

## 9 Traffic Operations Analysis

Existing (2019) and forecast (2045) No Build traffic operations analyses were conducted to determine the level of service (LOS), delay, and queueing information for the AM, PM, Friday, and summer peak hour conditions.

LOS is a qualitative rating system used to describe the efficiency of traffic operations at an intersection. Six LOS levels are defined, designated by letters A through F. LOS A represents the best operating conditions (no congestion), and LOS F represents the worst operating conditions (severe congestion).

For the 13 study intersections, it was assumed that a LOS D or better represents acceptable operating conditions for all approaches and movements and LOS D or better represents acceptable operating conditions for all movements. However, due to the long cycle lengths along TH 210, some movements may have higher delays, LOS E/F, but are still expected to be served within one signal cycle.

LOS for intersections is determined by the average control delay per vehicle. The range of control delay for each LOS is different for signalized and unsignalized intersections (including roundabouts). The expectation is that a signalized intersection is designed to carry higher traffic volumes and will experience greater delays than an unsignalized intersection; driver tolerance for delay is greater at a signal than a stop sign. Therefore, LOS thresholds for each LOS category are lower for unsignalized intersections than for signalized intersections.

The traffic operations analyses were conducted using the VISSIM (version 2020) software package; an average of 10 simulation runs was used for each modeling result.

**Appendix F** includes all relevant operational tables and outputs for the existing and 2045 No Build scenarios that follow.

### 9.1 2019 Existing Conditions

The following sections summarize the traffic operations for the AM, PM, Friday, and summer peak hours under 2019 existing conditions.

Field observations were conducted in November 2019 to aid in the development of the traffic models, observations were conducted during the AM, mid-day, and PM peak hours. The PMT also provided input on the existing traffic operations, which was taken into consideration during the development of the traffic models.

#### 9.1.1 2019 Existing Conditions – AM Peak Hour

Current AM peak hour intersection operations are acceptable based on overall delays for all movements; all intersections and approaches operate at LOS D or better. There are 11 movements that operate at LOS E; however these are mostly TH 210 left turning vehicles delayed due to the long traffic signal cycle lengths at these intersections.

While the traffic operations are generally acceptable, there are some queue storage issues due to short storage lanes, these are listed below:

- The maximum westbound left turn queue at N 8<sup>th</sup> Street extends beyond the available storage.
- The maximum westbound left turn queue at Gillis Avenue/13<sup>th</sup> Street SE extends beyond the available storage.
- The maximum eastbound left turn queue at 5<sup>th</sup> Avenue NE extends beyond the available storage
- The maximum northbound queue on 8<sup>th</sup> Avenue NE extends to the intersection of TH 25 at 8<sup>th</sup> Avenue NE.

**Table 6** represents the 2019 existing traffic operations of the AM peak hour. **Figure F1** in **Appendix F** shows the LOS and queuing information for each study intersection during the 2019 existing AM peak hour.

**Table 6 – 2019 Existing Conditions – AM Peak Hour**

Intersection	Approach Delay (sec/veh / LOS)				Intersection Delay (sec/veh / LOS)
TH 210 at: (Traffic Control)	Eastbound	Westbound	Northbound	Southbound	
Baxter Dr (Traffic Signal)	7.9 / A	6.0 / A	42.0 / D	19.0 / B	9.1 / A
NW 4 <sup>th</sup> St (Traffic Signal)	18.8 / B	17.2 / B	47.0 / D	45.1 / D	24.6 / C
N 1 <sup>st</sup> St/East River Rd (Minor Street Stop)	2.7 / A	1.0 / A	10.1 / B	8.2 / A	2.1 / A
N 4 <sup>th</sup> St (Traffic Signal)	14.4 / B	5.5 / A	36.7 / D	38.2 / D	12.3 / B
N 6 <sup>th</sup> St (Traffic Signal)	5.0 / A	7.0 / A	32.2 / C		9.1 / A
N 8 <sup>th</sup> St (Traffic Signal)	5.9 / A	15.4 / B	31.5 / C	39.9 / D	14.3 / B
Gillis Ave/13 <sup>th</sup> St SE (Traffic Signal)	6.7 / A	10.0 / B	23.8 / C	22.2 / C	11.1 / B
4 <sup>th</sup> Ave NE (Traffic Signal)	1.2 / A	3.9 / A	43.9 / D	37.5 / D	4.5 / A
5 <sup>th</sup> Ave NE (Minor Street Stop)	6.4 / A	0.2 / A		10.5 / B	3.3 / A
TH 25 Ramp (Exit Ramp)	0.1 / A	0.2 / A			0.2 / A
8 <sup>th</sup> Ave NE (Traffic Signal)	33.4 / C	38.7 / D	50.5 / D	27.0 / C	36.7 / D
10 <sup>th</sup> Ave NE (Minor Street Stop)	1.4 / A	0.3 / A	12.5 / B	10.8 / B	2.3 / A
13 <sup>th</sup> Ave NE (Minor Street Stop)	0.4 / A	0.2 / A		8.8 / A	1.0 / A

## 9.1.2 2019 Existing Conditions – PM Peak Hour

There are currently operational issues along TH 210 during the PM peak hour based on delay and LOS as well as queuing. A summary of the operational issues is below:

### Delay/LOS Issues:

- TH 210 at NW 4<sup>th</sup> Street
  - The eastbound left turning movement operates at LOS F.
  - The northbound and southbound approaches operate at LOS E.
- The westbound left turning movement at N 8<sup>th</sup> Street operates at a LOS F.
- TH 210 at 8<sup>th</sup> Avenue NE:
  - The eastbound left turning movement operates at LOS F.
  - The northbound approach at 8<sup>th</sup> Avenue NE operates at LOS E.
- It should be noted that some additional lower volume left turn movements from TH 210 are not included in this summary, these volumes are all served within a single cycle and the delay is caused from the long signal cycle length.

### Queuing Issues:

- The maximum southbound right turn queue at Baxter Drive extends beyond the available storage.
- TH 210 at NW 4<sup>th</sup> Street:
  - The maximum eastbound left turn queue extends beyond the available storage.
  - The maximum westbound queue extends beyond NW 2<sup>nd</sup> Street.
- The maximum northbound left turn queue at N 4<sup>th</sup> Street extends beyond the available storage.
- TH 210 at N 8<sup>th</sup> Street:
  - The maximum westbound left turn queue extends beyond the available storage.
  - The maximum northbound left turn queue extends beyond the available storage.
- The maximum westbound left turn queue at Gillis Avenue/13<sup>th</sup> Street SE extends beyond the available storage.
- The maximum eastbound left turn queue at 5<sup>th</sup> Avenue NE extends beyond the available storage.
- TH 210 at 8<sup>th</sup> Avenue NE:
  - The maximum eastbound left turn queue extends beyond the available storage.
  - The maximum northbound queue extends approximately 720 feet east of 8<sup>th</sup> Avenue NE on TH 25, a total queue of approximately 1,320 feet.

**Table 7** represents the 2019 existing traffic operations of the PM peak hour. **Figure F2** in **Appendix F** shows the LOS and queuing information for each study intersection during the 2019 existing PM peak hour.

Table 7 – 2019 Existing Conditions – PM Peak Hour

Intersection	Approach Delay (sec/veh / LOS)				Intersection Delay (sec/veh / LOS)
TH 210 at: (Traffic Control)	Eastbound	Westbound	Northbound	Southbound	
Baxter Dr (Traffic Signal)	20.8 / C	20.5 / C	45.3 / D	32.2 / C	23.2 / C
NW 4 <sup>th</sup> St (Traffic Signal)	30.4 / C	41.8 / D	60.0 / E	60.5 / E	43.2 / D
N 1 <sup>st</sup> St/East River Rd (Minor Street Stop)	1.2 / A	0.6 / A	12.4 / B	20.6 / C	1.2 / A
N 4 <sup>th</sup> St (Traffic Signal)	11.5 / B	8.1 / A	41.4 / D	47.7 / D	15.3 / B
N 6 <sup>th</sup> St (Traffic Signal)	4.8 / A	11.4 / B	41.7 / D		13.4 / B
N 8 <sup>th</sup> St (Traffic Signal)	7.5 / A	28.5 / C	32.8 / C	40.2 / D	21.2 / C
Gillis Ave/13 <sup>th</sup> St SE (Traffic Signal)	7.4 / A	16.4 / B	29.4 / C	33.7 / C	14.3 / B
4 <sup>th</sup> Ave NE (Traffic Signal)	1.3 / A	4.3 / A	75.1 / E	37.4 / D	4.1 / A
5 <sup>th</sup> Ave NE (Minor Street Stop)	4.6 / A	0.2 / A		12.7 / B	3.6 / A
TH 25 Ramp (Exit Ramp)	0.3 / A	0.3 / A			0.3 / A
8 <sup>th</sup> Ave NE (Traffic Signal)	53.0 / D	54.2 / D	67.3 / E	50.0 / D	55.6 / E
10 <sup>th</sup> Ave NE (Minor Street Stop)	1.2 / A	0.3 / A	15.3 / C	8.8 / A	1.8 / A
13 <sup>th</sup> Ave NE (Minor Street Stop)	0.7 / A	0.2 / A		10.7 / B	1.1 / A

### 9.1.3 2019 Existing Conditions – Friday Peak Hour

Because the Friday peak hour on TH 210 has 5% higher traffic demands than the PM peak hour, the operational issues in the PM peak hour would be worsened with increased traffic on Fridays. A summary of the operational issues is below:

#### Delay/LOS Issues:

- TH 210 at NW 4<sup>th</sup> Street
  - The eastbound left turning movement operates at LOS F.
  - The northbound and southbound approaches operate at LOS E.
- The westbound left turning movement at N 8<sup>th</sup> Street operates at LOS F.
- TH 210 at 8<sup>th</sup> Avenue NE – the overall intersection operates at a LOS E.
  - The eastbound left turning movement operates at LOS F.
  - The northbound approach at 8<sup>th</sup> Avenue NE operates at LOS E.
- It should be noted that some additional lower volume left turn movements from TH 210 are not included in this summary, these volumes are all served within a single cycle and the delay is caused from the long signal cycle length.

#### Queuing Issues:

- The maximum southbound right turn queue at Baxter Drive extends beyond the available storage.
- TH 210 at NW 4<sup>th</sup> Street:
  - The maximum eastbound left turn queue extends beyond the available storage.
  - The maximum westbound queue extends beyond NW 2<sup>nd</sup> Street.
- The maximum northbound left turn queue at N 4<sup>th</sup> Street extends beyond the available storage.
- TH 210 at N 8<sup>th</sup> Street:
  - The maximum westbound left turn queue extends beyond the available storage.
  - The maximum northbound left turn queue extends beyond the available storage.
- The maximum westbound left turn queue at Gillis Avenue/13<sup>th</sup> Street SE extends beyond the available storage.
- The maximum eastbound left turn queue at 5<sup>th</sup> Avenue NE extends beyond the available storage.
- TH 210 at 8<sup>th</sup> Avenue NE:
  - The maximum eastbound left turn queue extends beyond the available storage.
  - The maximum northbound queue extends approximately 850 feet east of 8<sup>th</sup> Avenue NE on TH 25, a total queue of approximately 1,450 feet.

**Table 8** represents the 2019 existing traffic operations of the Friday peak hour. **Figure F3** in **Appendix F** shows the LOS and queuing information for each study intersection during the 2019 existing Friday peak hour.

Table 8 – 2019 Existing Conditions – Friday Peak Hour

Intersection	Approach Delay (sec/veh / LOS)				Intersection Delay (sec/veh / LOS)
TH 210 at: (Traffic Control)	Eastbound	Westbound	Northbound	Southbound	
Baxter Dr (Traffic Signal)	21.0 / C	21.9 / C	46.0 / D	34.3 / C	24.1 / C
NW 4 <sup>th</sup> St (Traffic Signal)	33.7 / C	49.7 / D	60.2 / E	60.6 / E	47.4 / D
N 1 <sup>st</sup> St/East River Rd (Minor Street Stop)	1.1 / A	0.7 / A	12.5 / B	19.9 / C	1.2 / A
N 4 <sup>th</sup> St (Traffic Signal)	11.7 / B	8.1 / A	41.8 / D	48.3 / D	15.5 / B
N 6 <sup>th</sup> St (Traffic Signal)	5.0 / A	11.5 / B	41.8 / D		13.6 / B
N 8 <sup>th</sup> St (Traffic Signal)	8.1 / A	30.8 / C	34.9 / C	42.5 / D	22.7 / C
Gillis Ave/13 <sup>th</sup> St SE (Traffic Signal)	7.5 / A	17.9 / B	29.0 / C	31.6 / C	14.9 / B
4 <sup>th</sup> Ave NE (Traffic Signal)	1.5 / A	4.1 / A	74.9 / E	37.7 / D	4.1 / A
5 <sup>th</sup> Ave NE (Minor Street Stop)	5.1 / A	0.1 / A		13.7 / B	3.9 / A
TH 25 Ramp (Exit Ramp)	0.3 / A	0.3 / A			0.3 / A
8 <sup>th</sup> Ave NE (Traffic Signal)	59.1 / E	56.6 / E	69.8 / E	53.9 / D	59.6 / E
10 <sup>th</sup> Ave NE (Minor Street Stop)	1.3 / A	0.3 / A	16.1 / C	8.4 / A	1.9 / A
13 <sup>th</sup> Ave NE (Minor Street Stop)	0.7 / A	0.2 / A		10.9 / B	1.1 / A

## 9.1.4 2019 Existing Conditions – Summer Peak Hour

The summer peak hour has 10% higher traffic demands than the PM peak hour and the coordinated cycle length is 10 second longer than the PM peak; therefore, many of the same operational issues seen in the PM and Friday peak hours are worsened in the summer peak hour. A summary of the operational issues is below:

### Delay/LOS Issues:

- The northbound approach at Baxter Drive operates at LOS E.
- TH 210 at NW 4<sup>th</sup> Street – the overall intersection operates at a LOS E.
  - The eastbound left turning movement operates at LOS F.
  - The northbound approaches operate at LOS F.
  - The southbound approaches operate at LOS E.
- The southbound approach at N 4<sup>th</sup> Street operates at LOS E.
- The westbound left turning movement at N 8<sup>th</sup> Street operates at LOS F.
- TH 210 at 8<sup>th</sup> Avenue NE – the overall intersection operates at a LOS E.
  - The eastbound and southbound left turning movements operates at LOS F.
  - All four approaches operate at LOS E.
- It should be noted that some additional lower volume left turn movements from TH 210 are not included in this summary, these volumes are all served within a single cycle and the delay is caused from the long signal cycle length.

### Queuing Issues:

- The maximum southbound right turn queue at Baxter Drive extends beyond the available storage.
- TH 210 at NW 4<sup>th</sup> Street:
  - The maximum eastbound left turn queue extends beyond the available storage.
  - The maximum westbound queue extends beyond NW 2<sup>nd</sup> Street.
- The maximum northbound left turn queue at N 4<sup>th</sup> Street extends beyond the available storage.
- TH 210 at N 8<sup>th</sup> Street:
  - The maximum westbound left turn queue extends beyond the available storage.
  - The maximum northbound left turn queue extends beyond the available storage.
- The maximum westbound left turn queue at Gillis Avenue/13<sup>th</sup> Street SE extends beyond the available storage.
- The maximum eastbound left turn queue at 5<sup>th</sup> Avenue NE extends beyond the available storage and into the traffic signal at 4<sup>th</sup> Avenue NE.
- TH 210 at 8<sup>th</sup> Avenue NE:
  - The maximum eastbound left turn queue extends beyond the available storage.
  - The maximum northbound queue extends approximately 1,100 feet east of 8<sup>th</sup> Avenue NE on TH 25, a total queue of approximately 1,700 feet.

**Table 9** represents the 2019 existing traffic operations of the summer peak hour. **Figure F4** in **Appendix F** shows the LOS and queuing information for each study intersection during the 2019 existing summer peak hour.

**Table 9 – 2019 Existing Conditions – Summer Peak Hour**

Intersection	Approach Delay (sec/veh / LOS)				Intersection Delay (sec/veh / LOS)
TH 210 at: (Traffic Control)	Eastbound	Westbound	Northbound	Southbound	
Baxter Dr (Traffic Signal)	14.7 / B	16.4 / B	<b>58.1 / E</b>	41.9 / D	20.5 / C
NW 4 <sup>th</sup> St (Traffic Signal)	37.4 / D	43.4 / D	<b>148.0 / F</b>	<b>67.7 / E</b>	<b>59.9 / E</b>
N 1 <sup>st</sup> St/East River Rd (Minor Street Stop)	1.5 / A	0.7 / A	14.7 / B	24.7 / C	1.5 / A
N 4 <sup>th</sup> St (Traffic Signal)	9.9 / A	7.4 / A	45.1 / D	<b>56.2 / E</b>	15.1 / B
N 6 <sup>th</sup> St (Traffic Signal)	5.2 / A	11.1 / B	46.1 / D		14.1 / B
N 8 <sup>th</sup> St (Traffic Signal)	7.0 / A	33.7 / C	39.4 / D	47.0 / D	24.4 / C
Gillis Ave/13 <sup>th</sup> St SE (Traffic Signal)	8.2 / A	19.0 / B	33.2 / C	41.6 / D	16.4 / B
4 <sup>th</sup> Ave NE (Traffic Signal)	1.2 / A	2.7 / A	<b>71.7 / E</b>	43.5 / D	3.6 / A
5 <sup>th</sup> Ave NE (Minor Street Stop)	6.5 / A	0.2 / A		15.0 / C	4.8 / A
TH 25 Ramp (Exit Ramp)	0.3 / A	0.4 / A			0.3 / A
8 <sup>th</sup> Ave NE (Traffic Signal)	<b>66.9 / E</b>	<b>63.2 / E</b>	<b>77.9 / E</b>	<b>59.3 / E</b>	<b>66.6 / E</b>
10 <sup>th</sup> Ave NE (Minor Street Stop)	1.3 / A	0.4 / A	23.6 / C	8.3 / A	2.4 / A
13 <sup>th</sup> Ave NE (Minor Street Stop)	0.9 / A	0.2 / A		11.3 / B	1.2 / A



## 9.2 2045 No Build Conditions

The following sections summarize the traffic operations for the AM, PM, Friday, and summer peak hours under 2045 No Build conditions. The analyses for the 2045 No Build conditions have forecasted traffic volumes with a 0.5% annual growth rate from the existing 2019 conditions.

Other than the planned improvements at the intersection at TH 210 at NW 4<sup>th</sup> Street, all intersection control, intersection geometrics, and signal phasing are the same as the existing condition. Signal timing changes were made in an effort to optimize 2045 No Build traffic operations.

### 9.2.1 2045 No Build Conditions – AM Peak Hour

2045 No Build AM peak hour intersection operations are acceptable based on overall delays for all movements; all approaches and intersections operate at LOS D or better; the only exception is at the intersection of 8<sup>th</sup> Avenue NE where the northbound approach operates at a LOS E.

There are some queue storage issues, which are listed below:

- The maximum westbound left turn queue at N 4<sup>th</sup> Street extends beyond the available storage.
- The maximum westbound left turn queue at N 8<sup>th</sup> Street extends beyond the available storage.
- The maximum westbound left turn queue at 13<sup>th</sup> St SE extends beyond the available storage.
- The maximum eastbound left turn queue at 5<sup>th</sup> Ave NE extends beyond the available storage
- The maximum northbound queue extends approximately 300 feet east of 8<sup>th</sup> Avenue NE on TH 25, a total queue of approximately 900 feet.

**Table 10** represents the 2045 No Build traffic operations of the AM peak hour. **Figure F5** in **Appendix F** shows the LOS and queuing information for each study intersection during the 2045 No Build AM peak hour.

Table 10 – 2045 No Build Conditions – AM Peak Hour

Intersection	Approach Delay (sec/veh / LOS)				Intersection Delay (sec/veh / LOS)
TH 210 at: (Traffic Control)	Eastbound	Westbound	Northbound	Southbound	
Baxter Dr (Traffic Signal)	9.0 / A	5.8 / A	43.6 / D	18.8 / B	9.7 / A
NW 4 <sup>th</sup> St (Traffic Signal)	23.1 / C	21.0 / C	48.8 / D	45.7 / D	27.9 / C
N 1 <sup>st</sup> St/East River Rd (Minor Street Stop)	3.8 / A	1.3 / A	11.3 / B	9.7 / A	2.8 / A
N 4 <sup>th</sup> St (Traffic Signal)	11.0 / B	7.4 / A	37.7 / D	36.4 / D	11.6 / B
N 6 <sup>th</sup> St (Traffic Signal)	8.3 / A	6.8 / A	32.1 / C		10.4 / B
N 8 <sup>th</sup> St (Traffic Signal)	5.9 / A	14.2 / B	30.7 / C	38.4 / D	13.7 / B
Gillis Ave/13 <sup>th</sup> St SE (Traffic Signal)	5.3 / A	10.9 / B	24.0 / C	26.1 / C	11.2 / B
4 <sup>th</sup> Ave NE (Traffic Signal)	5.1 / A	4.5 / A	46.8 / D	40.0 / D	6.7 / A
5 <sup>th</sup> Ave NE (Minor Street Stop)	11.6 / B	0.2 / A		12.0 / B	5.6 / A
TH 25 Ramp (Exit Ramp)	0.1 / A	0.2 / A			0.2 / A
8 <sup>th</sup> Ave NE (Traffic Signal)	42.8 / D	48.5 / D	60.6 / E	33.5 / C	45.5 / D
10 <sup>th</sup> Ave NE (Minor Street Stop)	1.5 / A	0.4 / A	14.9 / B	13.1 / B	2.8 / A
13 <sup>th</sup> Ave NE (Minor Street Stop)	0.7 / A	0.2 / A		8.9 / A	1.1 / A

## 9.2.2 2045 No Build Conditions – PM Peak Hour

The 2045 No Build PM peak hour operational issues will continue to degrade with increased traffic volumes. A summary of the operational issues is below:

### Delay/LOS Issues:

- TH 210 at NW 4<sup>th</sup> Street
  - The eastbound left turning movement operates at LOS F.
  - The northbound and southbound approaches operate at LOS E.
- The southbound stopped approach at N 1<sup>st</sup> Street/East River Road operates at a LOS E.
- The westbound left turning movement at N 8<sup>th</sup> Street operates at LOS F.
- TH 210 at 8<sup>th</sup> Avenue NE – the overall intersection operates at a LOS E.
  - All left turning movements operates at LOS F.
  - The northbound approach operates at LOS F.
  - The other three approaches operate at LOS E.
- It should be noted that some additional lower volume left turn movements from TH 210 are not included in this summary, these volumes are all served within a single cycle and the delay is caused from the long signal cycle length.

### Queuing Issues:

- The maximum southbound right turn queue at Baxter Drive extends beyond the available storage.
- TH 210 at NW 4<sup>th</sup> Street:
  - The maximum eastbound left turn queue extends beyond the available storage.
  - The maximum westbound queue extends beyond NW 2<sup>nd</sup> Street.
- The maximum northbound left turn queue at N 4<sup>th</sup> Street extends beyond the available storage.
- TH 210 at N 8<sup>th</sup> Street:
  - The maximum westbound left turn queue extends beyond the available storage.
  - The maximum northbound left turn queue extends beyond the available storage.
- The maximum westbound left turn queue at Gillis Avenue/13<sup>th</sup> Street SE extends beyond the available storage.
- The maximum eastbound left turn queue at 5<sup>th</sup> Avenue NE extends beyond the available storage and into the traffic signal at 4<sup>th</sup> Avenue NE.
- TH 210 at 8<sup>th</sup> Avenue NE:
  - The maximum eastbound left turn queue extends beyond the available storage.
  - The maximum northbound queue extends approximately 1,550 feet east of 8<sup>th</sup> Avenue NE on TH 25, a total queue of approximately 2,150 feet.

**Table 11** represents the 2045 No Build traffic operations of the PM peak hour. **Figure F6** in **Appendix F** shows the LOS and queuing information for each study intersection during the 2045 No Build PM peak hour.

Table 11 – 2045 No Build Conditions – PM Peak Hour

Intersection	Approach Delay (sec/veh / LOS)				Intersection Delay (sec/veh / LOS)
TH 210 at: (Traffic Control)	Eastbound	Westbound	Northbound	Southbound	
Baxter Dr (Traffic Signal)	17.0 / B	14.6 / B	52.7 / D	43.0 / D	20.6 / C
NW 4 <sup>th</sup> St (Traffic Signal)	31.7 / C	33.5 / C	72.5 / E	60.4 / E	42.1 / D
N 1 <sup>st</sup> St/East River Rd (Minor Street Stop)	1.2 / A	0.6 / A	14.1 / B	44.0 / E	1.3 / A
N 4 <sup>th</sup> St (Traffic Signal)	15.0 / B	7.9 / A	44.5 / D	52.0 / D	17.3 / B
N 6 <sup>th</sup> St (Traffic Signal)	6.7 / A	11.2 / B	42.9 / D		14.4 / B
N 8 <sup>th</sup> St (Traffic Signal)	9.1 / A	29.3 / C	38.1 / D	43.5 / D	23.3 / C
Gillis Ave/13 <sup>th</sup> St SE (Traffic Signal)	6.7 / A	19.6 / B	33.4 / C	38.9 / D	15.9 / B
4 <sup>th</sup> Ave NE (Traffic Signal)	1.9 / A	3.1 / A	73.2 / E	40.6 / D	4.0 / A
5 <sup>th</sup> Ave NE (Minor Street Stop)	7.9 / A	0.2 / A		16.3 / C	5.7 / A
TH 25 Ramp (Exit Ramp)	0.3 / A	0.4 / A			0.3 / A
8 <sup>th</sup> Ave NE (Traffic Signal)	72.6 / E	64.8 / E	83.5 / F	61.6 / E	70.6 / E
10 <sup>th</sup> Ave NE (Minor Street Stop)	1.4 / A	0.4 / A	25.1 / D	8.1 / A	2.6 / A
13 <sup>th</sup> Ave NE (Minor Street Stop)	0.9 / A	0.2 / A		11.0 / B	1.2 / A

### 9.2.3 2045 No Build Conditions – Friday Peak Hour

Because the Friday peak hour having higher traffic demands than the PM peak hour, the operational issues in the PM peak hour would be worsened with increased traffic on Fridays just like in the existing conditions. A summary of the operational issues is below:

#### **Delay/LOS Issues:**

- TH 210 at NW 4<sup>th</sup> Street
  - The eastbound and westbound left turning movement operates at LOS F.
  - The northbound approaches operate at LOS F.
  - The southbound approaches operate at LOS E
- The southbound stopped approach at N 1<sup>st</sup> Street/East River Road operates at a LOS F.
- The westbound left turning movement at N 8<sup>th</sup> Street operates at LOS F.
- TH 210 at 8<sup>th</sup> Avenue NE – the overall intersection operates at a LOS F.
  - All left turning movements operates at LOS F.
  - The northbound and eastbound approaches operates at LOS F.
  - The westbound and southbound approaches operate at LOS E.
- It should be noted that some additional lower volume left turn movements from TH 210 are not included in this summary, these volumes are all served within a single cycle and the delay is caused from the long signal cycle length.

#### **Queuing Issues:**

- The maximum southbound right turn queue at Baxter Drive extends beyond the available storage.
- TH 210 at NW 4<sup>th</sup> Street:
  - The maximum eastbound and westbound left turn queue extends beyond the available storage.
  - The maximum westbound queue extends beyond NW 2<sup>nd</sup> Street.
- TH 210 at N 4<sup>th</sup> Street:
  - The maximum westbound left turn queue extends beyond the available storage.
  - The maximum northbound left turn queue extends beyond the available storage.
- TH 210 at N 8<sup>th</sup> Street:
  - The maximum westbound left turn queue extends beyond the available storage.
  - The maximum northbound left turn queue extends beyond the available storage.
- The maximum westbound left turn queue at Gillis Avenue/13<sup>th</sup> Street SE extends beyond the available storage.
  - The maximum westbound queue extends into the 2<sup>nd</sup> Avenue NE intersection.
- The maximum eastbound left turn queue at 5<sup>th</sup> Avenue NE extends beyond the available storage and into the traffic signal at 4<sup>th</sup> Avenue NE.
- TH 210 at 8<sup>th</sup> Avenue NE:
  - The maximum eastbound left turn queue extends beyond the available storage.
  - The maximum northbound queue extends approximately 1,800 feet east of 8<sup>th</sup> Avenue NE on TH 25, a total queue of approximately 2,400 feet.

**Table 12** represents the 2045 No Build traffic operations of the Friday peak hour. **Figure F7** in **Appendix F** shows the LOS and queuing information for each study intersection during the 2045 No Build Friday peak hour.

**Table 12 – 2045 No Build Conditions – Friday Peak Hour**

Intersection	Approach Delay (sec/veh / LOS)				Intersection Delay (sec/veh / LOS)
TH 210 at: (Traffic Control)	Eastbound	Westbound	Northbound	Southbound	
Baxter Dr (Traffic Signal)	17.3 / B	15.1 / B	53.2 / D	49.2 / D	21.6 / C
NW 4 <sup>th</sup> St (Traffic Signal)	36.3 / D	46.7 / D	84.1 / F	63.0 / E	50.9 / D
N 1 <sup>st</sup> St/East River Rd (Minor Street Stop)	4.2 / A	2.6 / A	33.5 / D	75.7 / F	4.3 / A
N 4 <sup>th</sup> St (Traffic Signal)	15.6 / B	7.9 / A	42.8 / D	50.4 / D	17.2 / B
N 6 <sup>th</sup> St (Traffic Signal)	7.1 / A	11.4 / B	45.2 / D		15.1 / B
N 8 <sup>th</sup> St (Traffic Signal)	10.8 / B	30.3 / C	37.8 / D	43.7 / D	24.3 / C
Gillis Ave/13 <sup>th</sup> St SE (Traffic Signal)	7.0 / A	21.7 / C	37.1 / D	37.9 / D	17.3 / B
4 <sup>th</sup> Ave NE (Traffic Signal)	2.6 / A	3.4 / A	68.7 / E	44.0 / D	4.7 / A
5 <sup>th</sup> Ave NE (Minor Street Stop)	8.9 / A	0.2 / A		16.5 / C	6.2 / A
TH 25 Ramp (Exit Ramp)	0.5 / A	0.4 / A			0.5 / A
8 <sup>th</sup> Ave NE (Traffic Signal)	91.4 / F	71.7 / E	88.4 / F	64.8 / E	80.1 / F
10 <sup>th</sup> Ave NE (Minor Street Stop)	1.3 / A	0.5 / A	29.1 / D	8.8 / A	2.8 / A
13 <sup>th</sup> Ave NE (Minor Street Stop)	0.9 / A	0.2 / A		11.1 / B	1.2 / A

## 9.2.4 2045 No Build Operations – Summer Peak Hour

The summer peak hour has 10% higher traffic demands than the PM peak hour and the coordinated cycle length is 10 second longer than the PM peak; therefore, many of the same operational issues seen in the PM and Friday peak hours are worsened in the summer peak hour, just as they are in the existing conditions. A summary of the operational issues is below:

### Delay/LOS Issues:

- The northbound and southbound approaches at Baxter Drive operates at LOS E.
- TH 210 at NW 4<sup>th</sup> Street – the overall intersection operates at LOS E.
  - The eastbound left turning movement operates at LOS F.
  - The northbound approaches operate at LOS F.
  - The southbound approaches operate at LOS E
- The southbound stopped approach at N 1<sup>st</sup> Street/East River Road operates at a LOS F.
- The westbound left turning movement at N 8<sup>th</sup> Street operates at LOS F.
- The westbound left turning movement at Gillis Avenue/13<sup>th</sup> Street NE operates at LOS F.
- TH 210 at 8<sup>th</sup> Avenue NE – the overall intersection operates at a LOS F.
  - All left turning movements operates at LOS F.
  - The northbound and eastbound approaches operates at LOS F.
  - The westbound and southbound approaches operate at LOS E.
- It should be noted that some additional lower volume left turn movements from TH 210 are not included in this summary, these volumes are all served within a single cycle and the delay is caused from the long signal cycle length.

### Queuing Issues:

- The maximum southbound right turn queue at Baxter Drive extends beyond the available storage.
- TH 210 at NW 4<sup>th</sup> Street:
  - The maximum eastbound and westbound left turn queue extends beyond the available storage.
  - The maximum westbound queue extends beyond NW 2<sup>nd</sup> Street.
- TH 210 at N 4<sup>th</sup> Street:
  - The maximum westbound left turn queue extends beyond the available storage.
  - The maximum northbound left turn queue extends beyond the available storage.
- TH 210 at N 8<sup>th</sup> Street:
  - The maximum westbound left turn queue extends beyond the available storage.
  - The maximum northbound left turn queue extends beyond the available storage.
- The maximum westbound left turn queue at Gillis Avenue/13<sup>th</sup> Street SE extends beyond the available storage.
  - The maximum westbound queue extends into the 2<sup>nd</sup> Avenue NE intersection.
- The maximum eastbound left turn queue at 5<sup>th</sup> Avenue NE extends beyond the available storage and through the traffic signal at 4<sup>th</sup> Avenue NE.

- TH 210 at 8<sup>th</sup> Avenue NE:
  - The maximum eastbound left turn queue extends beyond the available storage.
  - The maximum northbound queue extends approximately 2,200 feet east of 8<sup>th</sup> Avenue NE on TH 25, a total queue of approximately 2,800 feet.

**Table 13** represents the 2045 No Build traffic operations of the summer peak hour. **Figure F8** in **Appendix F** shows the LOS and queuing information for each study intersection during the 2045 No Build summer peak hour.

**Table 13 – 2045 No Build Conditions – Summer Peak Hour**

Intersection	Approach Delay (sec/veh / LOS)				Intersection Delay (sec/veh / LOS)
TH 210 at: (Traffic Control)	Eastbound	Westbound	Northbound	Southbound	
Baxter Dr (Traffic Signal)	18.1 / B	16.5 / B	<b>58.8 / E</b>	<b>58.2 / E</b>	23.7 / C
NW 4 <sup>th</sup> St (Traffic Signal)	<b>35.1 / D</b>	<b>42.0 / D</b>	<b>242.4 / F</b>	<b>65.1 / E</b>	<b>70.5 / E</b>
N 1 <sup>st</sup> St/East River Rd (Minor Street Stop)	3.7 / A	1.5 / A	<b>42.4 / E</b>	<b>51.4 / F</b>	3.6 / A
N 4 <sup>th</sup> St (Traffic Signal)	18.7 / B	8.6 / A	47.4 / D	53.8 / D	19.5 / B
N 6 <sup>th</sup> St (Traffic Signal)	9.5 / A	15.1 / B	47.5 / D		18.0 / B
N 8 <sup>th</sup> St (Traffic Signal)	10.9 / B	<b>35.4 / D</b>	41.3 / D	47.3 / D	27.0 / C
Gillis Ave/13 <sup>th</sup> St SE (Traffic Signal)	6.8 / A	25.9 / C	41.8 / D	41.9 / D	19.7 / B
4 <sup>th</sup> Ave NE (Traffic Signal)	5.4 / A	3.3 / A	<b>69.7 / E</b>	45.0 / D	6.1 / A
5 <sup>th</sup> Ave NE (Minor Street Stop)	12.4 / B	0.3 / A		19.6 / C	8.4 / A
TH 25 Ramp (Exit Ramp)	2.5 / A	0.4 / A			1.5 / A
8 <sup>th</sup> Ave NE (Traffic Signal)	<b>117.4 / F</b>	<b>75.2 / E</b>	<b>99.4 / F</b>	<b>70.0 / E</b>	<b>92.6 / F</b>
10 <sup>th</sup> Ave NE (Minor Street Stop)	1.2 / A	0.5 / A	<b>36.4 / E</b>	9.2 / A	3.3 / A
13 <sup>th</sup> Ave NE (Minor Street Stop)	0.9 / A	0.2 / A		14.3 / B	1.4 / A