Indianola Avenue – Task 3 Highway Capacity Software Analysis

Introduction

Michael Baker International has been tasked by the City of Columbus with evaluating the feasibility of a lane reconfiguration along Indianola Avenue. The lane reconfiguration includes the addition of bicycle facilities by means of parking lane modifications between existing bike lanes at Oakland Park Avenue and the cycle track at E Hudson Street and Summit Street.

Purpose

The purpose of the Highway Capacity Software (HCS) analysis is to evaluate the feasibility of implementing a lane reconfiguration along Indianola Avenue. This reconfiguration would reduce a traveled lane in the peak period along Indianola Avenue as well as on-street parking to allow for new bicycle facilities to be installed.

Traffic Data

Traffic Counts

Turning Movement Counts (TMC) were conducted by the City of Columbus in September of 2020. Due to the ongoing COVID-19 pandemic, these turning movement counts were adjusted to represent pre-pandemic traffic volumes.

Certified Traffic

No-Build and Build turning movement volumes were developed for the Opening Year (2024) and Design Year (2044) including both AM and PM peak volumes. These Certified Traffic volumes were developed in April of 2021 and certified by ODOT. See **Appendix A** for the Certified Traffic report and traffic plates.

Methodology

Highway Capacity Software

The Highway Capacity Software (HCS) analysis was split up into two files. The two intersections along Hudson St are contained in one file, and the remaining four intersections along Indianola Ave are included in the second. Based on the roadway volumes, the eastbound movement along Hudson St was coded as the forward direction whereas the northbound movement along Indianola Ave was considered the forward direction.

The City of Columbus provided the existing signal timing for the study intersections. The E North Broadway intersection and Oakland Park Avenue intersection had a different cycle length when compared to the other intersections along the corridor. Therefore, in the HCS coding, it was considered an “uncoordinated intersection”. Due to the high volumes at the E North Broadway intersection, and distance from the Oakland Park Avenue intersection to the rest of the corridor, they remained coded as uncoordinated for the proposed analysis.

The HCS analysis was conducted in accordance with the ODOT Analysis and Traffic Simulation Manual (OATS). AM and PM peak volumes were analyzed under the No-Build and Build

conditions. The Opening Year (2024) and Design Year (2044) were optimized to obtain the results for the respective traffic volumes, see **Table 3** and **Table 4**.

The cycle length and splits were optimized in accordance with Chapter 6 of the OATS manual. The cycle length was set to a minimum of 60 seconds and a maximum of 120 seconds with 5 second intervals. Cycle lengths for the AM and PM peak hours were analyzed separately, and therefore may be different durations. Because the intersections of E North Broadway and Oakland Park Ave were considered uncoordinated, the optimized cycle lengths may fall outside of the 60-120 second window.

Conditions

The existing configuration (No Build) was first analyzed to set a baseline. Then the base lane reconfiguration was analyzed and compared to the No Build. As will be discussed in later sections, additional configurations beyond the base lane reconfiguration were then analyzed for the E North Broadway intersection to evaluate signal operation improvements and a recommended Build Condition was recommended and detailed. The HCS Reports can be found in **Appendix B**

No Build Condition

The segment of Indianola Avenue from E Hudson Street to E Arcadia Avenue is two travel lanes in each direction with on-street parking available on both sides. However, on-street parking is not permitted on weekdays between 7:00-9:00 AM and 4:00-6:00 PM in either direction. Anecdotal observations indicate that cars are occasionally parked in the curb lane during peak restricted hours.

From E Arcadia Avenue to E North Broadway, the corridor is two travel lanes in each direction with a center turn lane between Parkview Drive and E North Broadway. On-street parking is present but parking on the east side of the roadway is prohibited between 4:00-6:00 PM, and parking on the west side is prohibited from 7:00-9:00 AM.

The northernmost segment from E North Broadway through Oakland Park Avenue has one travel lane and one merge lane in the northbound direction and two travel lanes in the southbound direction. The existing intersection lane configurations are shown below in **Table 1**.

Table 1. No Build Intersection Lane Configurations

Intersection	Direction	Lane Designation					
		Left Only	Left+Thru	Thru Only	Thru+Right	Right Only	All Movements
Hudson & Summit	Eastbound			X	X		
	Westbound		X	X			
	Northbound						
	Southbound						X
Indianola & Hudson	Eastbound				X		
	Westbound			X		X	
	Northbound			X		X	
	Southbound	X			X		
Indianola & Arcadia	Eastbound		X			X	
	Westbound						X
	Northbound		X		X		
	Southbound		X		X		
Indianola & Weber	Eastbound	X			X		
	Westbound	X			X		
	Northbound	X		X	X*		
	Southbound	X		X	X*		
Indianola & North Broadway	Eastbound	X			X		
	Westbound	X		X		X	
	Northbound	X		X	X*		
	Southbound	X		X	X*		
Indianola & Oakland Park	Eastbound	X			X		
	Westbound	X			X		
	Northbound	X			X		
	Southbound	X			X		

* Coded in HCS as right turn only in the off-peak direction due to on-street parking

Alternatives Analysis

Initially, the following base lane reconfiguration was assessed within HCS to determine the expected LOS and delay. The base lane reconfiguration would modify existing on street parking along Indianola Avenue and a dedicated parking lane would be provided on one side of the street based on recommendations from the parking utilization assessment. The corridor would then operate with one lane of travel in each direction. This reflects current operations of the corridor during off-peak periods when parking is not restricted. The center turn lane would remain and a bike lane would be installed in each direction. Additionally, the outside, eastbound lane along Hudson St was initially evaluated for the feasibility of conversion to a cycle track.

It was determined that every intersection would operate at an acceptable vehicular level of service with the base lane reconfiguration except for the Indianola Ave & E North Broadway

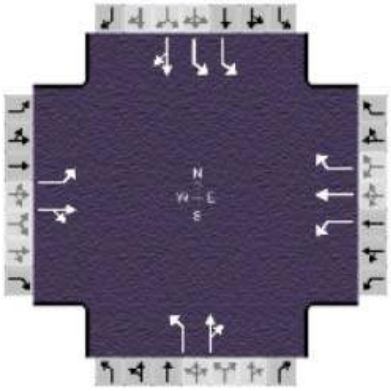
intersection. The conversion of vehicular travel lanes to bike lanes through this intersection would cause the intersection delay to increase to 67.1 seconds and the LOS to decay to E during the PM Peak hour in the 2024 opening year (See the HCS reports in Appendix B for details). The Certified Traffic volumes show that a minimum of 350 southbound vehicles are turning left at this intersection. With only a single southbound left turning lane, this movement requires a significant portion of the cycle length causing all movement's Level of Service (LOS) to degrade below an acceptable level.

The outside, eastbound lane along Hudson St was evaluated for the feasibility of conversion to a cycle track. The results showed that the Hudson St & Summit St intersection would operate with an intersection delay of at least 170.5 seconds and a LOS F. However, after correspondence with McTrans, the producer of HCS software, the limitations of the HCS program in analyzing capacity regarding cycle track conversions was apparent. Therefore, further evaluation outside of the scope of this project is recommended, including access management as well as traffic operation impacts.

Once the Base Analysis ruled out the traditional implementation of the bike lanes at E North Broadway, an Alternatives Analysis was conducted to increase signalized operation for all movements at the E North Broadway intersection, while also providing accommodations for bike traffic. Additional configurations were investigated to improve the LOS.

An additional southbound left-turn lane was analyzed due to the high turning volume. **Figure 1** above shows the lane configuration for this alternative analysis. The alternative analysis (**Alt 1 Build**) includes 5-foot bike lanes on both sides of Indianola Ave, and a 10-foot painted median to offset the northbound left turn lane for alignment reasons. With dual southbound turning lanes, the southbound left turn movement was coded as protected only in HCS.

(E North Broadway)



(Indianola Avenue)

Figure 1. Alt 1 North Broadway Lane Configuration

As shown in **Table 3** and **Table 4** the addition of a second southbound left turn lane results in reduced delay. However, in 2044 the LOS is still not ideal during the PM peak. A second

alternative (**Alt 2 Build**) was investigated which included the lane designations in **Figure 1** and adds an additional eastbound through lane. The right of way at the E North Broadway intersection was evaluated and determined to have ample width for the additional lane. However, further evaluation would be needed to determine impacts and appropriate design for the sidewalk and tree lawn at this location. Engagement with adjacent and area residents would be needed if this improvement were to be pursued at a future date. The second alternative results in acceptable LOS for all approaches, see **Table 3** and **Table 4**.

Finally, given that Alt 1 and Alt 2 would require physical modifications to the intersection, a third, hybrid alternative (incorporated into the **Build Condition** discussed below) was identified that balances the objective of accommodating bicycle movement through the intersection while maintaining acceptable vehicular traffic operations. In this alternative, the intersection would be restriped so that the outside right curb lane on the north and south legs of Indianola become dedicated right turn only lanes. Bike lanes will merge into the right turn lanes and cyclists will mix with turning traffic in the lane. Cyclists will be permitted to proceed directly through the intersection, while vehicles in the lane will only be permitted to turn right. This has the added benefit of separating right turning vehicles from those proceeding directly through the intersection. The outside lane will transition back to a bike lane on the opposite side of the intersection. A similar treatment has been used for bike lane transitions elsewhere in the City. Options for enhanced signage and bicycle pavement markings will be explored to emphasize to drivers the presence of cyclists mixing with traffic through the intersection area.

As shown in **Table 3** and **Table 4** this configuration will minimize traffic delay impacts as opposed to the other alternatives considered. Currently, vehicles traveling through this intersection experience between 31 and 42 seconds of delay on average while waiting at the traffic signal. No significant change in travel delay is anticipated with this modification on opening day. A failure analysis was also performed to identify potential traffic impacts over the course of the following 20 years from the project opening year of 2024. As is shown in **Table 5**, the analysis indicates that starting around year 2034, additional intersection improvements may be necessary to accommodate future traffic growth while maintaining acceptable traffic signal operations and minimizing vehicular delay. Volumes for the years 2029, 2034, and 2039 were interpolated between the 2024 and 2044 certified traffic volumes as shown in **Table 2** below.

Table 2. Interpolated Volumes at E North Broadway

		PM Build Volume				
Approach	**Movement**	**2024 Certified**	**2029**	**2034**	**2039**	**2044 Certified**
Eastbound	**Left**	120	123	125	128	130
	Thru	620	640	660	680	700
	Right	80	80	80	80	80
Westbound	**Left**	120	123	125	128	130
	Thru	570	588	605	623	640
	Right	330	340	350	360	370
Northbound	**Left**	100	100	100	100	100
	Thru	350	353	355	358	360
	Right	90	90	90	90	90
Southbound	**Left**	350	360	370	380	390
	Thru	360	363	365	368	370
	Right	140	143	145	148	150

Build Condition

The proposed Build Condition as shown in **Table 3** and **Table 4** is made up of a mix of cross sections as determined through the Alternatives Analysis above. First, since the cycle track on Hudson St was deemed infeasible at this time, the bike lanes are proposed to begin on Indianola Ave at Arcadia with the connection from this point to the existing bike facilities on Summit St occuring via sharrows on Arcadia Ave between Indianola Ave and Summit St and a bike boulevard on Summit St between Arcadia Ave and Hudson St. The Build Condition for the Hudson St at Summit St matches the no-build configuration. However, the Build Condition does include converting the existing four-lane segment of Indianola Ave between Hudson St and Arcadia Ave to a three-lane segment, including a dedicated left turn at Hudson St and at Arcadia Ave. The Build Condition for the intersections of Weber Rd with Indianola Ave and Oakland Park Ave with Indianola Ave are also reflective of a three-lane section with a dedicated left turn lane. The Build Condition for the Indianola Ave intersection with E North Broadway shows the results of the analysis of the "hybrid alternative" as detailed in the Alternatives Analysis above, including a left-turn only, through only, and right-turn only lanes with the bike lanes ending just upstream of the approaches and merging into the right-turn only lanes.

Table 3. AM Peak HCS Analysis Results

Intersection	Approach	AM Peak															
		2024 No Build		2044 No Build		2024 Build		2044 Build		2024 Alt 1 Build		2044 Alt 1 Build		2024 Alt 2 Build		2044 Alt 2 Build	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Hudson & Summit	Eastbound	3.8	A	4.7	A	7.1	A	6.0	A	-	-	-	-	-	-	-	-
	Westbound	9.6	A	11.0	B	10.9	B	9.0	A		-	-	-	-	-	-	-
	Northbound	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Southbound	25.1	C	24.1	C	20.7	C	14.8	B		-	-	-	-	-	-	-
	Intersection	6.6	A	8.0	A	9.0	A	7.6	A	-	-	-	-	-	-	-	-
Hudson & Indianola	Eastbound	30.1	C	23.8	C	34.8	C	35.9	D		-	-	-	-	-	-	-
	Westbound	15.5	B	14.9	B	20.3	C	18.4	B	-	-	-	-	-	-	-	-
	Northbound	23.8	C	27.8	C	25.0	C	26.8	C		-	-	-	-	-	-	-
	Southbound	18.3	B	21.0	C	24.8	C	34.7	C	-	-	-	-	-	-	-	-
	Intersection	21.6	C	20.7	C	26.4	C	28.8	C		-	-	-	-	-	-	-
Indianola & Arcadia	Eastbound	22.6	C	23.4	C	22.7	C	23.5	C	-	-	-	-	-	-	-	-
	Westbound	21.5	C	23.1	C	21.4	C	21.4	C		-	-	-	-	-	-	-
	Northbound	10.9	B	6.0	A	6.0	A	7.7	A	-	-	-	-	-	-	-	-
	Southbound	7.2	A	7.1	A	6.6	A	7.6	A		-	-	-	-	-	-	-
	Intersection	12.2	B	12.3	B	10.7	B	12.3	B	-	-	-	-	-	-	-	-
Indianola & Weber	Eastbound	19.0	B	16.8	B	18.2	B	16.8	B		-	-	-	-	-	-	-
	Westbound	19.8	B	17.7	B	19.0	B	17.7	B	-	-	-	-	-	-	-	-
	Northbound	9.6	A	11.0	B	10.5	B	13.3	B		-	-	-	-	-	-	-
	Southbound	8.2	A	10.3	B	10.1	B	12.5	B	-	-	-	-	-	-	-	-
	Intersection	12.8	B	13.8	B	14.1	B	15.0	B		-	-	-	-	-	-	-
Indianola & Broadway	Eastbound	31.2	C	37.9	D	33.4	C	34.7	C	30.3	C	31.5	C	-	-	24.8	C
	Westbound	31.3	C	40.6	D	31.9	C	43.3	D	26.2	C	30.1	C	-	-	27.2	C
	Northbound	35.9	D	45.7	D	34.1	C	47.3	D	32.8	C	44.7	D	-	-	44.6	D
	Southbound	26.5	C	34.5	C	26.0	C	36.3	D	36.4	D	45.7	D	-	-	45.6	D
	Intersection	31.1	C	39.0	D	30.8	C	40.0	D	30.8	C	36.5	D	-	-	33.9	C
Indianola & Oakland Park	Eastbound	12.0	B	12.0	B	12.0	B	12.2	B		-	-	-	-	-	-	-
	Westbound	12.4	B	12.5	B	12.5	B	12.7	B	-	-	-	-	-	-	-	-
	Northbound	9.3	A	7.2	A	7.1	A	7.5	A		-	-	-	-	-	-	-
	Southbound	8.8	A	8.1	A	7.7	A	8.6	A	-	-	-	-	-	-	-	-
	Intersection	9.5	A	8.4	A	8.1	A	8.6	A		-	-	-	-	-	-	-

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Table 4. PM Peak HCS Analysis Results

Intersection	Approach	PM Peak															
		2024 No Build		2044 No Build		2024 Build		2044 Build		2024 Alt 1 Build		2044 Alt 1 Build		2024 Alt 2 Build		2044 Alt 2 Build	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Hudson & Summit	Eastbound	3.3	A	3.4	A	16.7	B	21.9	C	-	-	-	-	-	-	-	-
	Westbound	11.9	B	14.0	B	7.9	A	8.4	A		-	-	-	-	-	-	-
	Northbound	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Southbound	34.8	C	43.6	D	28.1	C	28.8	C		-	-	-	-	-	-	-
	Intersection	6.8	A	8.0	A	13.8	B	17.3	B	-	-	-	-	-	-	-	-
Hudson & Indianola	Eastbound	30.0	C	35.7	D	42.1	D	36.2	D		-	-	-	-	-	-	-
	Westbound	16.0	B	18.7	B	16.7	B	18.8	B	-	-	-	-	-	-	-	-
	Northbound	30.1	C	38.9	D	27.0	C	36.8	D		-	-	-	-	-	-	-
	Southbound	21.8	C	23.8	C	18.6	B	21.8	C	-	-	-	-	-	-	-	-
	Intersection	23.2	C	27.6	C	26.0	C	27.1	C		-	-	-	-	-	-	-
Indianola & Arcadia	Eastbound	31.7	C	17.1	B	24.8	C	22.1	C	-	-	-	-	-	-	-	-
	Westbound	28.8	C	15.9	B	22.9	C	20.7	C		-	-	-	-	-	-	-
	Northbound	5.5	A	8.4	A	7.3	A	8.5	A	-	-	-	-	-	-	-	-
	Southbound	8.5	A	10.5	B	7.1	A	7.6	A		-	-	-	-	-	-	-
	Intersection	12.2	B	11.0	B	11.0	B	11.0	B	-	-	-	-	-	-	-	-
Indianola & Weber	Eastbound	24.7	C	13.9	B	19.3	B	15.8	B		-	-	-	-	-	-	-
	Westbound	25.9	C	16.1	B	20.1	C	17.5	B	-	-	-	-	-	-	-	-
	Northbound	11.1	B	11.9	B	14.3	B	17.8	B		-	-	-	-	-	-	-
	Southbound	11.4	B	13.3	B	13.2	B	17.4	B	-	-	-	-	-	-	-	-
	Intersection	17.6	B	13.8	B	16.5	B	17.2	B		-	-	-	-	-	-	-
Indianola & Broadway	Eastbound	40.3	D	42.0	D	48.6	D	**154.5**	**F**	52.3	D	181.9	F	-	-	37.2	D
	Westbound	31.1	C	45.3	D	31.0	C	**46.1**	**D**	30.0	C	44.8	D	-	-	40.5	D
	Northbound	42.0	D	59.9	E	47.1	D	**59.9**	**E**	53.8	D	68.7	E	-	-	46.2	D
	Southbound	32.4	C	44.0	D	39.6	D	**75.8**	**E**	50.2	D	59.3	E	-	-	45.2	D
	Intersection	35.7	D	46.6	D	40.5	D	**83.8**	**F**	44.9	D	87.9	F	-	-	41.8	D
Indianola & Oakland Park	Eastbound	12.1	B	13.2	B	12.2	B	14.1	B		-	-	-	-	-	-	-
	Westbound	12.5	B	13.6	B	12.6	B	14.5	B	-	-	-	-	-	-	-	-
	Northbound	8.7	A	13.4	B	8.5	A	8.5	A		-	-	-	-	-	-	-
	Southbound	9.2	A	12.4	B	8.2	A	8.2	A	-	-	-	-	-	-	-	-
	Intersection	9.4	A	13.0	B	8.9	A	9.0	A		-	-	-	-	-	-	-

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Table 5. Failure Analysis at E North Broadway Intersection

Intersection	Approach	PM Peak									
		2024 Build		2029 Build		2034 Build		2039 Build		2044 Build	
		Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Indianola & E North Broadway	Eastbound	48.6	D	40.9	D	61.3	E	75.1	E	154.5	F
	Westbound	31.0	C	36.9	D	44.4	D	56.2	E	46.1	D
	Northbound	47.1	D	48.8	D	54.5	D	59.3	E	59.9	E
	Southbound	39.6	D	51.1	D	40.7	D	53.8	D	75.8	E
	Intersection	40.5	D	43.6	D	49.4	D	61.0	E	83.8	F

Traffic Recommendations

Michael Baker was tasked with evaluating the feasibility of a lane reconfiguration along Indianola Avenue to add bicycle facilities via HCS analysis. Based on the results of the HCS analysis, Michael Baker recommends the following:

- Reconfigure existing roadway to a three-lane segment, one through lane both northbound and southbound and one two-way left turn lane, along Indianola Ave between Hudson St and Oakland Park Ave and add right-turn only lanes at E. North Broadway
- Install dedicated northbound and southbound left-turn lanes at signalized intersections per turn lane length calculations.
- Install bike lanes on Indianola Ave from Hudson St to 300' south of E North Broadway.
- Merge northbound and southbound approaching bike lanes to North Broadway into vehicular right-turn only lane.
- Consolidate parking to one side of Indianola Ave based on results of the Parking Utilization Assessment.
- Continue to monitor the E North Broadway intersection over time. Additional modifications could be required in the future to maintain intersection operation.
- Consider installing a second southbound left turn lane on Indianola Ave at E. North Broadway when monitoring listed above warrants it.
- Do not convert outside eastbound through lane on Hudson St to a cycle track until further evaluation can determine the feasibility.

Turn Lane Lengths

A center turn lane is present under existing conditions, therefore, analysis was only conducted to determine the turn lane length for the Build condition. The Opening Year and Design Year AM and PM peak volumes were used in conjunction with ODOT's L&D Volume 1 to calculate the turn lane length, see **Table 6**.

Table 6. Left Turn Lane Lengths (including 50' diverging taper)

Intersection	Movement	Queue Type	Build Condition					
			2024		2044		2044 Alt	
			AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Indianola Ave & Hudson St	NBL		N/A	N/A	N/A	N/A	-	-
	SBL	Storage (ft)	400	300	325	375	-	-
		95th Percentile	208	219	450	268	-	-
	EBL		N/A	N/A	N/A	N/A	-	-
	WBL		N/A	N/A	N/A	N/A	-	-
	Cycle Length (s)		95	70	90	90	-	-

Intersection	Movement	Queue Type	Build Condition					
			2024		2044		2044 Alt	
			AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Indianola Ave & Arcadia Ave	NBL	Storage (ft)	150	200	200	200	-	-
		95th Percentile	100	150	122	179	-	-
	SBL	Storage (ft)	100	100	100	100	-	-
		95th Percentile	152	184	185	190	-	-
	EBR	Storage (ft)	150	150	225	150	-	-
		95th Percentile	131	159	177	146	-	-
	WBL	Storage (ft)	100	100	100	100	-	-
		95th Percentile	88	79	109	87	-	-
	Cycle Length (s)		60	65	60	60	-	-
Indianola Ave & Weber Rd	NBL	Storage (ft)	100	100	100	100	-	-
		95th Percentile	164	265	200	264	-	-
	SBL	Storage (ft)	100	100	100	100	-	-
		95th Percentile	178	227	204	242	-	-
	EBL	Storage (ft)	100	100	100	150	-	-
		95th Percentile	192	228	223	233	-	-
	WBL	Storage (ft)	150	100	100	150	-	-
		95th Percentile	170	263	174	282	-	-
	Cycle Length (s)		60	65	60	60	-	-
Indianola Ave & North Broadway	NBL	Storage (ft)	200	200	250	225	225	250
		95th Percentile	243	469	304	594	377	789
	SBL	Storage (ft)	450	500	575	600	525*	675*
		95th Percentile	312	379	445	700	499	671
	EBL	Storage (ft)	200	225	225	250	225	300
		95th Percentile	484	850	596	1793	555	2041
	WBL	Storage (ft)	225	225	250	250	250	300
		95th Percentile	608	578	913	811	771	893
	Cycle Length (s)		106	125	131	148	117	163
Indianola Ave & Oakland Park	NBL	Storage (ft)	100	100	100	100	-	-
		95th Percentile	129	183	143	198	-	-
	SBL	Storage (ft)	100	100	100	100	-	-
		95th Percentile	162	174	193	198	-	-
	EBL	Storage (ft)	100	100	100	100	-	-
		95th Percentile	73	65	74	68	-	-
	WBL	Storage (ft)	100	100	100	100	-	-
		95th Percentile	64	69	64	73	-	-
	Cycle Length (s)		39	40	40	44	-	-

*Storage length accommodated by 2 lanes.

Note: The 95th Percentile Queue lengths take from HCS Reports. This length is the longer of the left lane or thru lane queue.

Table 6 shows that the alternative build condition results in reduced left turn lane lengths due to improved intersection LOS. The presence of the center turn lane will be allow left turning vehicles access to the left turn lane. Turning lane calculations are available in **Appendix C**.

Turn Lane Lengths Recommendations

Michael Baker International recommends, at minimum, the turn lane lengths shown in **Table 7** below to accommodate left turn storage. Where field conditions allow, additional left turn lane length will be extended, up to the preferred lengths shown in **Appendix C,** to alleviate blockage. Actual left turn lane lengths will be determined during design.

Table 6. Minimum Turn Lane Lengths

Intersection	Movement	Storage	Taper	Total
Indianola Ave & Hudson St*	SBL	350	50	400
Indianola Ave & Arcadia Ave	NBL	150	50	200
	SBL	50	50	100
	EBR**	175	50	225
Indianola Ave & Weber Rd	NBL	50	50	100
	SBL	50	50	100
	EBL	100	50	150
	WBL	100	50	150
Indianola Ave & North Broadway	NBL	200	50	250
	SBL	550	50	600
	EBL	250	50	300
	WBL	250	50	300
Indianola Ave & Oakland Park	NBL	50	50	100
	SBL	50	50	100
	EBL	50	50	100
	WBL	50	50	100

*Intersection restricts all other left turns except southbound
*Approach has right-turn only, but no left-turn only