

**MEMORANDUM**

TO: Sherri Sirwaitis, Case Manager
Planning and Zoning Department

CC: Members of the Zoning and Platting Commission
Jeff Howard, McLean & Howard, LLP

FROM: Andrew Linseisen, P.E.
Acting Assistant Director,
Development Services Department

Gordon Derr, P.E.
Assistant Director,
Austin Transportation Department

DATE: July 11, 2016

SUBJECT: Traffic Impact Analysis for Bull Creek Parcel
Zoning Case No. CD – 2015 - 0009

Section 25-6-113 of the Land Development Code requires that a traffic impact analysis be conducted for a project proposed with a zoning application if the project is anticipated to generate more than 2,000 daily trips. The project site of 75.59 acres is located east of Bull Creek Road and south of West 45th Street. The project is proposed to be built in two phases, the first to be completed in 2018, with full build out of Phase 2 in 2024.

The traffic impact analysis was to determine the likely consequences of the site development with respect to the following five components: data collection, trip generation, trip distribution, trip assignment and operational analysis.

A traffic model (using Synchro™ software) was developed to evaluate the intersection levels of service (LOS) and estimate congestion conflicts and queuing related to peak hour traffic accessing the site. Both existing and future conditions were studied.

As shown in the analysis, existing, future and site traffic will combine to support finding need for roadway improvements, including traffic signal improvements to serve future traffic volumes. Detailed analysis of the traffic model and resulting improvements will be continued at the time of site development permit plan review. All traffic operational analysis and resulting design elements are to be reviewed and approved by the Austin Transportation Department as part of the ongoing review

process in coordination with the Development Services Department. This memorandum will summarize the preliminary findings of the TIA and identify the agreed upon necessary mitigation measures. Further analysis at the time of site development permit plan review will result in more detailed elements of the proposed infrastructure improvements.

Summary of Project

The proposed development, called “The Grove at Shoal Creek” will be a mixed-use, urban infill redevelopment to be completed by 2024 and will include residential, retail and office uses. A detailed breakdown of the proposed land uses and intensities is shown in Table 1.

Access will come from five (5) proposed connections to Bull Creek Road, including one (1) public roadway (Jackson Avenue) which will cross the project site and connect to West 45th Street. Operationally, the points of access are as follows:

- Driveway 1 – located approximately 800 feet south of West 45th Street. Outbound left turns onto Bull Creek Road will not be permitted and a second northbound lane will facilitate outbound right turns when Phase 2 is complete.
- Driveway 2/Jackson Avenue – located across from Jackson Avenue and will be a public street, offering thru connection to West 45th Street (built as part of Phase 2).
- Driveway 3 – located across from 41st Street on Bull Creek Road.
- Driveway 4 – located across from 40th Street on Bull Creek, restricted to right in/right out operation only.
- Driveway 5 – located across from 42nd Street on Bull Creek.

Additional Analysis – Access to 45th Street

Vehicular access to West 45th Street was included in the TIA (as an extension of Jackson Avenue). The extension of Jackson Avenue is proposed to operate as a right-in/right-out connection. The analysis assigns 150 of the estimated 279 right turning site traffic vehicles from the intersection of Bull Creek Road/West 45th Street to the eastern connection, assuming they will travel through the intersection and use the new access point. The analysis also assumes that 100 of the estimated 151 right turning site traffic vehicles from northbound Bull Creek to eastbound 45th will exit the new access point. Additional detailed analysis of the crossing traffic from Bull Creek Road (or West 35th Street & Jackson Avenue) has not been included in this memorandum.

Surrounding network of roadways

MoPac is currently a major six lane divided freeway in the vicinity of the site with a posted speed limit of sixty-five miles per hour (65 MPH). The frontage roads offer connection to West 35th and West 45th Street respectively.

West 45th Street is a four lane undivided minor arterial roadway in the vicinity of the site with a posted speed limit of thirty-five miles per hour (35 MPH). There is sidewalk along the north side of West 45th Street in the vicinity of the site.

Bull Creek Road is a two lane undivided collector roadway with a posted speed limit of thirty-five miles per hour (35 MPH). There are bicycle lanes and sidewalk along both sides of the roadway in the vicinity of the site.

Jackson Avenue is a two lane undivided collector roadway with a posted speed limit of thirty miles per hour (30 MPH). Sidewalk is installed along the west side of the roadway.

Shoal Creek Boulevard is a two lane undivided roadway in the vicinity of the site. The posted speed limit is thirty miles per hour (30 MPH). Sidewalk is installed along both sides of the roadway.

Jefferson Street is a two lane divided roadway with a continuous center left turn lane between Bull Creek Road and West 35th Street. The posted speed limit is 30 MPH.

West 35th Street is a four lane undivided major arterial roadway with a posted speed limit of thirty-five miles per hour (35 MPH).

Trip Generation and Traffic Analysis

The proposed development will be mixed use, and include up to 110 single family dwelling units, 600 apartments, 425 condominium/townhouse units, 600 congregate care units, 25,000 SF of medical office, 200,000 SF of general office space, 55,000 SF of retail (shopping center) and 35,000 SF of supermarket land uses, plus pharmacy, bank, and other retail and commercial land uses. According to the 9th Edition of the ITE Trip Generation Manual, the total number of estimated daily trips (unadjusted) for this development is 23,969. A detailed table of the proposed land uses and intensities is presented in Table 1 below:

Table 1 provides the estimated daily trip generation rates for the proposed development.

Table 1 – Unadjusted Trip Generation		
Land Use	Size	Estimated Daily Trips
Single Family (210)	110 du	1146
Apartment (220)	600 du	3760
Residential Condo (230)	425 du	2265
Congregate Care (253)	600 du	1212
Health/Fitness Club (492)	7500 SF	247
General Office (710)	200,000 SF	2223
Medical Office (720)	25,000 SF	807
Specialty Retail (826)	55,000 SF	2438
Supermarket (850)	35,000 SF	3578
Pharmacy/Drugstore w/o DT (880)	8,500 SF	766
Walk-in Bank (911)	3,000 SF	364
Drinking Place (925)	8,000 SF	907
Quality Restaurant (931)	15,000 SF	1349
High Turnover Restaurant (932)	9,000	1144
Coffee/Donut shop w/o DT (936)	2,000 SF	1762
Totals		23,969

The scoping document allowed for the following trip reduction credits: Internal Capture: 10% for PM peak for office, residential, shopping center and supermarket land uses only, with a 5% AM peak reduction for Coffee shop. In addition, a transit reduction of 5% was allowed, with the understanding that negotiations with CapMetro are necessary to facilitate access to the site.

Current Capital Metro bus service (Routes #491 and #19) along Bull Creek Road is infrequent. Route #491 is run hourly three days a week during non-peak hours: Route #19 is run daily (every 35 to 40 minutes in each direction). To support the 5% transit reduction, approximately 73 trips during the AM Peak and approximately 102 trips during the PM Peak would use transit. Maintaining the current 35-40 minute headways offers transit access between four and five buses per peak hour (counting both directions). The TIA estimates future ridership demand (of approximately 20 to 26 riders per bus) would be met by current service levels, subject to CapMetro's assessment after build out. In addition, the applicant was granted the following trip reduction credits for non-motorized travel modes:

Table 2 – Non-motorized trip credits by land use		
Land Use	AM reduction	PM reduction
Office (ITE code 710)	4 %	4 %
Shopping Center/Retail (ITE codes 826/880)	3 %	3 %
Restaurant (ITE codes 925/931/932/936)	3 %	3 %

Staff also agreed that for certain identified land uses, additional trip reduction percentages would apply:

Table 3 – Pass by reduction rates (by land use)		
Land Use	AM reduction	PM reduction
Shopping Center (ITE codes 826)	0 %	34 %
Supermarket (ITE code 850)	0 %	36 %
Pharmacy w/o Drive-thru (ITE code 880)	0 %	34 %
Restaurant (ITE codes 925/931/932)	0 %	20%/34%/34%
Coffee shop w/o Drive-thru (ITE code 936)	20 %	34 %

As a result, the overall estimated daily trips are reduced from 23,969 to 19,442 daily trips as shown in Table 4 below.

Table 4 – Trip Generation (Adjusted)		
Land Use	Size	Adjusted Estimated Daily Trips
Single Family (210)	110 du	1032
Apartment (220)	600 du	3384
Residential Condo (230)	425 du	2038
Congregate Care (253)	600 du	1151
Health/Fitness Club (492)	7500 SF	235
General Office (710)	200,000 SF	1912
Medical Office (720)	25,000 SF	727
Specialty Retail (826)	55,000 SF	1706
Supermarket (850)	35,000 SF	2576
Pharmacy/Drugstore w/o DT (880)	8,500 SF	574
Walk-in Bank (911)	3,000 SF	355
Drinking Place (925)	8,000 SF	780
Quality Restaurant (932)	15,000 SF	1012
High Turnover Restaurant (932)	9,000	858
Coffee/Donut shop w/o DT (936)	2,000 SF	1101
Total adjusted daily trips		19,442

Due to the nature of the surrounding roadway network, and in combination with the proposed mix of land uses, the distribution of site related traffic was developed assuming approximately 50% of the site traffic will come from Mo-Pac. The other access routes are shown in Table 5, and were used to assign site traffic within the TIA analysis:

Table 5 – Trip Distribution		
Street Name	AM	PM
Mo-Pac/45 th Street (from the north)	20%	18%
Mo-Pac (from the south)	21%	17%
Mo-Pac/35 th Street (from the south)	12%	13%
Bull Creek Road (from the north)	4%	5%
Shoal Creek Blvd (from the north)	4%	6%
45 th Street (from the east)	17%	16%
35 th Street (from the west)	7%	9%
Jefferson Street (from the south)	5%	6%
Bull Creek Road (from the south)	10%	10%
Totals	100%	100%

Turning movement count data was collected at the following locations and times:

Table 6 – Peak Hour Turning Movement Traffic Counts	
Location	Date
Mo-Pac southbound frontage road & West 45 th Street	December 10, 2014
Mo-Pac northbound frontage road & West 45 th Street	December 10, 2014
West 45 th Street & Bull Creek Road	December 10, 2014
West 45 th Street & Shoal Creek Blvd	December 10, 2014
Mo-Pac/Jackson Street & West 35 th Street	December 10, 2014
Jefferson Street & Bull Creek Road	December 10, 2014
West 35 th Street & Jefferson Street	December 10, 2014
Bull Creek Road & Jackson Avenue	January 22, 2015
Mo-Pac southbound frontage & West 45 th Street/Highland Terrace	March 24, 2015

In addition, 24 hour daily volume traffic counts were conducted on the following streets:

Table 7 – 24 hour travel count data for residential streets	
Jackson Avenue	Week of March 24, 2015
Oakmont Street	Week of March 24, 2015
West 39 th Street	Week of March 24, 2015
West 40 th Street	Week of March 24, 2015
West 41 st Street	Week of March 24, 2015
West 42 nd Street	Week of March 24, 2015
West 44 th Street	Week of March 24, 2015
Lawton Avenue	Week of September 29, 2015

No background developments were identified and an annual growth rate of 1% was applied as determined from historic traffic volume data provided by TxDOT. The intersections identified for analysis were evaluated using the Highway Capacity Manual (HCM) method for capacity analysis. The results of the analysis are shown in the following tables:

- Table 8 – 2014 Existing Conditions
- Table 9 – 2018 No Build Conditions (no development)
- Table 10 – 2018 Build Conditions (Phase 1 of development)
- Table 11 – 2024 No Build Conditions (no development)
- Table 12 – 2024 Build Conditions (Phases 1 & 2 of development)

Analysis methodology and results

Operational analyses were performed for each intersection (AM and PM peak hour), to identify the capacity and congestion anticipated. The procedure follows the methodology set forth in the 5th Edition of the Transportation Research Board of the Highway Capacity Manual (HCM) 2010. All of the various scenarios, including existing and proposed conditions for this study area were analyzed using this methodology, which determines the intersection delay as the average control delay per vehicle for the signalized intersection. LOS refers to the perception by motorists of the

TABLE 8
ANALYSIS RESULTS FOR 2014 EXISTING CONDITONS

Intersection	Traffic Control Type	2014 EXISTING CONDITION											
		AM Peak Hour ²						PM Peak Hour ³					
		MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C	MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C
MoPac SBFR at 45th	Signal	25.5	C					17.2	B				
Westbound left		42.1	D	517	635	315	0.84	19.9	B	228	176	315	0.49
Southbound left		20.5	C	115	153	N/A	0.3	23.1	C	200	253	N/A	0.47
Southbound right		3.1	A	0	47	N/A	0.32	7.1	A	39	102	N/A	0.39
MoPac NBFR at 45th	Signal	42.2	D					41.0	D				
Eastbound left		23.1	C	8	15	340	0.1	29.8	C	60	61	340	0.67
Eastbound through		33	C	58	62	340	0.71	26.3	C	64	58	340	0.68
Westbound		4.1	A	22	22	N/A	0.57	14.1	B	151	523	N/A	0.71
Northbound		118.9	F	367	591	900	1.16	171.9	F	300	489	900	1.23
Southbound left		47	D	1	6	N/A	0.02	52.0	D	1	10	N/A	0.03
Southbound right		1.8	A	0	0	N/A	1.8	0.4	A	0	0	N/A	0.05
Bull Creek at 45th	Signal	67.9	E					68.2	E				
Eastbound		35.2	D	192	205	480	0.79	89.5	F	267	334	480	1.00
Westbound		107	F	391	522	N/A	1.1	48.8	D	308	390	N/A	0.83
Northbound left		46	D	72	123	130	0.58	78.5	E	323	523	130	0.96
Northbound through/right		36.6	D	69	131	N/A	0.33	60.6	E	277	447	N/A	0.86
Southbound left		33.1	C	14	191	130	0.08	51.0	D	14	39	130	0.12
Southbound through/right		88.5	F	36	358	N/A	0.94	77.0	E	99	207	N/A	0.81
MoPac NBFR at 35th/Jackson	Signal	280.3	F					65.7	E				
Eastbound left/through		37.2	D	335	411	N/A	0.68	78.0	E	323	429	N/A	0.92
Eastbound right		4.9	A	0	43	N/A	0.2	9.8	A	3	90	N/A	0.56
Westbound		49.6	D	426	554	N/A	0.94	35.8	D	774	813	N/A	0.83
Northbound		813.3	F	1355	1614	1050	2.75	255.1	F	370	569	1050	1.44
Southbound left		49.5	D	9	30	80	0.18	76.8	E	25	63	80	0.42
Southbound through/right		12.9	B	13	68	N/A	0.3	39.8	D	110	201	N/A	0.59
Bull Creek at Jefferson	Signal	9.6	A					17.8	B				
Eastbound left/through		8.8	A	8	16	N/A	0.1	15.0	B	15	41	N/A	0.10
Eastbound right		3.2	A	0	26	130	0.14	4.3	A	0	36	130	0.28
Westbound		8.3	A	6	37	N/A	0.08	18.3	B	74	150	N/A	0.45
Northbound left		18.5	B	8	33	130	0.17	27.4	C	83	155	130	0.67
Northbound through/right		12	B	6	37	N/A	0.27	11.8	B	8	31	N/A	0.13
Southbound left		17.5	B	2	15	100	0.05	20.7	C	3	14	100	0.04
Southbound through/right		17.7	B	7	32	N/A	0.16	20.0	B	24	61	N/A	0.40

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		AM Peak Hour ²						PM Peak Hour ³					
		MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C	MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C
35 th at Jefferson	Signal	14.9	B					25.6	C				
Eastbound left		11.1	B	3	22	180	0.27	5.7	A	2	6	180	5.70
Eastbound through/right		6.2	A	20	195	N/A	0.45	3.7	A	13	52	N/A	3.70
Westbound left		11.6	B	29	55	110	0.27	18.3	B	58	95	110	18.30
Westbound through/right		15.5	B	393	500	N/A	0.62	25.4	C	510	605	N/A	25.40
Northbound left		44.1	D	35	71	215	0.21	44.9	D	83	139	215	44.90
Northbound through		66.5	E	44	85	N/A	0.41	84.1	F	219	341	N/A	84.10
Northbound right		9	A	0	39	215	0.28	7.4	A	0	61	215	7.40
Southbound left		57.4	E	86	129	150	0.5	55.3	E	108	173	150	55.30
Southbound through		55.8	E	10	30	N/A	0.09	60.5	E	110	180	N/A	60.50
Southbound right		0.4	A	0	0	160	0.06	7.2	A	2	44	160	7.20
Bull Creek at Jackson	Two-Way Stop	0.7	A					6.9	A				
Eastbound	Stop	11.3	B	N/A	0.2	N/A	0.051	29.2	D	N/A	4.1	N/A	0.628
Northbound left	Free	8.2	A	N/A	0	N/A	0.002	7.6	A	N/A	0.0	N/A	0.002
45 th /Highland Terrace at MoPac Ramp	Two-Way Stop	8.6	A					126.8	F				
Eastbound	Stop	0	A	N/A	0	50	0	10.7	B	N/A	1.5	50	0.343
Westbound left	Stop	17.6	C	N/A	3.9	1200	0.591	230.8	F	N/A	36.0	1200	1.440
Westbound right	Stop	8.5	A	N/A	0	175	0.004	8.8	A	N/A	0.2	175	0.061
Shoal Creek at 45th	All-Way Stop	52.3	F					55.8	F				
Eastbound inside lane	Stop	41.8	E	N/A	7.9	N/A	0.306	38.9	E	N/A	6.6	N/A	0.782
Eastbound outside lane	Stop	47.4	E	N/A	8.9	N/A	0.067	37.3	E	N/A	6.4	N/A	0.762
Westbound inside lane	Stop	61.9	F	N/A	11	N/A	0.828	77.5	F	N/A	11.9	N/A	1.021
Westbound outside lane	Stop	49.3	E	N/A	9.3	N/A	0.869	76.8	F	N/A	12.0	N/A	1.100
Northbound left/through	Stop	17.4	C	N/A	1.3	N/A	0.944	64.2	F	N/A	10.1	N/A	0.934
Northbound right	Stop	12.7	B	N/A	0.2	100	0.878	13.8	B	N/A	0.7	100	0.198
Southbound left/through	Stop	76.9	F	N/A	12	N/A	1.041	39.2	E	N/A	6.2	N/A	0.761
Southbound right	Stop	12.6	B	N/A	0.5	100	0.146	13.2	B	N/A	0.4	100	0.121

1. MOE is seconds delay per vehicle.
2. 7:30 AM – 8:30 AM
3. 4:30 PM – 5:30 PM
4. 95th Queue for signalized intersection measured in feet and for non-signalized intersection measured in vehicles

TABLE 9
ANALYSIS RESULTS FOR 2018 NO BUILD CONDITONS

Intersection	Traffic Control Type	2018 NO BUILD CONDITIONS											
		AM Peak Hour ²						PM Peak Hour ³					
		MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C	MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C
MoPac SBFR at 45 th	Signal	20.3	C					13.9	B				
Westbound left		39.2	D	502	707	315	0.88	20.3	C	216	200	315	0.51
Southbound left		9.2	A	53	67	N/A	0.31	16.9	B	127	190	N/A	0.49
Southbound right		1	A	0	0	N/A	0.33	4.7	A	8	75	N/A	0.40
MoPac NBFR at 45 th	Signal	13.6	B					27.7	C				
Eastbound left		24.1	C	8	17	340	0.1	43.6	D	99	85	340	0.67
Eastbound through		32.9	C	58	72	340	0.71	40.8	D	104	80	340	0.68
Westbound		4.8	A	23	23	N/A	0.6	16.8	B	486	543	N/A	0.86
Northbound left/through		44.3	D	54	101	900	0.25	63.1	E	131	220	900	0.68
Northbound right		10.4	B	0	108	550	0.73	11.2	B	0	64	550	0.47
Southbound left		46	D	1	6	N/A	0.01	52.0	D	1	10	N/A	0.03
Southbound right		1.9	A	0	0	N/A	0.26	0.4	A	0	0	N/A	0.06
Bull Creek at 45th	Signal	79.3	E					73.7	E				
Eastbound		48	D	315	397	480	0.83	96.6	F	288	414	480	1.04
Westbound		122.5	F	420	552	N/A	1.15	55.4	E	325	435	N/A	0.88
Northbound left		47.6	D	74	128	130	0.61	83.2	F	342	556	130	0.98
Northbound through/right		37	D	73	137	N/A	0.34	63.0	E	294	478	N/A	0.88
Southbound left		33.1	C	14	37	130	0.09	51.1	D	15	41	130	0.12
Southbound through/right		92.3	F	200	376	N/A	0.96	80.5	F	104	218	N/A	0.83
MoPac NBFR at 35th/Jackson	Signal	52.9	D					42.2	D				
Eastbound left/through		38.1	D	354	433	N/A	0.71	80.9	F	338	458	N/A	0.94
Eastbound right		5.2	A	2	45	N/A	0.21	11.1	B	13	106	N/A	0.58
Westbound		55.1	E	451	583	N/A	0.98	33.5	C	804	858	N/A	0.86
Northbound left/through		140	F	270	450	1050	1.12	85.1	F	103	203	1050	0.72
Northbound right		52.6	D	267	537	700	1.01	10.1	B	0	75	700	0.48
Southbound left		45.2	D	9	29	80	0.12	55.0	E	24	57	80	0.15
Southbound through/right		13	B	14	69	N/A	0.31	41.7	D	120	214	N/A	0.61
Bull Creek at Jefferson	Signal	11.5	B					18.3	B				
Eastbound left/through		10.5	B	18	50	N/A	0.12	15.3	B	16	42	N/A	0.11
Eastbound right		7.8	A	0	36	130	0.38	5.6	A	0	38	130	0.38
Westbound		9.7	A	13	40	N/A	0.09	19.4	B	83	157	N/A	0.49
Northbound left		18.7	B	11	34	130	0.17	27.0	C	87	163	130	0.67
Northbound through/right		12.1	B	8	37	N/A	0.27	11.8	B	8	32	N/A	0.13
Southbound left		18.4	B	3	15	100	0.05	20.8	C	3	14	100	0.04
Southbound through/right		18.5	B	10	34	N/A	0.17	20.2	C	26	63	N/A	0.40

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Intersection	Traffic Control Type	2018 NO BUILD CONDITIONS											
		AM Peak Hour ²						PM Peak Hour ³					
		MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C	MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C
35 th at Jefferson	Signal	15.7	B					27.1	C				
Eastbound left		12.6	B	7	19	180	0.29	12.9	B	13	18	180	0.31
Eastbound through/right		6.7	A	74	232	N/A	0.47	5.8	A	88	124	N/A	0.40
Westbound left		12.1	B	31	57	110	0.29	19.2	B	98	58	110	0.38
Westbound through/right		16.5	B	431	536	N/A	0.65	27.1	C	637	969	N/A	0.73
Northbound left		44.5	D	36	74	215	0.21	44.5	D	145	83	215	0.38
Northbound through		66.7	E	45	88	N/A	0.42	84.6	F	365	204	N/A	0.83
Northbound right		9.6	A	0	44	215	0.29	7.4	A	62	17	215	0.35
Southbound left		58.6	E	90	136	150	0.52	56.3	E	186	108	150	0.65
Southbound through		55.5	E	10	30	N/A	0.09	60.1	E	190	108	N/A	0.42
Southbound right		0.4	A	0	0	160	0.06	9.0	A	52	19	160	0.28
Bull Creek at Jackson	Two-Way Stop	0.7	A					8.0	A				
Eastbound	Stop	11.5	B	N/A	0.2	N/A	0.054	33.6	D	N/A	4.8	N/A	0.681
Northbound left	Free	8.2	A	N/A	0.0	N/A	0.002	7.6	A	N/A	0.0	N/A	0.002
45 th /Highland Terrace at MoPac Ramp	Signal	27.9	C					19.0	B				
Eastbound		0.0	A	0	0	50	0	1.8	A	4	29	50	0.33
Westbound left		51.1	D	156	196	1200	0.72	26.2	C	232	197	1200	0.77
Westbound right		0.0	A	0	1	175	0.01	1.8	A	0	13	175	0.07
Northbound left		0.0	A	0	0	130	0	23.5	C	1	7	130	0.00
Northbound		4.0	A	6	13	N/A	0.04	17.8	B	15	47	N/A	0.08
Southbound		6.5	A	41	72	N/A	0.14	29.0	C	38	80	N/A	0.11
Shoal Creek at 45th	All-Way Stop	57.2	F					60.6	F				
Eastbound inside lane	Stop	46.3	E	N/A	8.6	N/A	0.863	45.3	E	N/A	7.5	N/A	0.826
Eastbound outside lane	Stop	53.4	F	N/A	9.8	N/A	0.911	42.4	E	N/A	7.2	N/A	0.805
Westbound inside lane	Stop	71.0	F	N/A	12.1	N/A	0.99	78.5	F	N/A	11.8	N/A	1.074
Westbound outside lane	Stop	55.8	F	N/A	10.2	N/A	0.925	77.8	F	N/A	11.9	N/A	1.165
Northbound left/through	Stop	17.8	C	N/A	1.4	N/A	0.32	77.6	F	N/A	11.5	N/A	0.979
Northbound right	Stop	12.8	B	N/A	0.2	100	0.07	14.1	B	N/A	0.8	100	0.209
Southbound left/through	Stop	77.6	F	N/A	11.9	N/A	1.098	44.8	E	N/A	7.0	N/A	0.808
Southbound right	Stop	12.9	B	N/A	0.5	100	0.155	13.5	B	N/A	0.4	100	0.128

1. MOE is seconds delay per vehicle.

2. 7:30 AM – 8:30 AM

3. 4:30 PM – 5:30 PM

4. 95th Queue for signalized intersection measured in feet and for non-signalized intersection measured in vehicles

TABLE 10
ANALYSIS RESULTS FOR 2018 BUILD CONDITONS

Intersection	Traffic Control Type	2018 BUILD CONDITIONS											
		AM Peak Hour ²						PM Peak Hour ³					
		MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C	MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C
MoPac SBFR at 45 th	Signal	25.7	C					14.4	B				
Westbound left		50.6	D	494	770	315	0.92	20.3	C	214	198	315	0.51
Southbound left		9.1	A	52	66	N/A	0.31	17.6	B	138	204	N/A	0.51
Southbound right		1.0	A	0	0	N/A	0.33	5.3	A	10	84	N/A	0.40
MoPac NBFR at 45 th	Signal	15.2	B					28.5	C				
Eastbound left		24.7	C	8	17	340	0.1	40.3	D	94	79	340	0.65
Eastbound through		33.1	C	58	72	340	0.71	39.6	D	105	79	340	0.70
Westbound		8.6	A	57	73	N/A	0.64	19.9	B	290	332	N/A	0.87
Northbound left/through		44.3	D	54	101	900	0.25	63.1	E	131	220	900	0.68
Northbound right		10.3	B	0	107	550	0.73	11.2	B	0	69	550	0.51
Southbound left		46.0	D	1	6	N/A	0.01	52.0	D	1	10	N/A	0.03
Southbound right		1.9	A	0	0	N/A	0.26	0.4	A	0	0	N/A	0.06
Bull Creek at 45th	Signal	61.5	E					58.7	E				
Eastbound		31.1	C	180	478	480	0.9	85.3	F	323	452	480	1.09
Westbound		92.2	F	390	521	N/A	1.06	42.6	D	325	469	N/A	0.78
Northbound dual lefts		59.7	E	76	115	400	0.6	55.3	E	170	217	400	0.75
Northbound through/right		38.0	D	101	168	N/A	0.46	49.3	D	258	450	N/A	0.78
Southbound left		46.5	D	17	44	130	0.11	48.5	D	15	40	130	0.13
Southbound through/right		90.0	F	199	385	N/A	0.95	63.5	E	108	196	N/A	0.73
MoPac NBFR at 35th/Jackson	Signal	54	D					42.9	D				
Eastbound left/through		39.2	D	357	437	N/A	0.72	78.9	E	346	465	N/A	0.93
Eastbound right		5.5	A	2	46	N/A	0.22	11.5	B	18	112	N/A	0.57
Westbound		55.3	E	451	583	N/A	0.98	35.4	D	831	860	N/A	0.90
Northbound left/through		166.3	F	280	458	1050	1.20	81.4	F	126	231	1050	0.74
Northbound right		48.4	D	246	528	700	1.00	9.6	A	0	74	700	0.46
Southbound left		43.8	D	9	29	80	0.11	53.6	D	24	56	80	0.15
Southbound through/right		11.6	B	14	47	N/A	0.36	38.8	D	118	212	N/A	0.58
Bull Creek at Jefferson	Signal	11.4	B					18.6	B				
Eastbound left/through		10.6	B	21	57	N/A	0.13	16.0	B	17	45	N/A	0.12
Eastbound right		7.8	A	0	36	130	0.40	5.3	A	0	38	130	0.37
Westbound		9.7	A	12	39	N/A	0.09	21.4	C	89	173	N/A	0.55
Northbound left		18.6	B	11	33	130	0.16	25.9	C	89	165	130	0.66
Northbound through/right		12.0	B	8	37	N/A	0.27	11.3	B	8	31	N/A	0.13
Southbound left		18.4	B	3	15	100	0.05	20.7	C	3	14	100	0.04
Southbound through/right		18.5	B	10	34	N/A	0.17	20.0	B	25	63	N/A	0.39

TABLE 10
ANALYSIS RESULTS FOR 2018 BUILD CONDITONS

Intersection	Traffic Control Type	2018 BUILD CONDITIONS											
		AM Peak Hour ²						PM Peak Hour ³					
		MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C	MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C
35 th at Jefferson	Signal	15.5	B					27.6	C				
Eastbound left		11.9	B	7	18	180	0.28	13.2	B	8	14	180	0.31
Eastbound through/right		6.6	A	65	219	N/A	0.46	5.7	A	54	89	N/A	0.40
Westbound left		12.0	B	30	57	110	0.29	19.4	B	65	98	110	0.38
Westbound through/right		16.3	B	417	537	N/A	0.67	27.4	C	575	637	N/A	0.73
Northbound left		45.1	D	36	74	215	0.23	44.2	D	84	145	215	0.37
Northbound through		66.5	E	44	87	N/A	0.42	86.8	F	237	389	N/A	0.85
Northbound right		9.6	A	0	44	215	0.29	7.4	A	0	62	215	0.35
Southbound left		54.4	D	80	136	150	0.48	56.5	E	110	192	150	0.66
Southbound through		55.9	E	17	45	N/A	0.14	59.6	E	114	190	N/A	0.42
Southbound right		0.4	A	0	0	160	0.05	9.0	A	8	52	160	0.27
Bull Creek at Jackson	Two-Way Stop	0.6	A					5.3	A				
Eastbound	Stop	12.8	B	N/A	0.2	N/A	0.064	25.3	D	N/A	3.7	N/A	0.591
Northbound left	Free	8.3	A	N/A	0.0	N/A	0.002	7.9	A	N/A	0.0	N/A	0.003
45 th /Highland Terrace at MoPac Ramp	Signal	28.0	C					18.4	B				
Eastbound		0.0	A	0	0	50	0	1.7	A	4	26	50	0.33
Westbound left		51.4	D	155	195	1200	0.73	24.3	C	230	187	1200	0.76
Westbound right		0.0	A	0	1	175	0.01	1.6	A	0	12	175	0.07
Northbound left		0.0	A	0	0	130	0	27.5	C	1	7	130	0.00
Northbound		7.4	A	11	24	N/A	0.04	22.1	C	20	51	N/A	0.09
Southbound		6.4	A	40	71	N/A	0.14	30.9	C	41	84	N/A	0.12
Shoal Creek at 45th	All-Way Stop	60.0	F					61.3	F				
Eastbound inside lane	Stop	55.9	F	N/A	10.1	N/A	0.917	46.8	E	N/A	7.8	N/A	0.834
Eastbound outside lane	Stop	60.7	F	N/A	10.9	N/A	0.944	43.4	E	N/A	7.3	N/A	0.815
Westbound inside lane	Stop	70.6	F	N/A	12.1	N/A	0.981	78.7	F	N/A	11.8	N/A	1.123
Westbound outside lane	Stop	55.6	F	N/A	10.2	N/A	0.916	78.0	F	N/A	11.9	N/A	1.204
Northbound left/through	Stop	17.9	C	N/A	1.4	N/A	0.321	79.1	F	N/A	11.7	N/A	0.989
Northbound right	Stop	12.9	B	N/A	0.2	100	0.071	14.2	B	N/A	0.8	100	0.210
Southbound left/through	Stop	77.9	F	N/A	11.9	N/A	1.113	45.2	E	N/A	7.0	N/A	0.808
Southbound right	Stop	12.9	B	N/A	0.5	100	0.151	13.8	B	N/A	0.5	100	0.154
Bull Creek at Driveway 3	Two-Way Stop	4.1	A					4.6	A				
Eastbound	Stop	11.1	B	N/A	0.0	N/A	0.015	31.3	D	N/A	1.0	N/A	0.264
Westbound left/throughs	Stop	12.8	B	N/A	0.4	N/A	0.124	29.8	D	N/A	0.8	N/A	0.213
Wesbbound rights	Stop	9.4	A	N/A	0.5	N/A	0.136	13.2	B	N/A	0.4	N/A	0.127
Southbound lefts	Free	7.5	A	N/A	0.1	N/A	0.021	9.3	A	N/A	0.4	N/A	0.128
Northbound lefts	Free	7.7	A	N/A	0.0	N/A	0.003	7.5	A	N/A	0.0	N/A	0.007

1. MOE is seconds delay per vehicle.

2. 7:30 AM – 8:30 AM

3. 4:30 PM – 5:30 PM

4. 95th Queue for signalized intersection measured in feet and for non-signalized intersection measured in vehicles

TABLE 11
ANALYSIS RESULTS FOR 2024 NO BUILD CONDITONS

Intersection	Traffic Control Type	2024 NO BUILD CONDITIONS											
		AM Peak Hour ²						PM Peak Hour ³					
		MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C	MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C
MoPac SBFR at 45 th	Signal	27.6	C					13.5	B				
Westbound left		56	E	538	782	315	0.93	20.2	C	209	182	315	0.54
Southbound left		9.3	A	56	71	N/A	0.33	18.2	B	149	212	N/A	0.52
Southbound right		0.3	A	0	0	N/A	0.20	0.3	A	0	0	N/A	0.23
MoPac NBFR at 45 th	Signal	14.2	B					30.5	C				
Eastbound left		24	C	8	18	340	0.10	39.8	D	96	78	340	0.68
Eastbound through		32.8	C	63	77	340	0.73	37.2	D	101	74	340	0.69
Westbound		5.8	A	41	23	N/A	0.65	24.0	C	533	554	N/A	0.94
Northbound left/through		44.5	D	56	105	900	0.26	66.0	E	140	241	900	0.72
Northbound right		10.7	B	0	114	550	0.75	11.1	B	0	65	550	0.48
Southbound left		46	D	1	6	N/A	0.01	52.0	D	1	10	N/A	0.03
Southbound right		2.3	A	0	3	N/A	0.27	0.4	A	0	0	N/A	0.06
Bull Creek at 45th	Signal	92.3	F					95.7	F				
Eastbound		51.7	D	345	427	480	0.88	114.3	F	323	449	480	1.10
Westbound		148.7	F	466	600	N/A	1.22	93.1	F	352	480	N/A	0.93
Northbound left		51.6	D	80	141	130	0.66	99.3	F	395	601	130	1.05
Northbound through/right		37.8	D	78	145	N/A	0.35	72.9	E	318	522	N/A	0.94
Southbound left		33.2	C	15	38	130	0.09	51.2	D	16	43	130	0.13
Southbound through/right		107.6	F	229	408	N/A	1.03	86.9	F	113	240	N/A	0.87
MoPac NBFR at 35th/Jackson	Signal	66.1	E					45.8	D				
Eastbound left/through		39.7	D	384	467	N/A	0.75	92.8	F	365	504	N/A	1.00
Eastbound right		6	A	6	52	N/A	0.23	13.5	B	29	132	N/A	0.61
Westbound		69.4	E	520	644	N/A	1.04	33.3	C	901	950	N/A	0.92
Northbound left/through		177.8	F	309	491	1050	1.23	106.8	F	114	236	1050	0.86
Northbound right		74.7	E	378	627	700	1.08	10.1	B	0	77	700	0.50
Southbound left		46.8	D	10	30	80	0.15	55.5	E	26	59	80	0.16
Southbound through/right		13	B	15	72	N/A	0.33	44.3	D	132	230	N/A	0.65
Bull Creek at Jefferson	Signal	11.6	B					19.0	B				
Eastbound left/through		10.6	B	19	53	N/A	0.12	16.0	B	18	45	N/A	0.14
Eastbound right		7.8	A	0	37	130	0.39	4.9	A	0	38	130	0.36
Westbound		9.8	A	14	43	N/A	0.10	24.0	C	89	170	N/A	0.65
Northbound left		18.7	B	12	35	130	0.17	25.5	C	87	179	130	0.64
Northbound through/right		12	B	8	38	N/A	0.28	11.7	B	8	34	N/A	0.13
Southbound left		18.5	B	3	16	100	0.05	20.5	C	4	15	100	0.04
Southbound through/right		18.6	B	11	36	N/A	0.17	19.3	B	26	67	N/A	0.38

TABLE 11
ANALYSIS RESULTS FOR 2024 NO BUILD CONDITONS

Intersection	Traffic Control Type	2024 NO BUILD CONDITIONS											
		AM Peak Hour ²						PM Peak Hour ³					
		MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C	MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C
35 th at Jefferson	Signal	16.4	B					29.0	C				
Eastbound left		18.2	B	10	19	180	0.35	18.0	B	11	21	180	0.35
Eastbound through/right		7.3	A	117	234	N/A	0.49	5.3	A	74	88	N/A	0.42
Westbound left		12.2	B	34	53	110	0.33	20.0	B	71	104	110	0.43
Westbound through/right		16.9	B	494	523	N/A	0.69	29.0	C	657	705	N/A	0.78
Northbound left		45.4	D	38	78	215	0.23	45.9	D	89	154	215	0.41
Northbound through		66.9	E	48	93	N/A	0.44	89.4	F	240	395	N/A	0.87
Northbound right		10.1	B	0	48	215	0.30	11.2	B	19	90	215	0.38
Southbound left		61.8	E	95	145	150	0.57	63.1	E	116	208	150	0.73
Southbound through		55.8	E	11	32	N/A	0.10	61.2	E	119	198	N/A	0.45
Southbound right		0.4	A	0	0	160	0.06	12.5	B	20	68	160	0.30
Bull Creek at Jackson	Two-Way Stop	0.7	A					10.2	B				
Eastbound	Stop	11.7	B	N/A	0.2	N/A	0.059	43.2	E	N/A	6.2	N/A	0.769
Northbound left	Free	8.3	A	N/A	0.0	N/A	0.002	7.6	A	N/A	0.0	N/A	0.002
45 th /Highland Terrace at MoPac Ramp	Signal	27.8	C					17.3	B				
Eastbound		0.0	A	0	0	50	0.00	1.5	A	4	26	50	0.33
Westbound left		50.1	D	166	205	1200	0.73	22.1	C	224	189	1200	0.75
Westbound right		0.0	A	0	1	175	0.01	1.4	A	0	11	175	0.07
Northbound left		0.0	A	0	0	130	0.00	26.5	C	1	7	130	0.01
Northbound		4.7	A	6	16	N/A	0.04	20.8	C	20	54	N/A	0.10
Southbound		7.1	A	46	80	N/A	0.15	33.0	C	45	88	N/A	0.14
Shoal Creek at 45th	All-Way Stop	65.5	F					64.7	F				
Eastbound inside lane	Stop	58.5	F	N/A	10.4	N/A	0.926	55.0	F	N/A	8.9	N/A	0.893
Eastbound outside lane	Stop	68.8	F	N/A	11.9	N/A	0.972	50.7	F	N/A	8.4	N/A	0.871
Westbound inside lane	Stop	74.2	F	N/A	12.4	N/A	1.052	78.2	F	N/A	11.8	N/A	1.136
Westbound outside lane	Stop	72.3	F	N/A	12.4	N/A	0.988	77.5	F	N/A	11.9	N/A	1.219
Northbound left/through	Stop	18.5	C	N/A	1.5	N/A	0.343	79.9	F	N/A	11.6	N/A	1.066
Northbound right	Stop	13.0	B	N/A	0.2	100	0.077	14.6	B	N/A	0.9	100	0.225
Southbound left/through	Stop	77.6	F	N/A	11.9	N/A	1.161	54.9	F	N/A	8.3	N/A	0.861
Southbound right	Stop	13.1	B	N/A	0.6	100	0.165	13.7	B	N/A	0.5	100	0.137

1. MOE is seconds delay per vehicle.

2. 7:30 AM – 8:30 AM

3. 4:30 PM – 5:30 PM

4. 95th Queue for signalized intersection measured in feet and for non-signalized intersection measured in vehicles

TABLE 12
ANALYSIS RESULTS FOR 2024 BUILD CONDITONS

Intersection	Traffic Control Type	2024 BUILD CONDITIONS											
		AM Peak Hour ²						PM Peak Hour ³					
		MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C	MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C
MoPac SBFR at 45 th	Signal	32.6	C					16.0	B				
Westbound left		58	E	695	893	315	0.98	15.9	B	120	95	315	0.64
Southbound left		21.4	C	207	244	N/A	0.49	25.2	C	248	336	N/A	0.67
Southbound right		0.3	A	0	0	N/A	0.2	0.3	A	0	0	N/A	0.23
MoPac NBFR at 45 th	Signal	20.6	C					37.3	D				
Eastbound left		6.3	A	2	3	340	0.08	21.5	C	47	53	340	0.59
Eastbound through		13.1	B	22	19	340	0.76	23.0	C	64	62	340	0.76
Westbound		23.4	C	358	652	N/A	0.88	46.7	D	369	784	N/A	1.08
Northbound left/through		45.6	D	57	106	900	0.27	78.8	E	143	265	900	0.82
Northbound right		20.9	C	45	282	550	0.87	12.9	B	0	90	550	0.68
Southbound left		48.0	D	1	6	N/A	0.01	54.5	D	2	11	N/A	0.03
Southbound right		9.7	A	0	36	N/A	0.34	0.5	A	0	0	N/A	0.06
Bull Creek at 45th	Signal	45.8	D					36.2	D				
Eastbound left		8.2	A	13	17	100	0.27	13.7	B	11	19	100	0.24
Eastbound through/right		35.7	D	483	628	480	0.99	23.7	C	334	449	480	0.92
Westbound left		64.0	E	133	286	250	0.90	42.2	D	135	251	250	0.74
Westbound through/right		27.9	C	254	320	N/A	0.59	29.2	C	255	322	N/A	0.60
Northbound dual lefts		92.1	F	170	254	400	0.86	57.9	E	275	379	400	0.89
Northbound through		40.1	D	57	138	N/A	0.23	35.7	D	186	323	N/A	0.54
Northbound right		6.3	A	17	55	250	0.32	5.7	A	36	75	250	0.33
Southbound left		39.6	D	16	43	130	0.08	48.2	D	15	41	130	0.11
Southbound through/right		94.2	F	237	427	N/A	0.99	86.0	F	147	288	N/A	0.90
MoPac NBFR at 35th/Jackson	Signal	64.7	E					40.7	D				
Eastbound left/through		41.4	D	411	499	N/A	0.79	100.7	F	432	566	N/A	1.04
Eastbound right		6.7	A	10	56	N/A	0.23	0.3	A	0	0	N/A	0.22
Westbound		69.8	E	521	644	N/A	1.04	22.5	C	763	657	N/A	0.92
Northbound left/through		157.4	F	384	584	1050	1.19	91.1	F	221	371	1050	0.87
Northbound right		74.7	E	378	627	700	1.08	10.7	B	0	79	700	0.52
Southbound left/through		45.5	D	25	58	80	0.18	75.1	E	81	146	80	0.58
Southbound right		8.4	A	0	73	N/A	0.49	11.0	B	0	94	N/A	0.63
Bull Creek at Jefferson	Signal	11.9	B					22.1	C				
Eastbound left/through		11.7	B	33	85	N/A	0.20	17.2	B	39	82	N/A	0.26
Eastbound right		7.0	A	0	40	130	0.42	4.7	A	0	41	130	0.39
Westbound		11.3	B	27	73	N/A	0.17	29.7	C	125	264	N/A	0.76
Northbound left		19.1	B	21	51	130	0.26	30.6	C	115	241	130	0.73
Northbound through/right		11.2	B	8	38	N/A	0.26	11.8	B	9	34	N/A	0.13
Southbound left		19.3	B	3	16	100	0.05	20.7	C	4	15	100	0.05
Southbound through/right		19.3	B	11	37	N/A	0.17	20.6	C	29	67	N/A	0.41
35 th at Jefferson	Signal	19.3	B					32.5	C				
Eastbound left		23.4	C	14	24	180	0.36	30.7	C	23	37	180	0.39
Eastbound through/right		11.5	B	147	424	N/A	0.52	8.2	A	72	91	N/A	0.45
Westbound left		13.1	B	34	57	110	0.34	21.9	C	69	104	110	0.46
Westbound through/right		18.6	B	495	563	N/A	0.71	32.5	C	636	705	N/A	0.82
Northbound left		44.2	D	37	76	215	0.24	44.4	D	91	154	215	0.41
Northbound through		68.3	E	76	129	N/A	0.55	87.3	F	308	515	N/A	0.90
Northbound right		9.9	A	0	45	215	0.31	12.4	B	25	95	215	0.39
Southbound left		51.7	D	81	139	150	0.49	62.5	E	119	231	150	0.74
Southbound through		54.7	D	38	78	N/A	0.22	60.9	E	165	256	N/A	0.50
Southbound right		0.2	A	0	0	160	0.04	13.0	B	23	71	160	0.28

TABLE 12
ANALYSIS RESULTS FOR 2024 BUILD CONDITONS

Intersection	Traffic Control Type	2024 BUILD CONDITIONS											
		AM Peak Hour ²						PM Peak Hour ³					
		MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C	MOE ¹	LOS	50th Queue	95th Queue ⁴	Bay Length	V/C
Bull Creek at Jackson/Driveway 2	Signal	16.3	B					38.0	D				
Eastbound left		17.2	B	19	55	100	0.19	53.8	D	158	278	100	0.86
Eastbound through/right		26.4	C	23	68	N/A	0.19	36.4	D	47	93	N/A	0.27
Westbound left		17.2	B	18	54	100	0.19	29.9	C	37	74	100	0.36
Westbound through		30.1	C	31	85	100	0.32	82.6	F	73	176	100	0.84
Westbound right		9.5	A	0	49	100	0.40	13.7	B	0	55	100	0.60
Northbound left		9.5	A	0	4	150	0.00	7.3	A	1	4	150	0.01
Northbound through		21.2	C	110	209	N/A	0.42	46.1	D	408	657	N/A	0.95
Northbound right		0.2	A	0	0	150	0.07	0.1	A	0	0	150	0.04
Southbound left		10.7	B	32	72	300	0.29	38.4	D	51	159	300	0.78
Southbound through/right		14.4	B	120	316	N/A	0.53	11.2	B	94	186	N/A	0.36
45 th /Highland Terrace at MoPac Ramp	Signal	27.8	C					17.8	B				
Eastbound		0.0	A	0	0	50	0.00	1.8	A	10	38	50	0.35
Westbound left		47.5	D	192	229	1200	0.75	19.2	B	203	267	1200	0.77
Westbound right		0.0	A	0	1	175	0.01	1.4	A	0	13	175	0.06
Northbound left		0.0	A	0	0	130	0.00	37.0	D	1	6	130	0.01
Northbound		14.9	B	35	73	N/A	0.06	34.7	C	42	68	N/A	0.18
Southbound		8.8	A	62	105	N/A	0.19	37.2	D	59	93	N/A	0.19
Shoal Creek at 45th	All-Way Stop	69.7	F					72.5	F				
Eastbound inside lane	Stop	74.6	F	N/A	12.4	N/A	1.149	79.3	F	N/A	11.7	N/A	1.099
Eastbound outside lane	Stop	74.2	F	N/A	12.4	N/A	1.124	78.6	F	N/A	11.8	N/A	0.234
Westbound inside lane	Stop	74.7	F	N/A	12.3	N/A	1.207	79.0	F	N/A	11.7	N/A	1.164
Westbound outside lane	Stop	74.2	F	N/A	12.4	N/A	1.135	78.4	F	N/A	11.8	N/A	1.032
Northbound left/through	Stop	18.9	C	N/A	1.5	N/A	0.349	81.4	F	N/A	11.4	N/A	1.332
Northbound right	Stop	13.2	B	N/A	0.3	100	0.078	15.2	C	N/A	0.9	100	1.426
Southbound left/through	Stop	78.1	F	N/A	11.8	N/A	1.176	57.7	F	N/A	8.5	N/A	0.876
Southbound right	Stop	14.2	B	N/A	0.9	100	0.235	15.9	C	N/A	1.1	100	0.270
Bull Creek at Driveway 1	Two-Way Stop	1.5	A					1.6	A				
Westbound right	Stop	0.0	A	N/A	0.0	210	0.000	0.0	A	N/A	0.0	210	0.000
Southbound lefts	Free	9.6	A	N/A	0.9	N/A	0.231	15.1	C	N/A	1.8	N/A	0.385
Bull Creek at Driveway 3/41st	Two-Way Stop	2.4	A					6.2	A				
Eastbound	Stop	15.2	C	N/A	0.1	N/A	0.047	52.5	F	N/A	1.9	N/A	0.440
Westbound left/through	Stop	17.5	C	N/A	0.4	90	0.120	51.3	F	N/A	1.9	90	0.433
Westbound right	Stop	10.1	B	N/A	0.2	90	0.066	14.9	B	N/A	0.5	90	0.132
Northbound lefts	Free	8.0	A	N/A	0.0	N/A	0.004	7.7	A	N/A	0.0	N/A	0.008
Southbound lefts	Free	7.9	A	N/A	0.1	N/A	0.037	9.7	A	N/A	0.4	N/A	0.120
Bull Creek at Driveway 4	Two-Way Stop	1.1	A					0.8	A				
Westbound right	Stop	9.8	A	N/A	0.3	85	0.090	14.9	B	N/A	0.5	85	0.132
Bull Creek at Driveway 5/42nd	Two-Way Stop	2.4	A					8.9	A				
Eastbound	Stop	14.9	B	N/A	0.1	N/A	0.026	76.1	F	N/A	2.5	N/A	0.543
Westbound left/through	Stop	17.6	C	N/A	0.5	190	0.152	97.2	F	N/A	3.4	190	0.681
Westbound right	Stop	10.6	B	N/A	0.3	190	0.103	15.0	C	N/A	0.2	190	0.070
Northbound lefts	Free	8.0	A	N/A	0.0	N/A	0.001	7.9	A	N/A	0.0	N/A	0.008
Southbound lefts	Free	8.0	A	N/A	0.1	N/A	0.019	10.1	B	N/A	0.5	N/A	0.145

1. MOE is seconds delay per vehicle.
2. 7:30 AM – 8:30 AM
3. 4:30 PM – 5:30 PM
4. 95th Queue for signalized intersection measured in feet and for non-signalized intersection measured in vehicles

delay, freedom to maneuver, existing traffic congestion, and sense of comfort, convenience and perceived safety. Presented below is a summary table for the six LOS capacity conditions designated from “A” to “F” for both unsignalized and signalized intersections.

TABLE 13 – Definitions of Level of Service (LOS) Criteria

Level of Service	Delay Range for Unsignalized Intersections (sec/veh)	Delay Range for Signalized Intersections (sec/veh)	Description
A	≤ 10	≤ 10	Very low delays, nearly free traffic flow
B	>10 and ≤ 15	>10 and ≤ 20	Good traffic flow, more vehicles stop than LOS A
C	>15 and ≤ 25	>20 and ≤ 35	Stable traffic flow, significant number of vehicles stop
D	>25 and ≤ 35	>35 and ≤ 55	Noticeable traffic congestion, longer delays and queue lengths
E	>35 and ≤ 50	>55 and ≤ 80	Unstable traffic flow, significant congestion, traffic near roadway capacity
F	>50	>80	Unacceptable delay, extremely unstable flow, heavy congestion, traffic exceeds capacity

Neighborhood Traffic Analysis

Section 25-6-116 of the Land Development Code (LDC) specifies the desirable operating levels for streets with various pavement widths. Based on LDC, 25-6-116, a residential collector with a pavement width of 30' should not exceed 1,800 vehicles per day (vpd) to continue to operate at a desirable level. Several residential streets were reviewed as a part of this TIA to determine if the existing or projected daily volumes of traffic will exceed the thresholds set forth in the LDC. Table 14 below summarizes the evaluation of neighborhood streets performed for this project.

TABLE 14 – Neighborhood Traffic Analysis

Roadway	Width (ft)	Threshold Volume (vpd)	Existing Volume (vpd)	Site Volume (vpd)	Total Volume (vpd)	% Site Traffic
West 44 th St.	27	1,200	268	0	268	0%
Jackson Ave.	27	1,200	2,333	2,746	5,079	54.1%
West 42 nd St.	27	1,200	293	587	880	66.7%
West 41 st St.	27	1,200	428	536	964	55.6%
West 40 th St.	27	1,200	422	0	422	0%
Oakmont St.	27	1,200	551	0	551	0%
West 39 th St.	27	1,200	354	0	354	0%
Lawton St.	27	1,200	574	0	574	0%

Development of the project is proposed in two phases:

For Phase 1, only residential land uses are proposed:

TABLE 15
Adjusted Trip Generation – Phase 1

Land Use	Size		24-Hour	AM Peak Hour of Adjacent Street One Hour Between			PM Peak Hour of Adjacent Street One Hour Between		
				7 and 9 am			4 and 6 pm		
	Amount	Units		Total	Enter	Exit	Total	Enter	Exit
Single Family (210)	110	DU	1,089	82	21	62	109	69	40
Residential Condo (230)	375	DU	1,929	141	24	117	169	113	56
TxDOT Office				-88	-74	-14	-90	-10	-80
Total			3,019	136	-29	165	188	172	16

Phase 2 includes the remaining land uses (full buildout) and will reflect all the land uses described previously in Table 2.

TABLE 16
Adjusted Trip Generation – Full Buildout (Phase 2)

Land Use	Size		24-Hour	AM Peak Hour of Adjacent Street One Hour Between			PM Peak Hour of Adjacent Street One Hour Between		
				7 and 9 am			4 and 6 pm		
	Amount	Units		Total	Enter	Exit	Total	Enter	Exit
Single Family (210)	110	DU	1,032	82	21	62	97	61	36
Apartment (220)	600	DU	3,384	283	57	226	296	192	103
Residential Condo (230)	425	DU	2,038	156	27	130	167	112	55
Congregate Care Facility (253)	600	DU	1,151	34	20	14	97	53	44
Health/Fitness Club (492)	7,500	SF	235	10	5	5	25	14	11
Office (710)	200,000	SF	1,912	303	267	36	241	41	200
Medical Office (720)	25,000	SF	727	57	45	12	71	20	51
Specialty Retail (826)*	55,000	SF	1,706	100	62	38	83	37	47
Supermarket (850)	35,000	SF	2,576	113	70	43	180	92	88
Pharmacy/Drugstore w/o DT (880)	8,500	SF	574	10	7	4	43	21	22
Walk-in Bank (911)**	3,000	SF	355	0	0	0	35	15	19
Drinking Place (925)**	8,000	SF	780	0	0	0	67	44	23
Quality Restaurant (931)	15,000	SF	1,012	11	9	2	68	46	23
High Turnover Restaurant (932)	9,000	SF	858	90	49	40	54	32	22
Coffee/donut shop w/o DT (936)***	2,000	SF	1,101	151	77	74	49	25	25
TxDOT Office				-88	-74	-14	-90	-10	-80
Total			19,442	1,312	640	672	1,485	796	689

Applicant Proposed Improvements and Recommendations from the TIA

The analysis presented in the TIA assumes the following infrastructure improvements prior to the 2018 completion of Phase 1:

- Installation of a traffic signal at the 45th Street/Highland Terrace and Mo-Pac southbound exit ramp intersection to provide dual lefts prior to 2018 (by others).
- Construction of a second northbound lane at both West 35th and West 45th exit ramps for serving Mo-Pac traffic (by TxDOT).
- Construction of a northbound approach lane on Bull Creek Road to serve left turn movements at the intersection of West 45th Street. This improvement is to be constructed 100% by the developer.
- Construction of Driveway 3 on Bull Creek Road (across from 41st Street).

The analysis was not updated to reflect the construction of the 2024 improvements in the 2018 analysis. The AM and PM peak hour results for the 2024 Build Conditions indicate the following additional improvements are required (beyond those listed previously):

- Construct Driveway 2 across from Jackson Street.
- Stripe 150 feet of northbound and 300' southbound left turn lanes on Bull Creek.
- Construct 150 feet of right turn lane on northbound Bull Creek at Driveway 2.

- Restripe Jackson Avenue to provide a left turn lane and shared through/right turn lane.
- Install a traffic signal at Jackson Avenue/Bull Creek Road when warranted per Texas MUTCD.
- Construct Driveway 1 with 350 feet of southbound left turn bay on Bull Creek Road.
- Restripe and sign the southbound Jackson Avenue approach to West 35th Street to provide a shared left/through lane and right turn only lane.
- Reconstruct 45th Street to provide 100 feet of eastbound and 250 feet of westbound left turn bays at Bull Creek and
- Add a 250 feet northbound right turn lane on Bull Creek at 45th.
- Reconfigure traffic signal to remove split phasing at 45th and Bull Creek.
- Construct Driveway 4 across from West 40th Street (right-in/right-out).
- Construct Driveway 5 on Bull Creek Road across from West 42nd Street.

Conclusions of staff review

Staff evaluation of the TIA has determined that there are details related to the traffic operations and geometric elements of the proposed improvements that are as yet unresolved. The TIA assumed certain improvements, if those improvements cannot be completed then a revised TIA will have to be submitted or the development will be limited less than 2,000 trips per day. Specifically, the need for additional right-of-way at the intersections identified for signal upgrades and/or installation (West 45th Street/Bull Creek Road and Jackson Avenue/Bull Creek Road) and right-of-way required along Bull Creek Road to accommodate the improvements proposed, and the specific design details of the connection of Jackson Avenue to 45th Street.

Assuming all of the proposed improvements are constructed, staff finds this proposed development will adequately mitigate the anticipated traffic impact as determined in the TIA document, however, staff reserves the right to request further detailed analysis during the subdivision and site plan review process. Further, all traffic operations and design elements and transportation related improvements will be subject to review and approval by the Austin Transportation Department as part of the site development review process in coordination with DSD.

Staff Recommendations

1. Prior to the permitting of any portions of the development that exceed the Phase 1 trip limit of 2,000 daily vehicle trips, the dedication of the right-of-way or easements at the southeast and northwest corners of the Bull Creek/45th Street intersection, and the dedication of the right-of-way along Bull Creek Road sufficient to allow construction of the proposed improvements.
2. All the improvements listed in Table 17 below as being constructed by the developer must be constructed when EITHER the 110 single-family homes and 188 residential condominium units OR when 375 residential condominiums units are complete. No certificate of occupancies on-site will occur beyond these unit thresholds until all the developer constructed improvements identified as being constructed by the developer in 2018 – Phase 1 are complete.

3. Prior to 3rd reading at Council, fiscal surety in the amount of \$750,000 shall be paid to the City of Austin for construction of a pedestrian/bicycle bridge across Shoal Creek. The applicant shall be responsible for the full cost of construction of said bridge crossing, if the City of Austin secures the required easement to complete extension to Shoal Creek Boulevard. Should the City be unable to secure the necessary easement within seven (7) years of the date of PUD approval, the fiscal dedication shall become a non-refundable contribution and will satisfy the applicant's obligation for this pedestrian/bicycle improvement.
4. The multi-use trail along Bull Creek Road shall be within a public access easement for its entirety.
5. Prior to 3rd reading at Council, fiscal surety for all other TIA improvements shall be paid to the City of Austin as listed in Table 17 below:

Table 17 – List of improvements for Site Development

Intersection	Proposed Improvements	Developer Share
Initial Improvements		
Bull Creek Road Trail	<ul style="list-style-type: none"> Dedicate an easement for the 12' shared use path from 45th to south end of development 	100%
Jackson Ave to 45 th Street	<ul style="list-style-type: none"> Dedicate and construct Jackson Avenue extension from Bull Creek to West 45th Street 	100% (*Note 1)
Bull Creek from Driveway 5 to 45 th	<ul style="list-style-type: none"> Dedicate Right-of-way to accommodate the improvements per the TIA 	100%
2018 – Built as part of Phase 1		
West 45th Street at Bull Creek Road	<ul style="list-style-type: none"> Construct additional northbound left turn lane on Bull Creek to westbound 45th Restripe northbound approach as dual lefts and shared through/right lane 	100% \$259,000 (*Note 2)
Highland Terrace /45 th /MoPac Exit Ramp	<ul style="list-style-type: none"> Install Traffic Signal when/if warranted Restripe to provide westbound dual lefts when signal installed 	12.2% \$30,388
Shoal Creek Trail	<ul style="list-style-type: none"> Construct from south end of park to Idlewild Road 	100% \$30,000 (*Note 2)
Bull Creek Road Trail	<ul style="list-style-type: none"> Construct 12' shared use path from 45th to south end of development 	100% \$5,000 (*Note 2)
MoPac at West 45 th	<ul style="list-style-type: none"> Update signal timing 	100% \$5,000

West 45 th Street at Bull Creek Road	<ul style="list-style-type: none"> Reconstruct intersection to provide turn bays on 45th Street and a turn lane on Bull Creek Modify signal to remove split phasing 	100% \$770,000 (*Note 2)
Bull Creek from Driveway 1 to 45 th	<ul style="list-style-type: none"> Construct 2nd north bound lane 	100% \$253,000 (*Note 2)
Bull Creek from Driveway 1 to Driveway 2	<ul style="list-style-type: none"> Construct 2nd north bound lane 	100% \$253,000 (*Note 2)
Pedestrian Hybrid Beacon	<ul style="list-style-type: none"> Across Bull Creek Road adjacent to Driveway 4 	100% \$250,000
Jackson Ave between 35 th and Bull Creek	<ul style="list-style-type: none"> Complete Study of potential mitigation improvements as part of the warrant study for the Jackson / Bull Creek signal 	100%
Pedestrian Hybrid Beacon	<ul style="list-style-type: none"> Across Bull Creek Road adjacent to Driveway 1 	100% \$250,000
Shoal Creek bikeway	<ul style="list-style-type: none"> Construction of pedestrian/bicycle bridge across Shoal Creek 	100% \$750,000 (*Note 3)
	Total cost estimate Phase 1 Improvements	\$2,855,388
2024 – Built as part of Phase 2		
Jackson Ave at 35 th	<ul style="list-style-type: none"> Restripe approach of Jackson Avenue at 35th Street 	100% \$3,500
Jackson Ave between 35 th and Bull Creek	<ul style="list-style-type: none"> Implement mitigation recommendations of study of Jackson Ave. 	100%
Jackson Avenue/Bull Creek Road	<ul style="list-style-type: none"> Install a traffic signal at Jackson Avenue/Bull Creek Road when warranted per Texas MUTCD. 	100% \$330,000 (*Note 2)
	Total cost estimate Phase 2 Improvements	\$333,500

Note 1 Final design of the extension of Jackson Street to 45th Street will be completed as part of the subdivision infrastructure improvements internal to the development. The applicant is responsible for 100% of this construction cost as part of the subdivision infrastructure to serve the development.

Note 2 Construction costs shown are based on engineer's estimates of probable cost provided by the applicant's engineer. Applicant's cost contribution is not limited to this estimated amount and the applicant is responsible for the full construction of these improvements.

Note 3 Construction cost shown is based on engineer's estimates of probable cost provided by the applicant's engineer. Applicant's cost contribution is not limited to this estimated amount and the applicant is responsible for full the construction cost of these improvements provided the City of Austin secures the required easement to complete extension to Shoal Creek Boulevard. Should the City be unable to secure the necessary easement within seven (7) years of the date of PUD approval, the fiscal dedication shall become a non-refundable contribution to be used bicycle and pedestrian improvements in the adjacent area and will satisfy the applicant's obligation for this pedestrian/bicycle improvement.

- A signal warrant study is to be conducted by the developer for the intersection of Jackson Avenue and Bull Creek Road once the extension of Jackson Avenue from Bull Creek Road to West 45th Street is complete.

7. The developer will also study Jackson Avenue to determine appropriateness of additional mitigation to address traffic impacts from the development prior to the start of construction on Phase 2 of the development.
8. Right-of-way for the proposed Jackson Avenue extension shall be dedicated with the first subdivision plat for the project. The final detailed design of the connection at Jackson Avenue will be completed as part of the review of the subdivision construction plan application(s).
9. As recommended in the TIA, the site driveways and all internal streets/ private drives shall meet City of Austin geometric street design criteria and shall be located in accordance with City of Austin standards. Cross sections may reflect approved Grove Design Guidelines as provided by the PUD.
10. No later than five (5) years after approval, the TIA shall be revised by the developer and/or updated to reflect current conditions. Upon completion of the revised analyses, copies of the TIA revisions shall be submitted to the City of Austin for review and approval.
11. Based on the proposed PUD land use plan, outlets for additional street access may be required at the time of subdivision application.
12. Development of this property should be limited to uses and intensities which do not exceed or vary from the from the projected traffic conditions assumed in the TIA, including peak hour trip generation, traffic distribution, roadway conditions, and other traffic related characteristics.