th Street SW intersection will operate acceptably with signalization. This intersection meets a peak hour signal warrant in the morning peak hour. This intersection should be monitored by the City of Loveland as the background traffic volumes on Taft Avenue increase.

As noted on Table 3, all street links meet the level of service C standard of the Loveland Adequate Community Facilities Ordinance, except for northbound Taft Avenue (from north of 23rd Street SW through 28th Street SW), and Taft Avenue in both directions, south of 28th Street SW. It is important to note that the ACF threshold volume for northbound Taft Avenue north of 28th Street SW, and for both directions of Taft Avenue south of 28th Street SW, are exceeded with the existing traffic volumes.

The ACF link volume is not considered to be an objective engineering based standard. It is a subjective measure of quality of life, as determined by City staff over 20 years ago. As demonstrated by the subject links described below, the increase in traffic was not due to growth in this area of the City, but rather by outside factors over which the City has no control. Therefore, application of this subjective measure is questionable. Clearly, as a measure of functional capacity, a single lane can handle the forecasted traffic. According to the 2010 Highway Capacity Manual, Chapter 17/Urban Street Segments, the capacity of an uncontrolled, unconflicted through movement is 1,800 vehicles per hour. The operational analyses provide a calculated Lane Group Capacity for each movement at an intersection. At the Taft/28th Street SW with signal control, the afternoon northbound through/right-turn movement has a calculated Lane Group Capacity of 1,315 vehicles per hour. That is the capacity of the northbound lane, south of 28th Street SW, with the delays associated with being stopped at the signal. It is concluded that the actual lane capacity for the northbound lane would be somewhere between 1,800 and 1,315 vehicles per hour.

Northbound Taft Avenue has only one through lane in this area. Approximately 370 feet north of 23rd Street SW (east leg), Taft Avenue widens with two northbound through lanes. The property at 2128 South Taft Avenue will need to be modified in order to accommodate the second northbound through lane. As shown on Table 3, the afternoon peak hour background volume for northbound Taft Avenue, just north of 28th Street SW, is 1,062 vehicles. The Water's Edge site generated traffic for this section is 38 vehicles in the afternoon peak hour. This is an approximate 3.5 percent impact to the link volume. It is important to note that, if a signal is installed at the Taft/28th Street SW intersection, the Water's Edge site traffic will be entering Taft Avenue when Taft Avenue traffic is stopped at the intersection. Therefore, the Water's Edge site traffic will not be impacting (joining) the Taft Avenue traffic flow until much further north where Taft Avenue is wider and has an additional lane. The east frontage along Taft Avenue, between 23rd Street SW (east leg) and 28th Street SW would customarily be built by the vacant property to the east. The necessary improvements should be a capital project of the City, since the thresholds are exceeded with the existing traffic volumes or wait until the adjacent property develops.

South of 28th Street SW is the area between Loveland and Berthoud where Taft Avenue narrows to a two-lane county road. Based upon correspondence with Larimer County staff, Taft Avenue (LCR17) is/will be under design to implement a three-lane cross section south of 28th Street SW. This segment is within the Loveland Growth Management Area (GMA), but not within the City. The design will not include pedestrian or bicycle facilities. As such, the ACF threshold for this segment will be exceeded with the background traffic (without Water's Edge). As shown on Table 3, the morning peak hour background volume for southbound Taft Avenue, just south of 28th Street SW, is 923 vehicles. The Water's Edge site generated traffic for this section is 21 vehicles in the morning peak hour. The afternoon peak hour background volume for northbound Taft Avenue, just south of 28th Street SW, is 997 vehicles. The Water's Edge site generated traffic for this section is 22 vehicles in the afternoon peak hour. Both of these are approximately 2.2 percent impact to the link volumes. The ACF link threshold determination is a subjective measure of level of service quality, not directly related to the actual capacity or level of service as determined in the 2016HCM. Making the types of improvements necessary to meet the ACF link threshold on Taft Avenue, south of 28th Street SW, is beyond a reasonable expectation for a given development. The necessary improvements should be a capital project of the City/County, since the thresholds are exceeded with the background traffic.

IV. CONCLUSIONS/RECOMMENDATIONS

This study assessed the transportation impacts associated with the development of the Water's Edge in Loveland, Colorado. This study analyzed the transportation impacts in the short range (2023) and long range (2040) futures. As a result of these analyses, the following is concluded:

- Development of the Water's Edge site is feasible from a traffic engineering standpoint. The full development trip generation resulted in 1,510 daily trip ends, 113 morning peak hour trip ends, and 144 afternoon peak hour trip ends.
- Current operation at the Taft/23rd Street SW, Taft/26th Street SW, and Taft/28th Street SW intersections is acceptable based upon City of Loveland evaluation criteria, except for the west leg of Taft/28th Street SW intersection during both peak hours.
- Using the short range (2023) total peak hour traffic, the Taft/28th Street SW intersection will meet a peak hour signal warrant in the morning peak hour. Using the long range (2040) background and total peak hour traffic, the Taft/28th Street SW intersection meets peak hour signal warrants during the morning and afternoon peak hours.
- The short range (2023) range geometry is shown in Figure 11. An additional northbound through lane on Taft Avenue is required based upon the link volumes and not due to the operation at the various intersections. . With signalization at the Taft/28th Street SW intersection, the east and west legs should have a left-turn lane and a combined through/right-turn lane. No other auxiliary lanes are required at the other key intersections for the short range (2023) future. The long range (2040) geometry is shown in Figure 12. It is assumed that Taft Avenue would have two through lanes in each direction by/before the long range (2040) future.
- Using the short range (2023) background traffic, the Taft/23rd Street SW, Taft/26th Street SW, and Taft/28th Street SW intersections operate at acceptable levels of service in the peak hours, except for the east and west legs of the Taft/28th Street SW intersection with stop sign control. The minor street approaches at the Taft/28th Street SW intersection will experience delays commensurate with level of service E and F with stop sign control.
- With short range (2023) traffic and the Water's Edge development, the Taft/23rd Street SW, Taft/26th Street SW, Taft/28th Street SW, 28th Street SW/Access A, and 28th Street SW/Access B intersections meet the Loveland level of service standards in the peak hours, except for the east and west legs of the Taft/28th Street SW intersection with stop sign control as discussed in the short range (2023) background operation. The Taft/28th Street SW intersection will meet the Loveland level of service criteria with signalization.

- Bicycle lanes exist along Taft Avenue. The sidewalk system in this area exists adjacent to developed parcels of land. As streets are improved, sidewalks will be incorporated to the standard cross sections.
- Table 8 shows a summary of the recommended improvements and the responsibility for that improvement.

TABLE 8			
Recommended Improvements Summary			
Improvement Description and Location	Responsible Party		
	Applicant	Background	Master Planned
SHORT RANGE (2023)			
On-site/adjacent infrastructure.	X		
Construct westbound 28 th Street SW (north side) to major collector cross section adjacent to Water's Edge site.	X		
Construct northbound Taft Avenue to four-lane arterial cross section.	X ¹	X ²	
Signal and additional geometry at Taft/28 th Street SW intersection	X		
LONG RANGE (2040)			
Construct Taft Avenue to four-lane arterial cross section south of 28 th Street SW		X	X

1 Contribution commensurate with the relative impact
 2 City capital project or adjacent property