TRAFFIC IMPACT ANALYSIS (TIA)

CONTENT GUIDE

AND

FORMAT REQUIREMENTS

TRAFFIC IMPACT ANALYSIS

Background: The City of Houston Office of the City Engineer's Traffic Group is tasked with the review of submitted Traffic Impact Analysis (TIA) reports. Chapter 15 of the City of Houston Infrastructure Design Manual (IDM) provides guidelines and list of required items in a Traffic Impact Analysis (TIA).

Objective: The objective of this document is to aid traffic engineers in following the TIA outline provided in Chapter 15 of the IDM. In addition, it is to provide a standardized format for all submitted TIA reports. The overarching goal is for the City to receive a submitted TIA per Chapter 15 and in an expected format and therefore reducing the overall review time.

ADDITIONAL ITEMS REQUIRED FOR TIA APPROVAL

Include in the TIA submittal the additional required items below for approval.

- In a separate Appendix, include the following:
  - ☐ Scoping meeting minutes
  - ☐ Review Comment Log
  - ☐ Final Recorded Plat
  - ☐ CPC 101 Form
  - ☐ Traffic signal data received from Transtar (if applicable)

- Submit the following files:
  - ☐ Provide counts in excel format
  - ☐ Synchro Files
  - ☐ Traffic Count Tech memo (if applicable)
  - ☐ Signal Timing Analysis Files in PDF format (if applicable)

EXAMPLE FORMAT OF THE EXECUTIVE SUMMARY

I. Executive Summary
(a) Site Location & Analysis Area
(b) Development Description
(c) Conclusions
(d) Recommendations

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I. EXECUTIVE SUMMARY

The Traffic Group conducted a traffic impact analysis to analyze the potential traffic impacts of a proposed Office development in Houston, Texas. Traffic impacts were analyzed for the project to be completed by 2025. The analysis considered AM and PM peak hour periods and Traffic operational conditions.

(A) Site Location and Analysis Area

The proposed development is located north of downtown Houston at the corner of Washington Avenue and Mentor Way. The site is located approximately 1 mile from downtown Houston and is adjacent to the Houston Amtrak Station. Exhibit 1 illustrates the site location of the proposed development. Based on the size and land use of the proposed development, the site is under City of Houston Traffic Impact Category II in which the required analysis area includes intersections within 1/4-mile of the site location. Additional intersections were also included in the analysis outside of the required 1/4-mile radius. Exhibit 2 provides a visual representation of the analysis area per the City of Houston Traffic Impact Category.

(B) Development Description

The proposed development is a 5,000 sq-ft office with on-site parking. The development will be constructed in several phases. Access to the site will be provided via three driveways on Washington Avenue. The two driveways in the western portion of the development will serve as the entrance and exit of the the employee parking lot while the remaining driveway near the eastern portion will be utilized for customer parking.

(C) Conclusion

Three scenarios were analyzed for AM and PM peak hours as part of the Traffic Impact Analysis: 2020 Existing, 2025 No Build, and 2025 Build. For 2020 Existing, the study intersections operate at LOS C or better in the AM and PM peak hours. The 2025 No Build, the study intersections LOS are maintained for the 2020 Existing and the 2025 No Build. Delays are expected to increase at the study intersections due to traffic volume growth. For the 2025 Build conditions, the LOS for the study intersections are maintained with slight increases in delays. All the studied intersections for the 2025 Build condition report at LOS C or better.

(D) Recommendations

Based on the analysis, the proposed development is expected to have minor impacts to the traffic operations in the study area. The level of service at study intersections is maintained throughout all scenarios. The current roadway network is capable of supporting the proposed development. A proposed eastbound left turn lane on Washington Avenue for the employee driveways is recommended.

Traffic Impact Analysis
"Project Name"

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EXAMPLE

Note: Executive Summary broken down into sections as per the IDM Chapter 15

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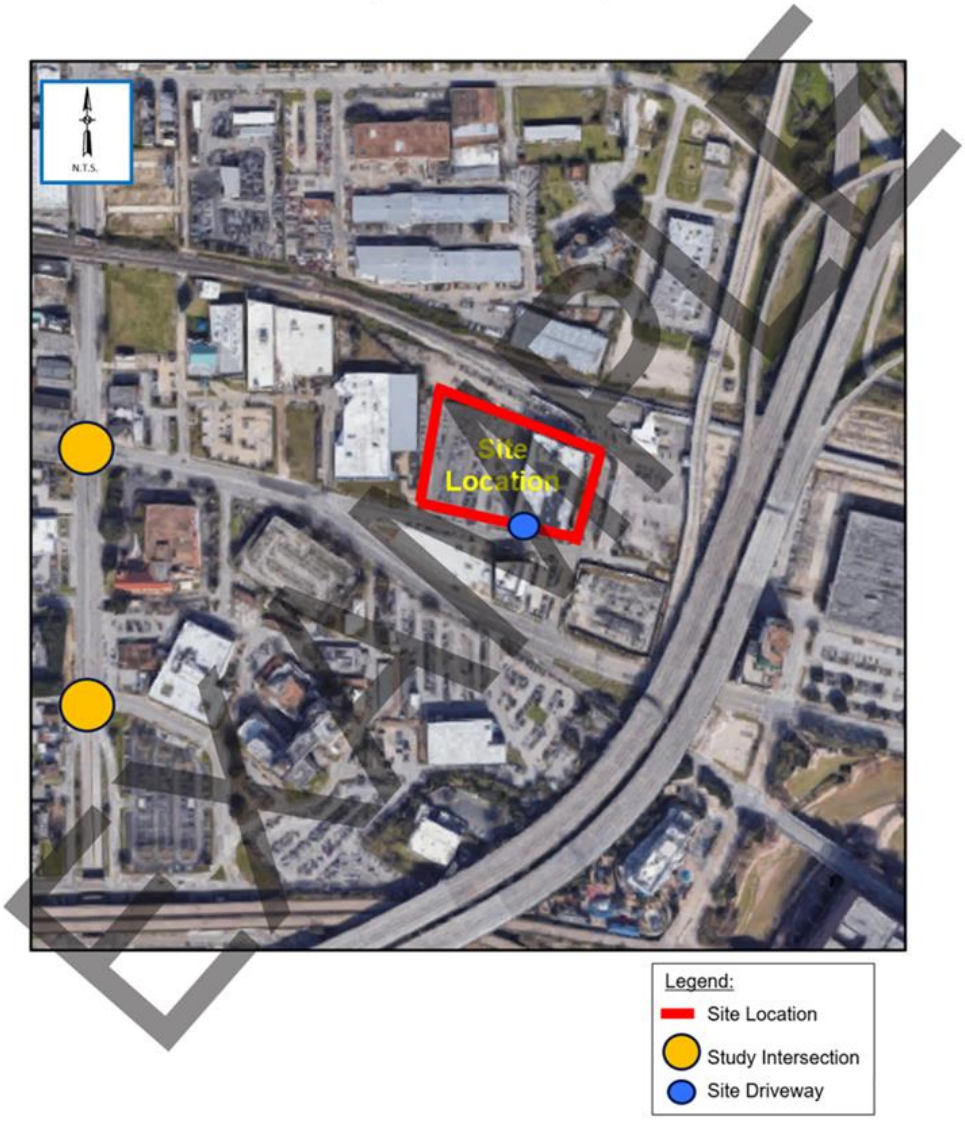
I. Executive Summary

(a) Site Location Map



Traffic Impact Analysis
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Note: Site Location Map shall be on its own page.

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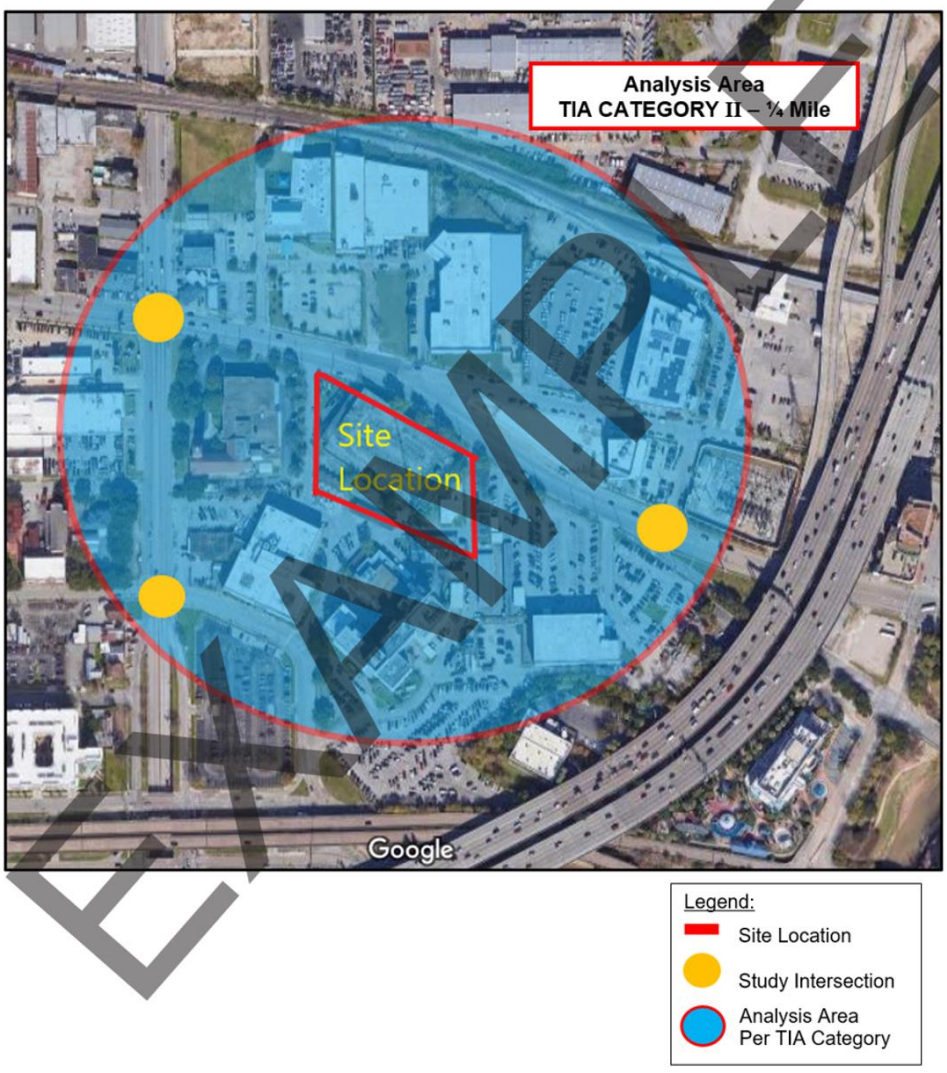
I. Executive Summary

(a) Analysis Area

(Per TIA Category)*



EXAMPLE

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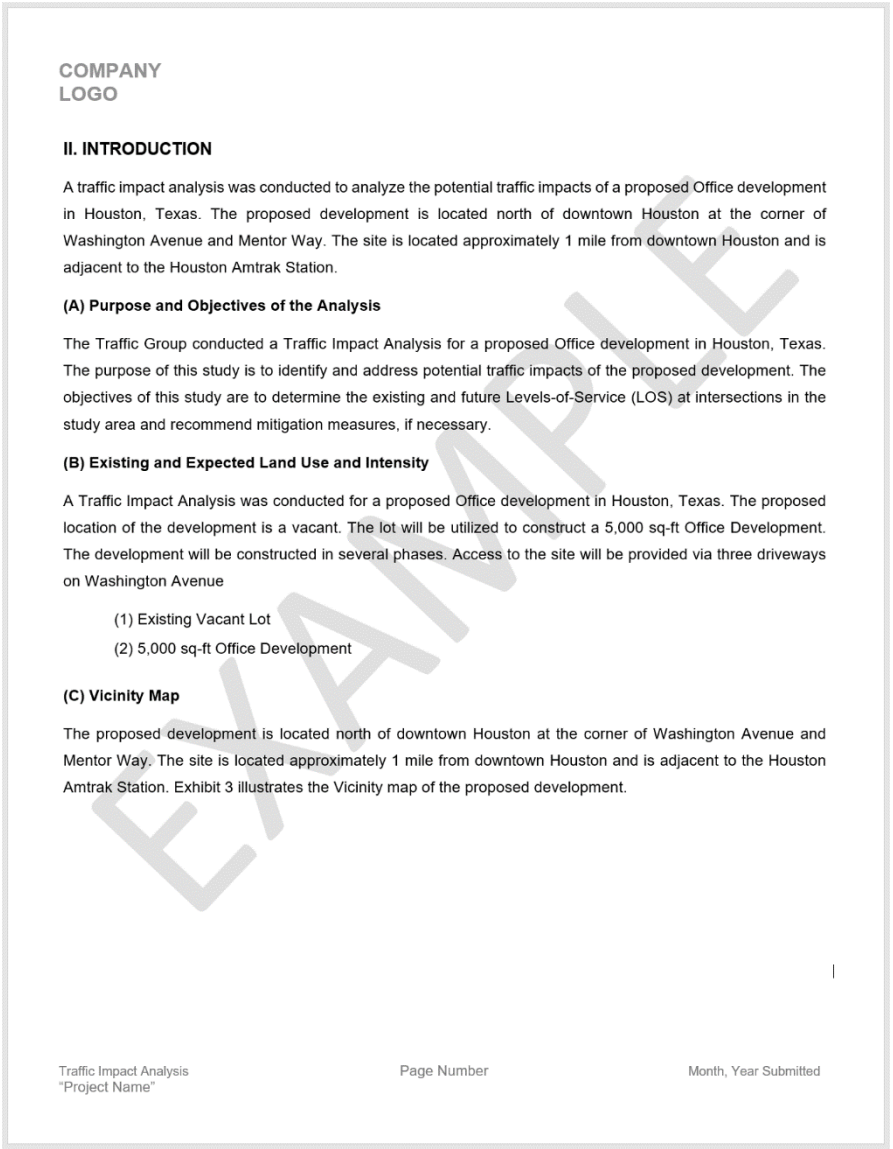
Note: Analysis Area shown shall be per TIA category on its own page

* **Or as agreed upon during the scoping meeting.**

EXAMPLE FORMAT OF THE INTRODUCTION

II. Introduction

(a) A statement about the purpose and objectives of the analysis.
(b) A description of the existing and expected land use and intensity.
(1) If residential, number and type of dwelling units.
(2) If commercial or industrial, square footage and type.
(3) If redevelopment, what is the expected trip generation differential.
(c) A vicinity map identifying major industrial and site access intersections and other approved projects near the development.
(d) A site plan for the development.
(e) A description of development phasing and estimate year each phase will begin and end.



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II. INTRODUCTION

A traffic impact analysis was conducted to analyze the potential traffic impacts of a proposed Office development in Houston, Texas. The proposed development is located north of downtown Houston at the corner of Washington Avenue and Mentor Way. The site is located approximately 1 mile from downtown Houston and is adjacent to the Houston Amtrak Station.

(A) Purpose and Objectives of the Analysis

The Traffic Group conducted a Traffic Impact Analysis for a proposed Office development in Houston, Texas. The purpose of this study is to identify and address potential traffic impacts of the proposed development. The objectives of this study are to determine the existing and future Levels-of-Service (LOS) at intersections in the study area and recommend mitigation measures, if necessary.

(B) Existing and Expected Land Use and Intensity

A Traffic Impact Analysis was conducted for a proposed Office development in Houston, Texas. The proposed location of the development is a vacant. The lot will be utilized to construct a 5,000 sq-ft Office Development. The development will be constructed in several phases. Access to the site will be provided via three driveways on Washington Avenue

(1) Existing Vacant Lot
(2) 5,000 sq-ft Office Development

(C) Vicinity Map

The proposed development is located north of downtown Houston at the corner of Washington Avenue and Mentor Way. The site is located approximately 1 mile from downtown Houston and is adjacent to the Houston Amtrak Station. Exhibit 3 illustrates the Vicinity map of the proposed development.

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EXAMPLE

Note: Introduction broken down into sections as per the IDM Chapter 15

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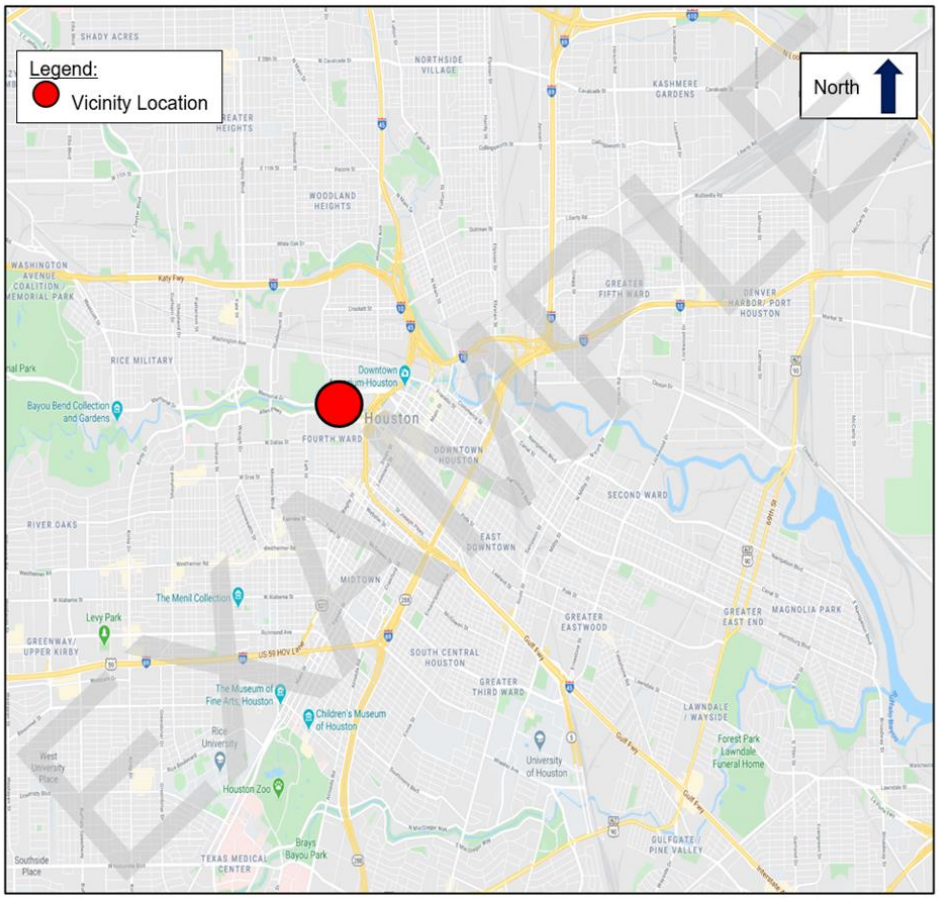
II. Introduction

(c) Vicinity Map



EXAMPLE

Traffic Impact Analysis
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Note: Vicinity Map shall be on its own page. Shall show any identifying major industrial and site access intersections and other approved projects near the development.

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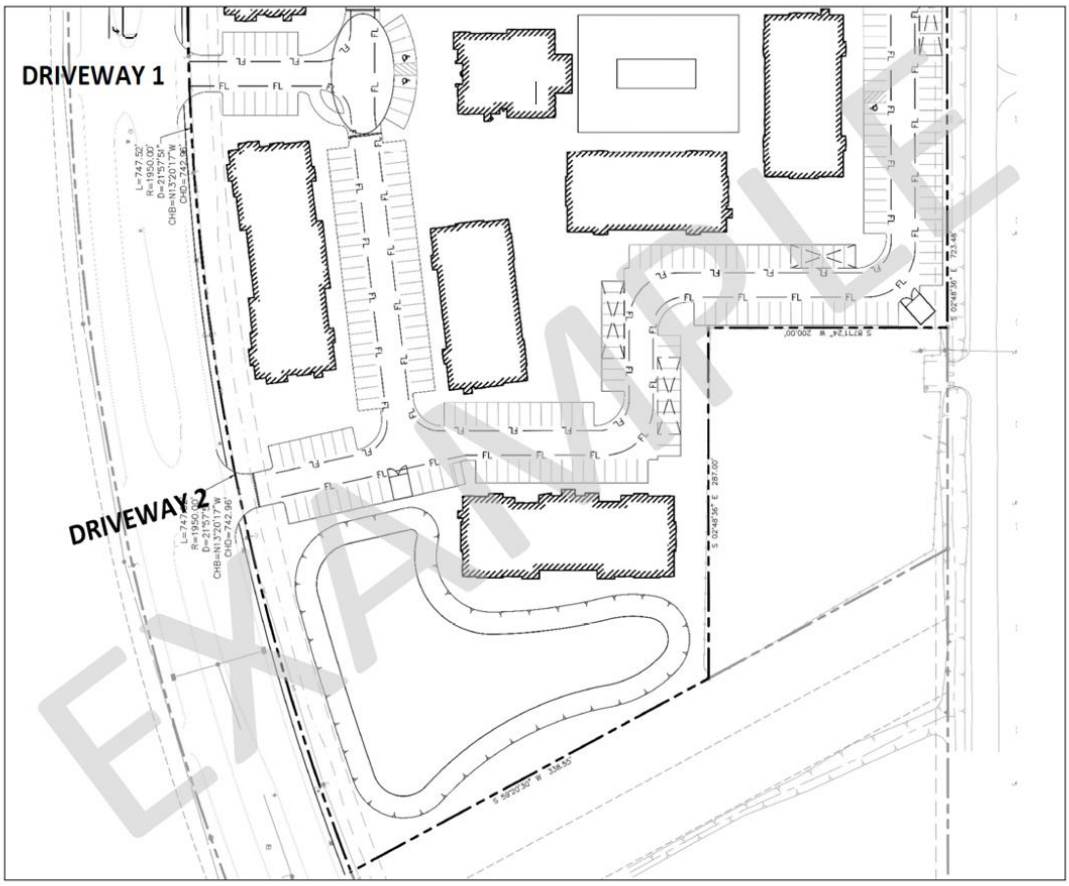
II. Introduction

(d) Site Plan



EXAMPLE

Traffic Impact Analysis
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Note: Site Plan shall be legible. Provide 11x17 if necessary.

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(E) Development Description

The proposed development is located north of downtown Houston at the corner of Washington Avenue and Mentor Way. The site is located approximately 1 mile from downtown Houston and is adjacent to the Houston Amtrak Station. Exhibit 3 illustrates the Vicinity map of the proposed development. The proposed 5,000 sq-ft Office development will be constructed in phases.

Phase 1: Commercial District

The commercial district is a high-density commercial area with easy access to US 59.The Commercial district features entertainment, office, and residential uses. The build-out year is 2018. The specific land uses proposed are:

- 664 Units Condominiums
- 336,464 Sq. Ft. Shopping Center
- 36,000 Sq. Ft. Movie Theater
- 180,000 Sq. Ft. Office

Phase 2: **Market District**

The marina district consists of hotel, retail, and apartment uses. The market is envisioned as an important recreational destination and water-based transportation facility. The build-out year is 2020. The specific land uses proposed are:

- 90 Rooms Hotel
- 1,318 Units Condominiums
- 40,800 Sq. Ft. Shopping Center

Phase 3: Residential District

The residential district is comprised of five neighborhoods with residential units closer to Washington Avenue. The build-out year is 2025. The specific land uses proposed are:

- 1,776 Units Apartments
- 215 Units Condominiums
- 12 Units Single Family Detached

EXAMPLE

Note: Provide a description of the development phasing and estimate year each phase will begin and end broken down cleanly.

EXAMPLE FORMAT OF THE REQUIRED TABLES(S)

IV. Required Table(s)
(a) Twenty-four hour approach volumes at major and site access intersections.
(b) Peak Hour approach volumes at major and site access intersections.

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IV. Required Table(s)

(a) Twenty-four hour Approach Volumes

Leg / Direction	Washington Ave Eastbound						Mentor Way Northbound						Washington Ave Westbound						Mentor Way Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2020-02-27 6:30AM	12	74	44	0	**130**	0	40	77	19	1	**137**	0	7	141	9	0	**157**	0	20	58	15	1	**94**	0	**518**
6:45AM	8	95	26	1	**130**	0	34	66	22	0	**122**	0	9	125	7	0	**141**	0	10	69	14	0	**93**	0	**486**
Hourly Total	20	169	70	1	**260**	0	74	143	41	1	**259**	0	16	266	16	0	**298**	0	30	127	29	1	**187**	0	**1004**
7:00AM	11	82	30	0	**123**	0	45	43	16	0	**104**	0	2	103	2	0	**107**	0	16	61	10	2	**89**	0	**423**
7:15AM	7	49	22	2	**80**	0	17	44	19	1	**81**	0	6	86	5	1	**98**	0	5	55	8	1	**69**	1	**328**
7:30AM	6	111	36	0	**153**	0	18	52	7	0	**77**	0	1	83	5	0	**89**	0	5	43	6	1	**55**	0	**374**
7:45AM	4	59	17	0	**80**	0	13	40	8	0	**61**	0	2	59	1	0	**62**	0	3	34	3	1	**41**	0	**244**
Hourly Total	28	301	105	2	**436**	0	93	179	50	1	**323**	0	11	331	13	1	**356**	0	29	193	27	5	**254**	1	**1369**
8:00AM	4	40	13	0	**57**	0	21	34	11	0	**66**	0	4	67	4	0	**75**	0	2	31	4	0	**37**	0	**235**
8:15AM	6	48	11	0	**65**	0	9	32	9	0	**50**	0	7	71	6	0	**84**	0	7	26	1	0	**34**	0	**233**
Hourly Total	10	88	24	0	**122**	0	30	66	20	0	**116**	0	11	138	10	0	**159**	0	9	57	5	0	**71**	0	**468**
4:30PM	20	150	29	0	**199**	1	28	64	26	0	**118**	0	13	99	9	0	**121**	0	21	64	13	3	**101**	0	**539**
4:45PM	15	150	41	0	**206**	0	32	56	33	0	**121**	0	4	70	7	0	**81**	0	10	61	9	3	**83**	0	**491**
Hourly Total	35	300	70	0	**405**	1	60	120	59	0	**239**	0	17	169	16	0	**202**	0	31	125	22	6	**184**	0	**1030**
5:00PM	12	151	43	2	**208**	0	24	72	29	0	**125**	0	9	91	8	0	**108**	0	10	57	6	4	**77**	0	**518**
5:15PM	15	109	38	2	**164**	0	32	56	30	0	**118**	0	13	74	10	0	**97**	0	11	62	6	1	**80**	0	**459**
5:30PM	13	116	33	0	**162**	0	34	59	24	0	**117**	0	5	96	9	0	**110**	0	13	57	8	3	**81**	0	**470**
5:45PM	15	143	38	0	**196**	0	30	64	23	0	**117**	0	14	91	4	0	**109**	0	22	64	5	2	**93**	0	**515**
Hourly Total	55	519	152	4	**730**	0	120	251	106	0	**477**	0	41	352	31	0	**424**	0	56	240	25	10	**331**	0	**1962**
6:00PM	13	115	25	2	**155**	1	26	64	28	1	**119**	0	10	87	12	1	**110**	0	23	50	4	1	**78**	0	**462**
6:15PM	4	102	37	1	**144**	0	25	59	24	1	**109**	0	9	72	8	1	**90**	0	17	45	7	0	**69**	0	**412**
Hourly Total	17	217	62	3	**299**	1	51	123	52	2	**228**	0	19	159	20	2	**200**	0	40	95	11	1	**147**	0	**874**
Total	165	1594	483	10	**2252**	2	428	882	328	4	**1642**	0	115	1415	106	3	**1639**	0	195	837	119	23	**1174**	1	**6707**
% Approach	7.3%	70.8%	21.4%	0.4%	-	-	26.1%	53.7%	20.0%	0.2%	-	-	7.0%	86.3%	6.5%	0.2%	-	-	16.6%	71.3%	10.1%	2.0%	-	-	-
% Total	2.5%	23.8%	7.2%	0.1%	**33.6%**	-	6.4%	13.2%	4.9%	0.1%	**24.5%**	-	1.7%	21.1%	1.6%	0%	**24.4%**	-	2.9%	12.5%	1.8%	0.3%	**17.5%**	-	-
Lights	159	1572	478	10	**2219**	-	423	867	326	4	**1620**	-	112	1387	102	3	**1604**	-	194	813	116	23	**1146**	-	6589
% Lights	96.4%	98.6%	99.0%	100%	**98.5%**	-	98.8%	98.3%	99.4%	100%	**98.7%**	-	97.4%	98.0%	96.2%	100%	**97.9%**	-	99.5%	97.1%	97.5%	100%	**97.6%**	-	98.2%
Articulated Trucks	1	6	1	0	**8**	-	0	1	0	0	**1**	-	0	10	0	0	**10**	-	0	3	2	0	**5**	-	24
% Articulated Trucks	0.6%	0.4%	0.2%	0%	**0.4%**	-	0%	0.1%	0%	0%	**0.1%**	-	0%	0.7%	0%	0%	**0.6%**	-	0%	0.4%	1.7%	0%	**0.4%**	-	0.4%
Buses and Single-Unit Trucks	5	16	4	0	**25**	-	5	14	2	0	**21**	-	3	18	4	0	**25**	-	1	21	1	0	**23**	-	94
% Buses and Single-Unit Trucks	3.0%	1.0%	0.8%	0%	**1.1%**	-	1.2%	1.6%	0.6%	0%	**1.3%**	-	2.6%	1.3%	3.8%	0%	**1.5%**	-	0.5%	2.5%	0.8%	0%	**2.0%**	-	1.4%
Bicycles on Road	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%
Pedestrians	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%	-

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Note: Provide Twenty-four-hour approach volumes table as shown here.

<u>Also</u> provide them as a figure. Examples of the needed figures are also provided in this document.

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IV. Required Table(s)

(b) Peak Hour Approach Volumes

Note: Provide the Peak hour approach volumes tables.

<u>Also</u> provide them as a figure. Examples of the needed figures are also provided in this document.

AM Peak Hour

Leg / Direction	Washington Ave Eastbound						Mentor Way Northbound						Washington Ave Westbound						Mentor Way Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2020-02-27 6:30AM	12	74	44	0	**130**	0	40	77	19	1	**137**	0	7	141	9	0	**157**	0	20	58	15	1	**94**	0	**518**
6:45AM	8	95	26	1	**130**	0	34	66	22	0	**122**	0	9	125	7	0	**141**	0	10	69	14	0	**93**	0	**486**
7:00AM	11	82	30	0	**123**	0	45	43	16	0	**104**	0	2	103	2	0	**107**	0	16	61	10	2	**89**	0	**423**
7:15AM	7	49	22	2	**80**	0	17	44	19	1	**81**	0	6	86	5	1	**98**	0	5	55	8	1	**69**	1	**328**
Total	38	300	122	3	**463**	0	136	230	76	2	**444**	0	24	455	23	1	**503**	0	51	243	47	4	**345**	1	**1755**
% Approach	8.2%	64.8%	26.3%	0.6%	-	-	30.6%	51.8%	17.1%	0.5%	-	-	4.8%	90.5%	4.6%	0.2%	-	-	14.8%	70.4%	13.6%	1.2%	-	-	-
% Total	2.2%	17.1%	7.0%	0.2%	**26.4%**	-	7.7%	13.1%	4.3%	0.1%	**25.3%**	-	1.4%	25.9%	1.3%	0.1%	**28.7%**	-	2.9%	13.8%	2.7%	0.2%	19.7%	-	-
PHF	0.792	0.789	0.693	0.375	**0.890**	-	0.756	0.747	0.864	0.500	**0.810**	-	0.667	0.807	0.639	0.250	**0.861**	-	0.638	0.880	0.783	0.500	**0.918**	-	0.847
Lights	34	296	120	3	**453**	-	134	221	75	2	**432**	-	23	444	22	1	**490**	-	51	234	44	4	**333**	-	1708
% Lights	89.5%	98.7%	98.4%	100%	**97.8%**	-	98.5%	96.1%	98.7%	100%	**97.3%**	-	95.8%	97.6%	95.7%	100%	**97.4%**	-	100%	96.3%	93.6%	100%	**96.5%**	-	97.3%
Articulated Trucks	1	0	0	0	**1**	-	0	1	0	0	**1**	-	0	3	0	0	**3**	-	0	0	2	0	**2**	-	7
% Articulated Trucks	2.6%	0%	0%	0%	**0.2%**	-	0%	0.4%	0%	0%	**0.2%**	-	0%	0.7%	0%	0%	**0.6%**	-	0%	0%	4.3%	0%	**0.6%**	-	0.4%
Buses and Single-Unit Trucks	3	4	2	0	**9**	-	2	8	1	0	11	-	1	8	1	0	**10**	-	0	9	1	0	**10**	-	40
% Buses and Single-Unit Trucks	7.9%	1.3%	1.6%	0%	**1.9%**	-	1.5%	3.5%	1.3%	0%	2.5%	-	4.2%	1.8%	4.3%	0%	**2.0%**	-	0%	3.7%	2.1%	0%	**2.9%**	-	2.3%
Bicycles on Road	0	0	0	0	**0**	-	0	0	0	0	0	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%	-

PM Peak Hour

Leg / Direction	Washington Ave Eastbound						Mentor Way Northbound						Washington Ave Westbound						Mentor Way Southbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2020-02-27 4:30PM	20	150	29	0	**199**	1	28	64	26	0	**118**	0	13	99	9	0	**121**	0	21	64	13	3	**101**	0	**539**
4:45PM	15	150	41	0	**206**	0	32	56	33	0	**121**	0	4	70	7	0	**81**	0	10	61	9	3	**83**	0	**491**
5:00PM	12	151	43	2	**208**	0	24	72	29	0	**125**	0	9	91	8	0	**108**	0	10	57	6	4	**77**	0	**518**
5:15PM	15	109	38	2	**164**	0	32	56	30	0	**118**	0	13	74	10	0	**97**	0	11	62	6	1	**80**	0	**459**
Total	62	560	151	4	**777**	1	116	248	118	0	**482**	0	39	334	34	0	**407**	0	52	244	34	11	**341**	0	**2007**
% Approach	8.0%	72.1%	19.4%	0.5%	-	-	24.1%	51.5%	24.5%	0%	-	-	9.6%	82.1%	8.4%	0%	-	-	15.2%	71.6%	10.0%	3.2%	-	-	-
% Total	3.1%	27.9%	7.5%	0.2%	**38.7%**	-	5.8%	12.4%	5.9%	0%	**24.0%**	-	1.9%	16.6%	1.7%	0%	**20.3%**	-	2.6%	12.2%	1.7%	0.5%	**17.0%**	-	-
PHF	0.775	0.927	0.878	0.500	**0.934**	-	0.906	0.861	0.894	-	**0.964**	-	0.750	0.843	0.850	-	**0.841**	-	0.619	0.953	0.654	0.688	**0.844**	-	0.931
Lights	62	552	150	4	**768**	-	114	245	117	0	**476**	-	37	329	32	0	**398**	-	52	240	34	11	**337**	-	1979
% Lights	100%	98.6%	99.3%	100%	**98.8%**	-	98.3%	98.8%	99.2%	0%	**98.8%**	-	94.9%	98.5%	94.1%	0%	**97.8%**	-	100%	98.4%	100%	100%	**98.8%**	-	98.6%
Articulated Trucks	0	3	1	0	**4**	-	0	0	0	0	**0**	-	0	4	0	0	**4**	-	0	2	0	0	**2**	-	10
% Articulated Trucks	0%	0.5%	0.7%	0%	**0.5%**	-	0%	0%	0%	0%	**0%**	-	0%	1.2%	0%	0%	**1.0%**	-	0%	0.8%	0%	0%	**0.6%**	-	0.5%
Buses and Single-Unit Trucks	0	5	0	0	**5**	-	2	3	1	0	**6**	-	2	1	2	0	**5**	-	0	2	0	0	**2**	-	18
% Buses and Single-Unit Trucks	0%	0.9%	0%	0%	**0.6%**	-	1.7%	1.2%	0.8%	0%	**1.2%**	-	5.1%	0.3%	5.9%	0%	**1.2%**	-	0%	0.8%	0%	0%	**0.6%**	-	0.9%
Bicycles on Road	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0	0	0	0	**0**	-	0
% Bicycles on Road	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%	0%	0%	0%	**0%**	-	0%
Pedestrians	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

EXAMPLE

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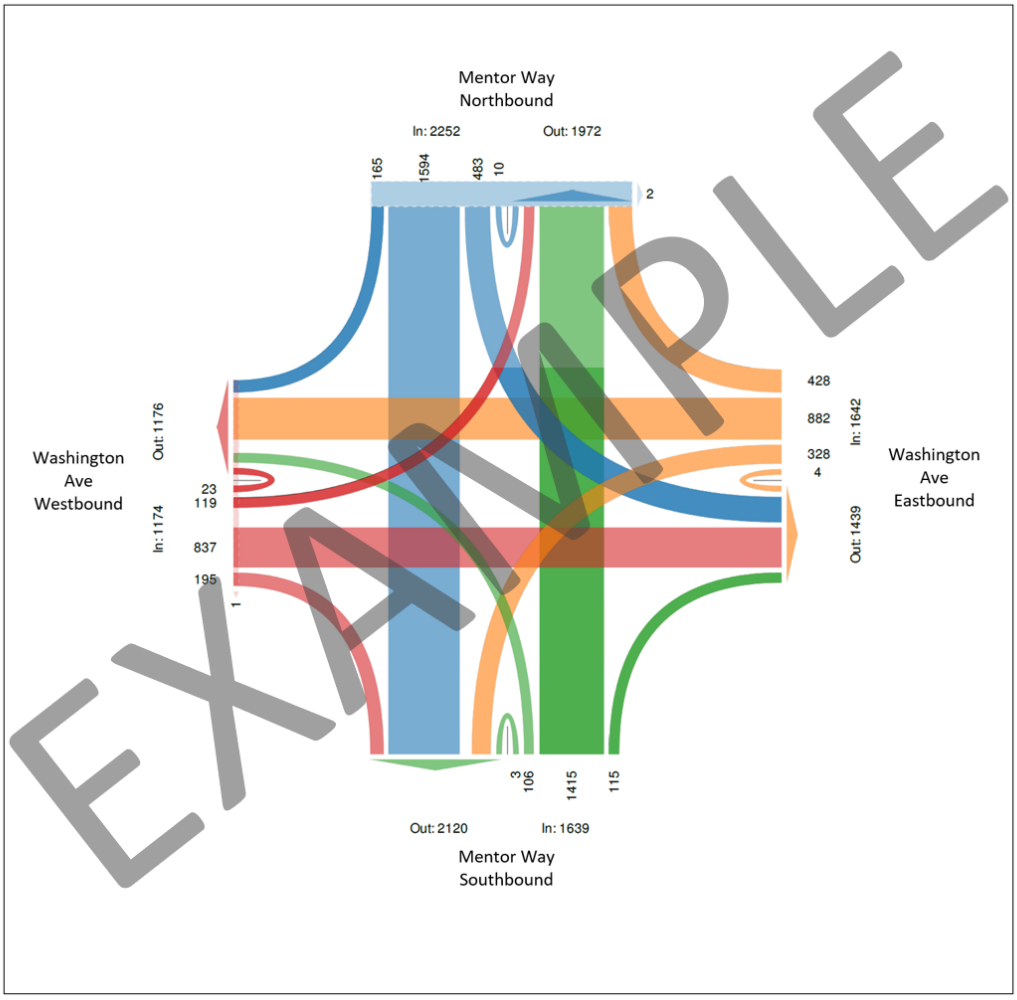
IV. Required Table(s)

(a) Twenty-four hour Approach Volumes



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Note: Provide twenty-four-hour approach volumes figure.

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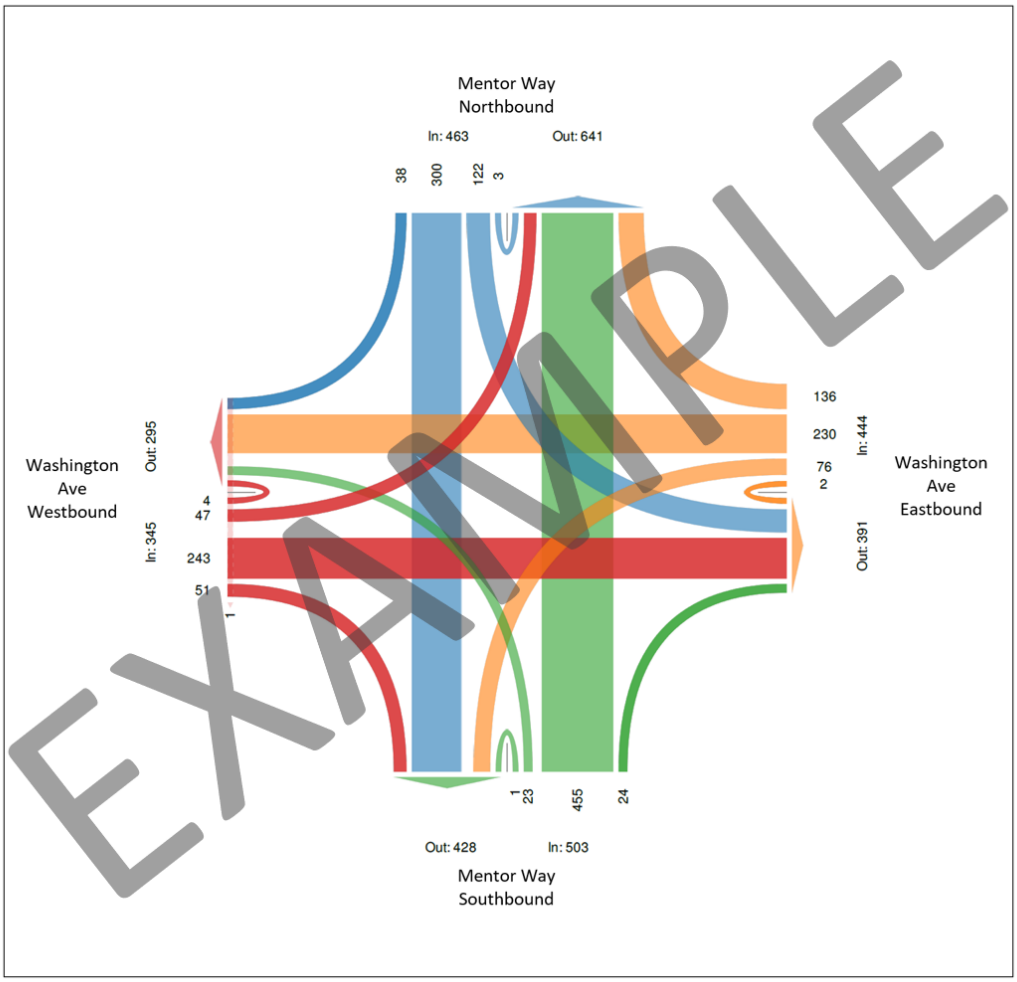
IV. Required Table(s)

(b) Peak Hour Approach Volumes



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Note: Provide Peak Hour approach volumes figure.

EXAMPLE FORMAT OF THE PROJECTED TRAFFIC

VI. Projected Traffic

(a) Sufficient details of calculations so that all calculations can be verified.

(b) Site generated traffic volumes (24-hour and peak periods) by corresponding development phase or year.

(c) Trip Generation - List of trip generation rates and/or sources of rates used for the study.

(d) Trip Distribution and Assignment - The gravity model or other acceptable trip distribution model used to estimate trip distribution. The Analysis Engineer can complete this task either manually or with applicable computer models.

(1) Background traffic volumes (24-hour and peak periods) by corresponding development phase or year.

(e) Traffic Volumes should account for all approved developments in the analysis area as well as area growth beyond the analysis area. Contact the City for information about surrounding developments.

(1) Pass-by and diverted traffic volume reduction rates, if applicable.

(2) Pedestrian, bicycle and transit reduction rates, and supporting evidence, if applicable.

(3) Internal capture reduction rates, if applicable.

(4) Total project traffic volumes (24-hour and peak periods) by corresponding development phase or year. Future traffic as may be required for a development with multiple phases should also be included.

(f) Required Table(s)

(1) Pass-by trip, internal capture, pedestrian, bicycles, and transit reduction rates used, if applicable.

(2) Twenty-Four hour approach volumes for background, pass-by, site generated, and total project traffic conditions at major and site access intersections and any additional transportation facilities specified by the City.

(3) Peak Hour approach volumes for background, pass-by, site generated, and total project traffic conditions at major and site access intersections and any additional transportation facilities specified by the City.

(g) Required Figure(s)

(1) Twenty-Four hour, and peak hour approach volumes for background, pass-by, site generated, and total project traffic conditions overlaid onto major and site access intersections lane configuration diagrams. Preferably overlaid onto aerial photography.

(2) Peak hour turning movement volumes for background, pass-by, site generated, and total project traffic conditions overlaid onto major and site access intersections lane configuration diagrams. Preferably overlaid onto aerial photography.

(3) Distribution and assignment rates for pass-by and site generated traffic volumes overlaid onto major and site access intersections lane configuration diagrams. Preferably overlaid onto aerial photography.

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VI. Projected Traffic

(a) Sufficient Details of Calculations

- Growth Factor information
  - Growth factor
  - Brief statement/summary of growth factor methodology
- Traffic Counts
  - Date traffic counts were taken
  - If after March 1, 2020 summarize the basis of the Traffic counts

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Note: N/A

Note: N/A

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VI. Projected Traffic

(c) Trip Generation

Table 1: Proposed Trip Generation Analysis Summary

Land Use Category	Size	Daily Weekday Trips			Weekday AM Peak Trips			Weekday PM Peak Trips		
		Total Trips	Trips Entering	Trips Exiting	Total Trips	Trips Entering	Trips Exiting	Total Trips	Trips Entering	Trips Exiting
Retail	5,300 sqft	202	101	101	20	16	4	17	5	12
School	7,110 sqft	205	103	102	13	9	4	16	8	8
Restaurant	7,500 sqft	283	142	141	7	4	3	29	14	15
Arena	2,800 sqft	31	16	15	5	5	0	5	0	5
Shopping Center	15,200 sqft	1,705	854	851	152	83	69	149	91	58
Clinic	35,900 sqft	N/A	N/A	N/A	N/A	N/A	N/A	17	6	11
Subtotal		2,426	1,216	1,210	197	117	80	233	124	109
Internal Capture		0	0	0	-16	-9	-7	-16	-10	-6
Pass-by Trips		0	0	0	0	0	0	-67	-38	-29
Total		**2,426**	1,216	1,210	**181**	108	73	**150**	76	74

EXAMPLE

3.2 Trip Distribution and Trip Assignment

The directional trip distribution and assignment of project generated trips were estimated based on an understanding of the existing and projected future traffic flows and travel patterns within the vicinity of the project site.

The development is proposed to primarily serve after school activities as well as some retail and restaurants, offices, and a clinic which resulted in trip distribution and the assignment project generated trips were estimated based on existing traffic volumes for the surrounding roadway network and the locations of homes in relation to the proposed project site.

The estimated directional trip distribution, as shown in **Figure 5**, for the proposed development is as follows:

- Ten percent (10%) to/from the north
- Twenty percent (20%) to/from the south

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EXAMPLE FORMAT OF THE TRAFFIC ANALYSIS

VII. Traffic Analysis

Analyze existing, background and project Traffic Conditions LOS and Delay at all major and site access intersections and determine MOEs of any additional transportation facilities within the analysis area as necessary or as specified by the City.

(a) Analysis must utilize existing traffic volumes.

(b) Analysis must utilize total projected traffic volumes which include site generated traffic and the background traffic to complete analyses for the required study limits and horizons as they correspond to the predetermined TIA category.

(c) Analysis may be prepared manually or by using various software programs such as Highway Capacity Software, Synchro or as approved by the City.

(d) Analysis must utilize the capacity analysis methodology found in the current edition of the Highway Capacity Manual, or control delay calculations from Synchro or other software as approved by the City, and/or delay calculations from micro-simulation of the complete street network (no individual intersections) to determine LOS.

(e) Determination of necessary or specified MOEs should be completed using state- of-the-practice engineering methods.

(f) In addition to LOS and delay, the Analysis Engineer should identify critical movements regarding capacity and potential locations of queue spillback.

(g) The Analysis Engineer should perform a signal warrant analysis for unsignalized intersections (engineering judgment) using the signal warrant guidelines. Additionally, as part of the improvements analysis the Analysis Engineer should analyze any unsignalized intersections warranting a signal as a signalized intersection and discuss within the TIA report.

(h) Tables of existing, background and project traffic conditions LOS and delay for each major and site access intersection and MOEs for any additional transportation facilities specified by the City, include critical movements and queue spillbacks.

Note: N/A

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VII. Traffic Analysis

(h) LOS and Delay Results

Table 5 – 2020 Existing LOS Results

INTERSECTION	APPROACH	AM Peak Hour		PM Peak Hour	
		DELAY (Sec/Veh)	LOS	DELAY (Sec/Veh)	LOS
SIGNALIZED INTERSECTIONS					
Washington Avenue at Houston Avenue	EB	32.8	C	34.7	C
	WB	27.1	C	25.2	C
	NB	22.2	C	21.5	C
	SB	14.1	B	17.6	B
	Intersection	**23.4**	**C**	**23.1**	**C**

Table 6 – 2022 No Build LOS Results

INTERSECTION	APPROACH	AM Peak Hour		PM Peak Hour	
		DELAY (Sec/Veh)	LOS	DELAY (Sec/Veh)	LOS
SIGNALIZED INTERSECTIONS					
Washington Avenue at Houston Avenue	EB	33.3	C	35.2	D
	WB	27.7	C	25.6	C
	NB	22.9	C	22.0	C
	SB	14.4	B	18.1	B
	Intersection	**23.9**	**C**	**23.6**	**C**

Table 7 – 2022 Build LOS Results

INTERSECTION	APPROACH	AM Peak Hour		PM Peak Hour	
		DELAY (Sec/Veh)	LOS	DELAY (Sec/Veh)	LOS
SIGNALIZED INTERSECTIONS					
Washington Avenue at Houston Avenue	EB	33.2	C	35.4	D
	WB	27.3	C	25.4	C
	NB	23.6	C	22.8	C
	SB	15.9	B	19.1	B
	Intersection	**24.3**	**C**	**24.1**	**C**
UNSIGNALIZED INTERSECTIONS					
Proposed Driveway 1	WB	14.7	B	15.9	C
Proposed Driveway 2	EB	12.9	B	13.2	B

EXAMPLE

Note: N/A

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VII. Traffic Analysis

(h) LOS and Delay Results

Table 8 – AM Peak Hour LOS Results Comparison

Study Intersections		AM Peak Hour					
		2020 Existing		2022 No Build		2022 Build	
		Delay	LOS	Delay	LOS	Delay	LOS
SIGNALIZED INTERSECTIONS							
Washington Avenue at Houston Avenue	EB	32.8	C	33.3	C	33.2	C
	WB	27.1	C	27.7	C	27.3	C
	NB	22.2	C	22.9	C	23.6	C
	SB	14.1	B	14.4	B	15.9	B
	Inter.	**23.4**	**C**	**23.9**	**C**	**24.3**	**C**
UNSIGNALIZED INTERSECTIONS							
Proposed Driveway 1	WB	-	-	-	-	14.7	B
Proposed Driveway 2	EB	-	-	-	-	12.9	B

Table 9 – PM Peak Hour LOS Results Comparison

Study Intersections		PM Peak Hour					
		2020 Existing		2022 No Build		2022 Build	
		Delay	LOS	Delay	LOS	Delay	LOS
SIGNALIZED INTERSECTIONS							
Washington Avenue at Houston Avenue	EB	34.7	C	35.2	D	35.4	D
	WB	25.2	C	25.6	C	25.4	C
	NB	21.5	C	22.0	C	22.8	C
	SB	17.6	B	18.1	B	19.1	B
	Inter.	**23.1**	**C**	**23.6**	**C**	**24.1**	**C**
UNSIGNALIZED INTERSECTIONS							
Proposed Driveway 1	WB	-	-	-	-	15.9	C
Proposed Driveway 2	EB	-	-	-	-	13.2	B

EXAMPLE

EXAMPLE FORMAT OF THE TRANSPORTATION IMPROVEMENT ANALYSIS (MITIGATION MEASURES)

IX. Transportation Improvements Analysis (Mitigation Measures)
(a) A description and justification of needed transportation improvements to accommodate project traffic conditions
(b) LOS and Delay evaluation and comparison including review of critical movements and queue spillbacks
(c) MOE comparison for any additional transportation facilities specified by the City
(d) Table(s)
(1) LOS and Delay comparisons for improvements including critical movements and queue spillback
(2) MOE comparisons for any additional transportation facilities improvements
(e) Figure(s)
(1) Concept schematics of improvements including corresponding LOS and Delay values.

Note: N/A

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IX. Transportation Improvement Analysis

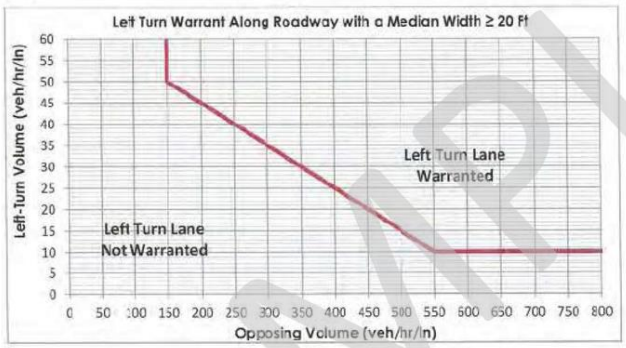
(Mitigation Measures)

(a) Description and Justification of Needed Transportation Improvements

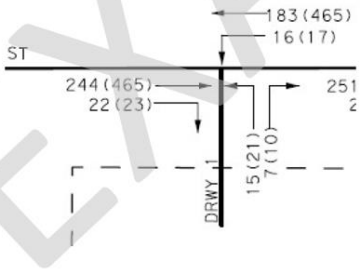
Left-Turn Lane Analysis for Driveway 1, Driveway 2, and Driveway 4

Left-Turn Warrant Criteria:

Exhibit 2



Projected Year 2025 Background Plus Project Traffic Volumes for Driveway 1:



Left-Turn Warrant Calculations:

Left-Turn Volume: 17 vehicles per hour (vph)
Opposing Volume: 465 vph + 23 vph = 488 vph

Based on the graph above, a Left-Turn warrant is met.

EXAMPLE

Note: Submit Signal Timing files separately.

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IX. Transportation Improvement Analysis

(Mitigation Measures)

(a) Description and Justification of Needed Transportation Improvements

MITIGATION MEASURES

Proposed mitigation measure improvements are recommended.

1. Washington Ave at Mentor Way: The signal timings for Washington Ave at Mentor Way intersection are recommended to be optimized in for the AM peak hour of Phase 1 and Phase 2 proposed conditions. This would allow more green time to the westbound traffic and improve the intersection delay to meet the COH standards.
2. Houston Ave at Washington Ave: The signal timings for Houston Ave at Washington Ave intersection are recommended to be optimized for the AM peak hour of Phase 1 of the development to meet COH standards.
3. Houston Ave at Mentor Way: The signal timings at the intersection of Houston Ave at Mentor Way are recommended to be optimized for the PM peak hour of Phase 2 of the development to meet COH standards.

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IX. Transportation Improvement Analysis

(Mitigation Measures)

(d) Table(s)

2022 Build LOS and Delay Results

INTERSECTION	APPROACH	AM Peak Hour		PM Peak Hour	
		DELAY (Sec/Veh)	LOS	DELAY (Sec/Veh)	LOS
SIGNALIZED INTERSECTIONS					
Washington Avenue at Houston Avenue	EB	33.3	C	35.2	D
	WB	27.7	C	25.6	C
	NB	22.9	C	22.0	C
	SB	14.4	B	18.1	B
	Intersection	**23.9**	**C**	**23.6**	**C**

2022 Build LOS and Delay Results with Mitigation

INTERSECTION	APPROACH	AM Peak Hour		PM Peak Hour	
		DELAY (Sec/Veh)	LOS	DELAY (Sec/Veh)	LOS
SIGNALIZED INTERSECTIONS					
Washington Avenue at Houston Avenue	EB	32.8	C	34.7	C
	WB	27.1	C	25.2	C
	NB	22.2	C	21.5	C
	SB	14.1	B	17.6	B
	Intersection	**23.4**	**C**	**23.1**	**C**

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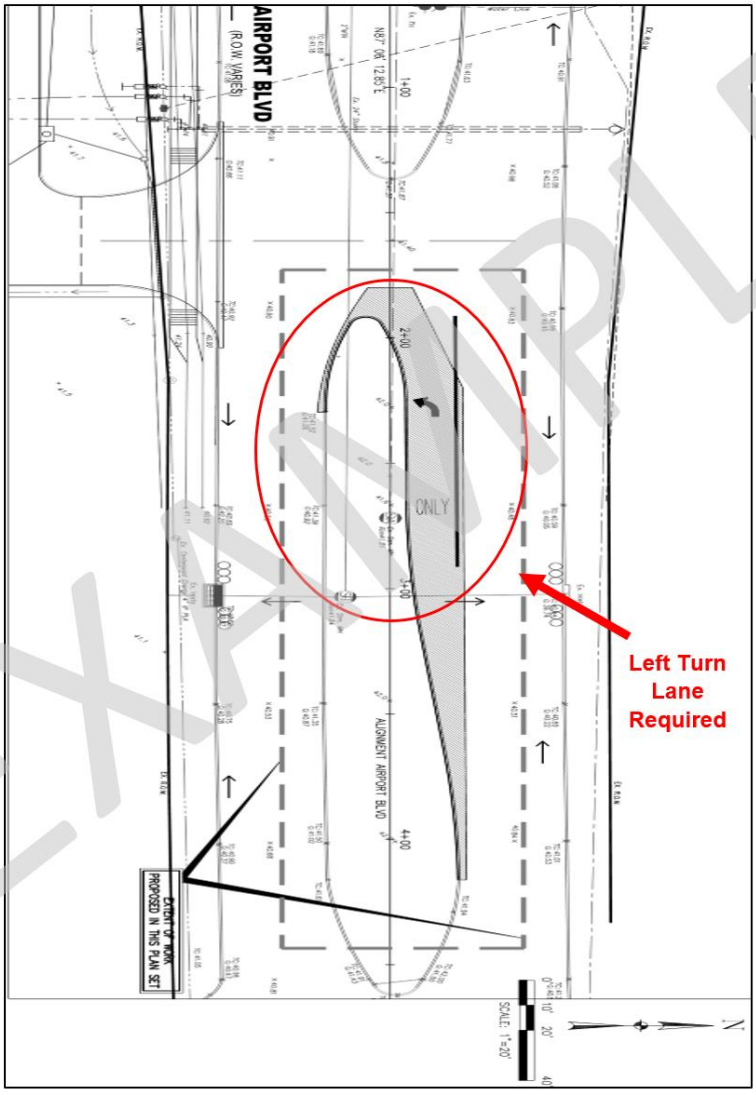
IX. Transportation Improvement Analysis

(Mitigation Measures)

(e) Figure(s)



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EXAMPLE