S.170th Street Micro-Simulation
Seattle-Tacoma International Airport
Port of Seattle/Aviation Planning

Port of Seattle
PORT OF SEATTLE
Aviation Planning
Airport Operations

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Summary

The Port is planning to relocate the cell phone waiting lot (cell lot) from the west side of Air Cargo Road to the south side of S.170th Street. As a result of this relocation, changes in the traffic patterns are expected at the intersection of S.170th Street and the southbound North Airport Expressway (NAE) off-ramp and new cell lot driveway. Traffic micro simulations have been developed by Port of Seattle staff with the goal of comparing transportation performances for no-action, two-way stop, signal, and roundabout alternatives for the year of opening 2014 and the future year 2028.

Traffic volumes, delay times, queue lengths and travel time for specific roadway sections were calculated and compared among the various alternatives. The no-action alternative simulation evaluates the current condition with the cell lot located off of Air Cargo Road. The two-way stop simulation evaluates the project with no traffic control improvements – i.e., the cell lot relocated to S.170th Street with the entrance/exit across from the southbound NAE off-ramp and stop signs at the cell lot exit and southbound NAE off-ramp. Comparison of the no-action and two-way stop simulation results shows a dramatic increase in delay times and queue length for vehicles at the southbound NAE off-ramp - indicating that traffic control improvements are needed.

This study shows that under all criteria evaluated, a roundabout performs equally well or better than a signal and so is the recommended alternative. Both a signal and a roundabout are able to serve the traffic with reasonable delay times and queues, but the roundabout alternative, in general, performs better with shorter delay times, shorter travel times and shorter or complete absence of queues. Other factors were also considered such as: construction and maintenance costs; level of service over a 24-hour period; and any additional traffic control improvements that would potentially be needed in the future under either scenario. While the study did not specifically analyze level of service (LOS) over a 24 hour period, the roundabout is assumed to provide a higher level of service in the off peak hours as well because traffic is allowed to flow uninterrupted – which has the added benefit of reducing carbon emissions from idling cars. In addition, simulation of the signal alternative indicates that an additional signal may be warranted by 2028 at the northbound NAE off-ramp due to peak hour queues in the westbound direction on S.170th Street extending from the signal to the intersection of International Boulevard and S.170th Street. This queue blocks vehicles from the northbound NAE off-ramp from turning left onto S.170th Street.

Content

1.Purpose of Report and Study Objectives

This report describes transportation conditions on the portion of S. 170th Street between International Boulevard and Air Cargo Road. It presents transportation information for this corridor and estimates transportation performances for a no-action, two-way stop and two project alternatives under evaluation. These two alternatives are a roundabout and a traffic signal at the intersection of S.170th Street and the cell phone lot access road.

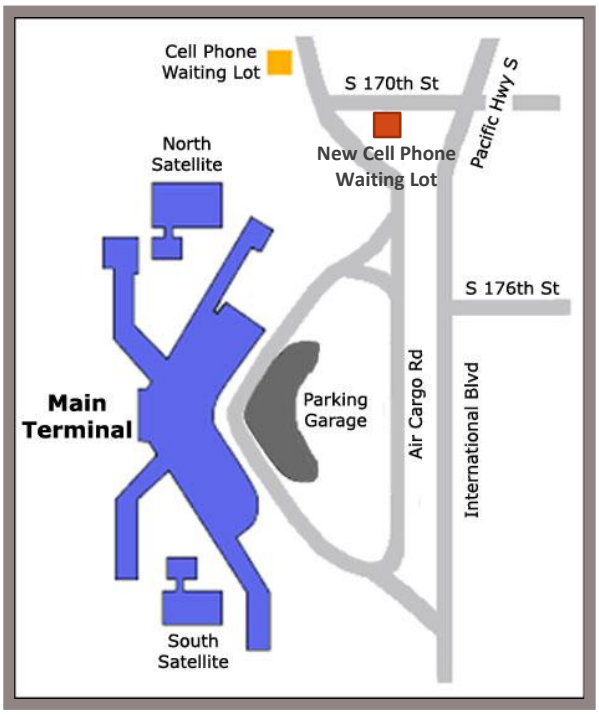

Figure 1 – Vicinity Map

The Port cell phone waiting lot (cell lot) is currently located on the west side of Air Cargo Road, north of S.170th Street. The lot occupies a portion of land that is aircraft accessible and that can be used to provide additional hardstand for aircraft parking. There are currently plans to move the cell phone lot to a new location in 2013 on the south side of S.170th Street with the entrance/exit across from the southbound North Airport Expressway (NAE) off-ramp, as shown in Figure 1.

Changes in the traffic patterns are eminent as a result of the cell lot relocation. Traffic micro simulation models have been developed by Port of Seattle staff to evaluate transportation performance for the no-action, two-way stop sign, signal, and roundabout alternatives and determine: 1) whether a traffic control improvement is needed, and 2) if traffic control is needed, is a traffic signal or roundabout preferred. More specifically, these models were developed with the following objectives:

1. Verify the capability of the road system to handle the increased traffic volumes.
2. Estimate and compare delay times at the site location.
3. Estimate and compare queue lengths at the site location.
4. Estimate and compare travel times at specified sections.

2.Site Location and Study Area

The study area includes the portion of S.170th Street between Air Cargo Road and International Boulevard. The corridor extends for a total distance of approximately 1,300 feet and includes the intersections of S.170th Street with: Air Cargo Road; the new cell phone lot entrance/exit and southbound NAEoff-ramp; the Doug-Fox parking lot driveway; and the northbound NAE off-ramp. The new cell phone lot will be located on the south side of S. 170th Street and will be accessible from a road that will be directly across from the southbound NAE off-ramp.

Figure 2 – Study Area

The model for the study area is shown in Figure 3 and is described in further detail in the next paragraph.

Figure 3 - Modeled Study Area

3.Background Information

Several micro simulation models were created for this study using Vissim, a microscopic multi-modal traffic flow simulation software developed by PTV (Planung Transport Verkehr) AG in Karlsruhe, Germany. Vissim is a software tool that simulates the movement of individual vehicles based on car-following and lane changing theories. Vissim software is able to replicate multimodal traffic flows, including cars, buses, and trucks. A Vissim model network consists of links to represent roadway segments and connectors between links. Link characteristics can be specified by the user and include link type, number of lanes, lane widths, and grades. The link type can be associated to a set of driving behavior parameters (lane changing, vehicle following, stopping and accelerating parameters, etc.). In addition, speed limits can be defined based on posted limits for existing facilities on selected links. Traffic volumes entering the model network are specified explicitly as vehicle inputs and represent the total number of vehicles entering the network at various entry points in a specified time interval. Also, traffic composition are defined and associated to each set of vehicle inputs to specify how the proportion of various types of vehicles and routings are defined to direct vehicles to their destinations. Models developed with Vissim can reach a very high level of detail, allowing also the definition of right-of-ways for conflicting movements modeled with complicated priority rules. In addition, two- and three-dimensional animations can be created, saved, and shown as movies.

Models of S.170th Street were developed as part of more extensive model that simulates the entire airport roadway system (airport model). The airport model analyzes vehicle inputs and compositions over a one-hour period, based on demand from a 2011 planning day flight schedule and includes entries from I-5, I-405, and SR 509 to S.188th Street. It also includes parts of SR 518, S.160th Street, S.170th Street, Air Cargo Road, airport garage, and the upper and lower curbside roadways. The extent of the airport model is presented in Figure 4 with the study area highlighted in the box. Figure 3 (on the previous page) shows the portion of the model representing the study area in more

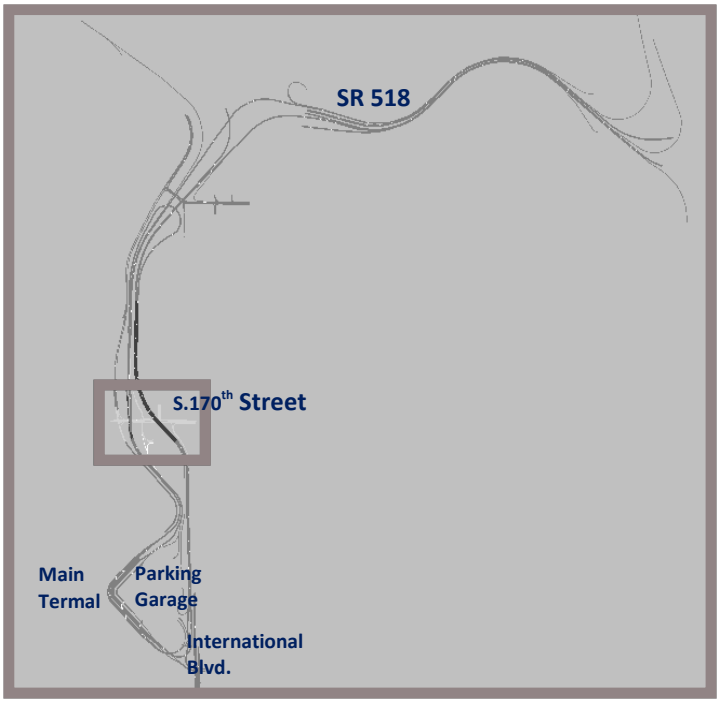

Figure 4 – Sea-Tac Model

detail. In order to assess traffic operating conditions for the study area, the airport model needs to be run, providing information also on the performances of the vicinity of the study area.

The individual VISSIM models for this study were developed for a one-hour time period and simulate the late-morning peak. This time of the day was selected because the peak hour for S.170th Street falls between 12:00 pm and 2:00 pm while the airport peak falls between 11:00 am and 1:00 pm. Additional 15 minutes of seeding time were added at the beginning of the simulation to populate the networks that are initially empty.

Multiple repetitions of the same model are required because results vary depending on the random number seed used in each run. The seed number is a Vissim input which affects how traffic randomly enters the model. Seed numbers impact different simulation results; therefore an average from the multiple runs is used to get the more statistically valid results. For these models, ten repetitions are statistically necessary to ensure that the true average vehicle volumes lay within a confidence interval equal to or greater than 95%[1]. This means that, by averaging ten repetitions, we can be more than 95% confident that the true traffic volume lies within less than two standard deviations from the mean. Vehicle volumes, delay times, and travel times were, therefore, calculated by averaging the results from the ten simulation runs.

The base model was calibrated by adjusting global model parameters to improve the ability to reproduce driver behavior and traffic performance characteristics (car following, lane change model, reaction to signal control, etc). Each individual model was also validated to assure that it was able to replicate actual traffic patterns. The models were validated by comparing simulated traffic volumes (estimated by the model) to observed traffic volumes on the roadway (counts or forecasts), using a statistical test called GEH statistic[2].
For hourly traffic flows, the formula for the GEH statistic is:

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

Where:
M is the traffic volume from the traffic model (vehicles per hour)
C is the real-world traffic count (vehicles per hour)

[1] *FHWA*. December 4 2012. <http://www.ops.fhwa.dot.gov/trafficanalysistools/tat_vol3/sectapp_b.htm >.

[2] *Wikipedia*. December 4 20120. <http://en.wikipedia.org/wiki/GEH >.

For traffic modeling work, a GEH statistic of less than 5.0 is considered a good match between the modeled and observed *hourly* volumes. In general, it is standard practice that 85% of the volumes in a traffic model should have a GEH statistic less than 5.0. GEHs in the range of 5.0 to 10.0 may warrant investigation. If the GEH statistic is greater than 10.0, there is a high probability of a problem with the model.

4.Alternatives

A no-action and three alternatives were analyzed for two specific years: year of opening (2014) and future year (2028). 2014 was chosen as the year of opening because all improvements are planned to be operational at this time. 2028 was chosen for the future year based on the Port's estimate for airfield expansion which would necessitate roadway improvements in the area of the cell lot, dislocating the cell lot and reconfiguring the intersection being studied.

Two project alternatives were defined for years 2014 and 2028 and require either a signal or a roundabout at the intersection of S.170th Street with the southbound Airport Expressway off-ramp. For year 2014, two more alternatives were defined, a no-action and a two-way stop controlled alternative. In the no-action alternative, the cell lot is located in the current location, west of Air Cargo Road and North of S.170th Street. Once the cell lot is in the new location, it will be accessible by a road located on the opposite side of the southbound off-ramp.

Currently, S.170th Street has two lanes in each direction and a posted speed limit of 35 mph. The intersection with the southbound NAE off-ramp currently operates as a three-leg intersection where the major street, S.170th Street, is uncontrolled and the minor street approach, the off-ramp, is controlled by a stop sign. The off-ramp is a two lane facility with a right-only turn lane and a left-only lane. This description is representative of the no-action alternative and is illustrated in Figure 5.

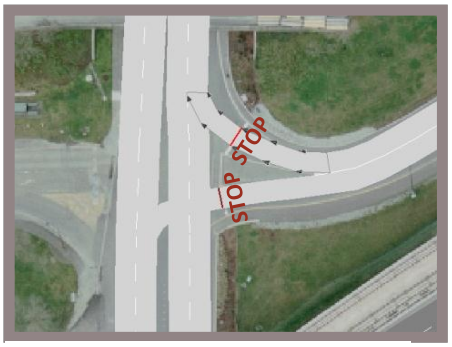

Figure 5 – No-Action

In the two-way stop-controlled alternative, the cell lot is relocated to S.170th Street and is operational. The intersection with the southbound NAE off-ramp operates as a four-leg intersection where the major street approach, at S.170th Street, is uncontrolled. In addition to the to the no-action configuration, in this

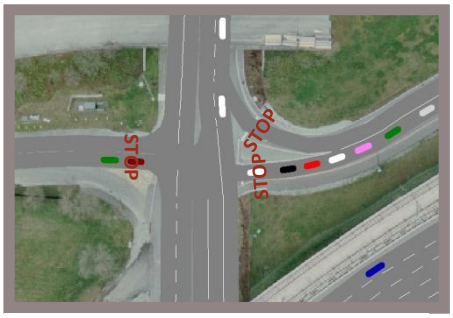

Figure 6 – Two-Way Stop-Control

alternative there is a fourth leg, opposite to the off-ramp, to provide accessibility to and from the cell phone parking. This leg is a one lane facility (one lane in each direction) and is also controlled by a stop sign. In the westbound direction, on S.170th Street, a left turn only lane is provided in proximity of the intersection to facilitate the access to the cell phone lot and to avoid delay for the through movements. The two-way stop-controlled alternative is shown in Figure 6.

The relocated cell lot is operational in the traffic signal option. The lane configuration is the same as the two-way stop-controlled alternative but the intersection is controlled by a pre-timed traffic light. A pre-timed traffic signal controls the intersection with each signal phase or traffic movement in a programmed sequence that is repeated throughout the entire hour. The westbound/eastbound traffic receives a fixed amount of 24 seconds of green time followed by the amber and red clearance intervals for 3 seconds. The southbound/northbound traffic receives a fixed amount of 15 seconds green time followed by the amber and red clearance interval for 3 seconds. The cycle length is of 45 seconds. A pre-timed signal was chosen for its ability to provide efficient operation during peak traffic periods.

Figure 7 – Signal

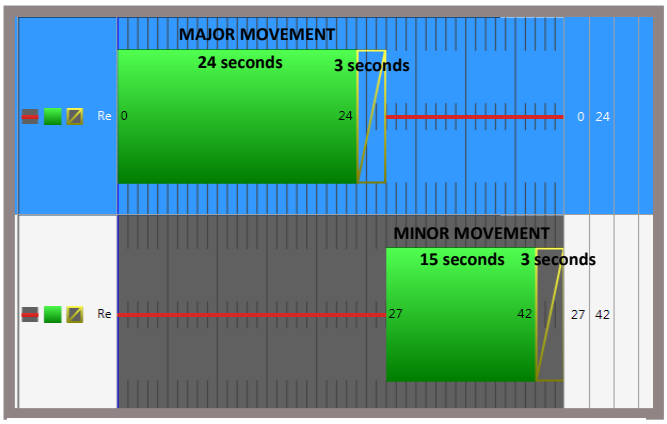

Figure 8 – Traffic Control Pre-Timed Phases

The relocated cell lot is also operational in the roundabout option. Under this scenario, the intersection of S.170th Street and the southbound NAE off-ramp is configured as a two lane roundabout. All of the approaches to and from the roundabout are defined as two lane roads, with the exception of the segment from cell phone lot that is defined as a one lane road.

Figure 9 – Roundabout

From a traffic operational perspective, there are several options for two lane roundabouts. The one chosen for this study is the type recommended by Washington State Department of Transportation[3]. In this type of roundabout, vehicles choose their lane the same way they would in a traditional two-lane intersection. To go straight or right, they get in the right lane. To go straight or left, they get in the left lane. Drivers

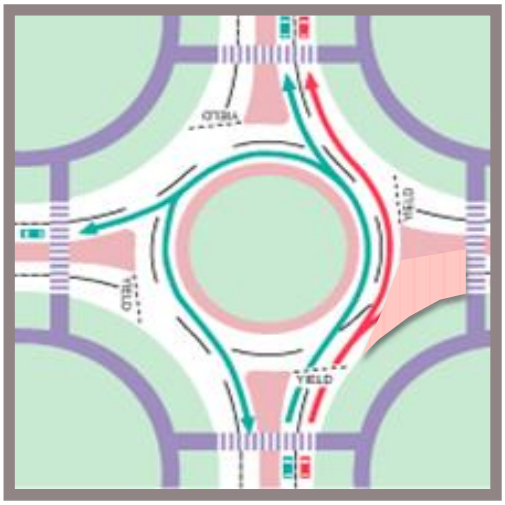

Figure 10 – How to Drive in a Roundabout

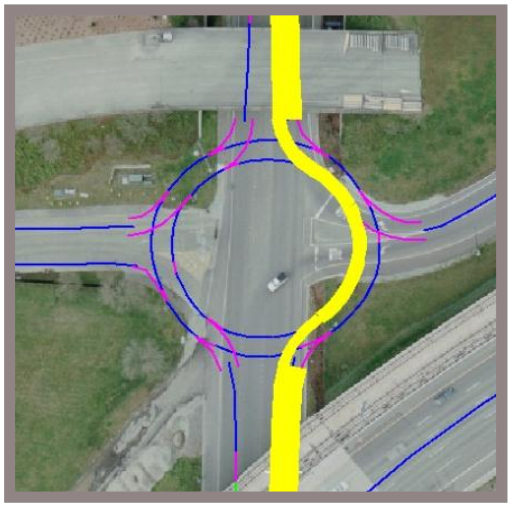

Figure 11 – Vissim Schematic

can also make U -turns from the left lane. Figure 10 shows traffic flow in this type of roundabout. Figure 11 shows how this was accomplished in Vissim and shows the schematic of the roundabout with one of the routes highlighted in yellow.

Given the high percentage of cargo vehicles in the study area, the roundabout was simulated with an inscribed circle diameter of 150 feet that will be able to accommodate larger size vehicles[4].

5.Year of Opening and Future Traffic Volumes

Traffic volumes were developed for two planning timeframes: opening year (2014), and future year (2028). Traffic volumes are the same for both roundabout and signal alternatives at each planning timeframe. Traffic volumes entering the model network are specified as vehicle inputs (vehicles per hour).

The 2014 volumes for the study area are the same used for the Doug Fox Access Study[5]. These volumes were developed for year 2014 and adjusted by lowering the initial Port

[3] *WSDOT*. December 4 2012. <http://www.wsdot.wa.gov/safety/roundabouts/>.

[4] *WSDOT*. December 4 2002. <http://www.wsdot.wa.gov/publications/manuals/fulltext/M22-01/1320.pdf>.

numbers to be within 10 % of City. In the no-action model, the volumes to the cell lot are routed to the existing lot location via Air Cargo Road. Figure 12 shows the 2014 volumes for the study area.

In addition to these volumes, vehicle inputs were defined for the entries outside the study area in the airport model. The airport model was developed for year 2011, three years earlier than the year of opening of the cell phone lot. Traffic volumes were derived by a planning day flight schedule. Mode share coefficients were derived by a Port survey. A growth factor of 6% was applied to the 2011 volumes in the airport model to match the year 2014 year of opening and the Doug Fox study volumes. This growth factor was calculated using the ratio of total enplanements between year 2011 and 2014[6]. Background volumes were added to match the volumes derived from the flight schedule to the Doug Fox volumes and to other valid volume counts.

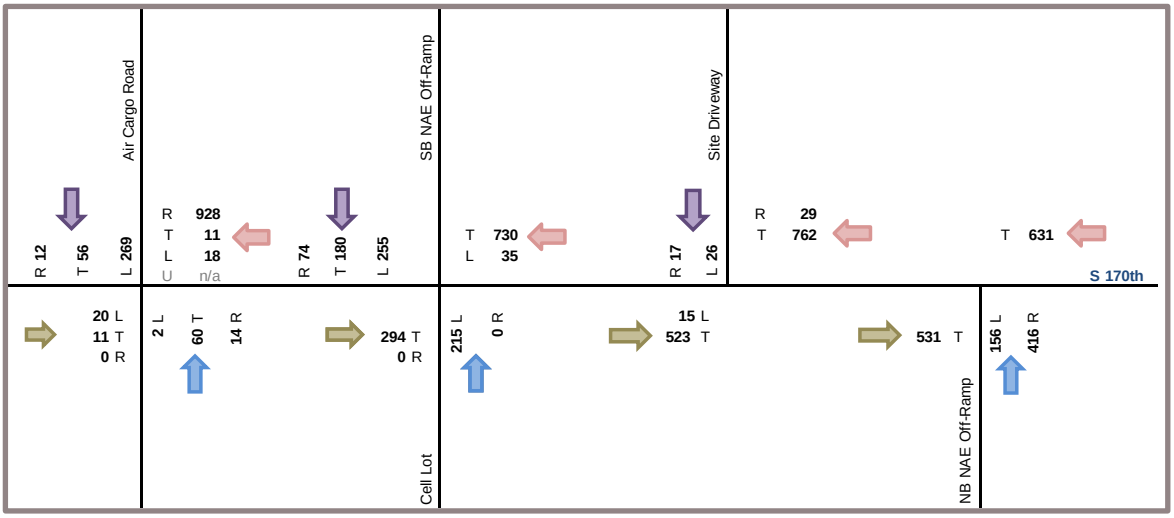

Figure 12 - 2014 Traffic Volumes

The 2028 volumes for the study area were also based on the Doug Fox Access Study. These volumes were initially developed for year 2025. A growth factor of 6.7% was applied to the 2025 volumes from the Doug Fox study to obtain a set of 2028 volumes for the study area. This growth factor was calculated using the ratio of total enplanements between year 2025 and 2028. Figure 13 shows the 2028 volumes for the study area.

[5] *Port of Seattle*, Doug Fox Traffic Study, 2012

[6] A table with the growth factors is reported in the Appendices.

In addition to these volumes, additional inputs were defined for the Sea-Tac curb based on the 2028 flight schedule. Background volumes were added to match the volumes derived from the flight schedule to the Doug Fox volumes.

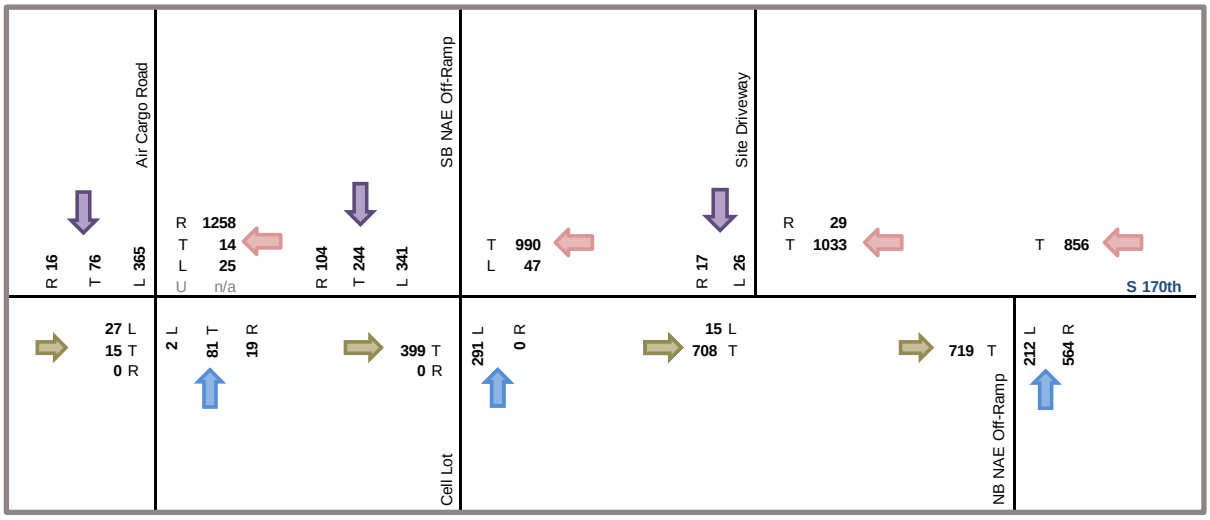

Figure 13 - 2028 Traffic Volumes

6.Capacity and Delay Analysis

This section compares the alternatives based on specific performance measures. Performance measures quantify how well a transportation system is working. Performance measures discussed in this section include volumes, queue lengths, delay and travel times.

Modeled volumes were calculated for all the road segments in the study area. Figure 14 shows how the modeled volumes match (blue, second line) with the input volumes (black, on top) for the no-action and the two-way stop-controlled alternatives. This is part of the model validation and it is an important step in order to verify that the model is loading volumes correctly. As mentioned in the previous paragraphs, in traffic modeling, it is a standard practice to use GEH statistics. GEH values of less than 5.0 are considered a good match between the modeled and observed hourly volumes. Figure 14 shows GEH values below 5.0 for the no-action - indicating that the model is able to load and serve the demand. For the two-way stop-controlled alternative, the GEH values are also below 5.0 with the exception of the southbound NAE off-ramp. This indicates that the ramp, simply controlled by a stop sign, is unable to serve the demand when the new cell-phone lot is operational. This is the first indicator of queues on the ramp.

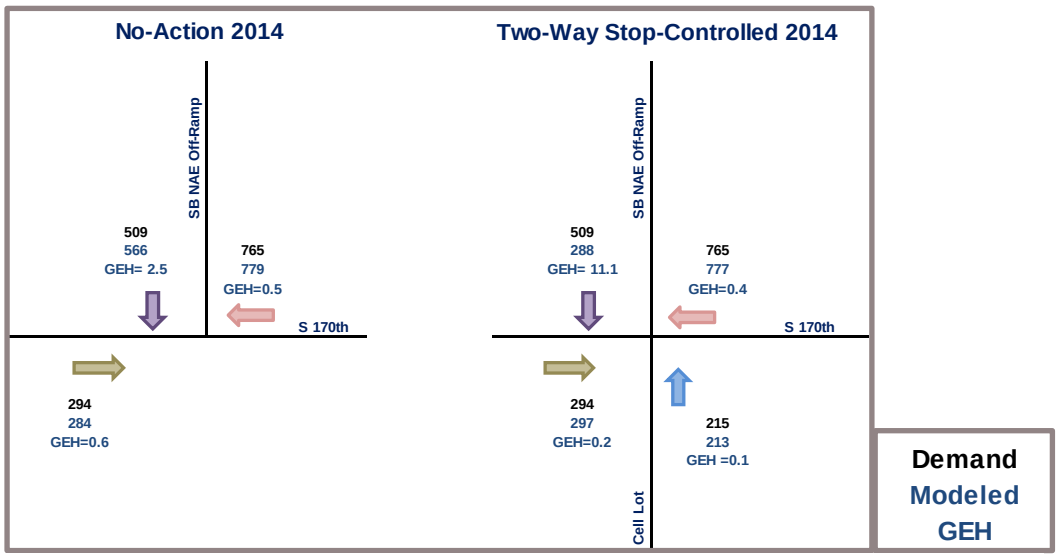

Figure 14 – 2014 No-Action and Two-Way Stop-Controlled Volumes

GEH statistics were calculated for all the links along the study area for the 2014 and 2028 signal and roundabout alternatives. Figure 15 and Figure 16 shows the demand volumes (black, on top) and the modeled volumes (blue, second line) for the roundabout and signal alternatives respectively for year 2014 and year 2028. The GEH values are all less than 5.0 for year 2028 – which again is considered a good match.

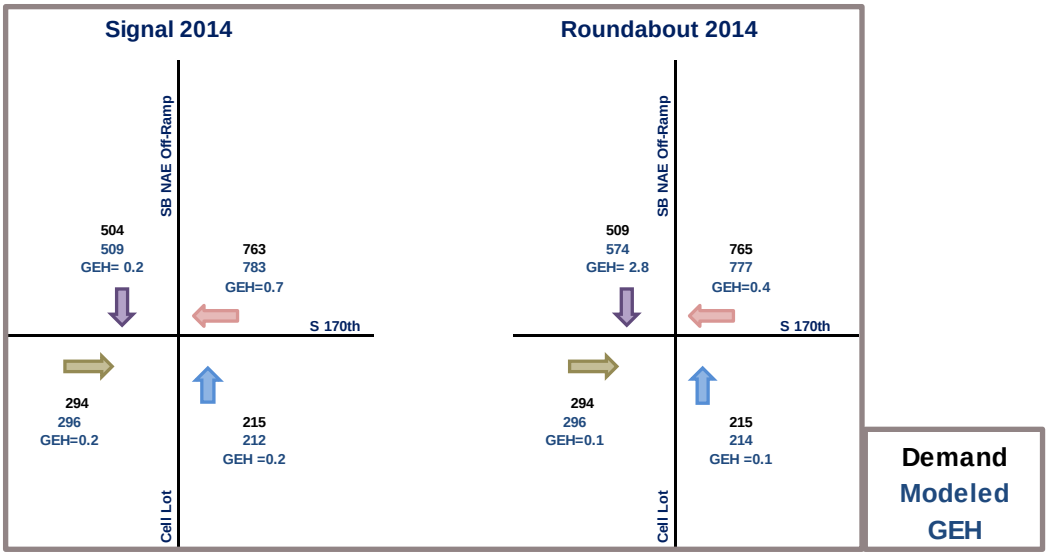

Figure 15 – 2014 Signal and Roundabout Volumes

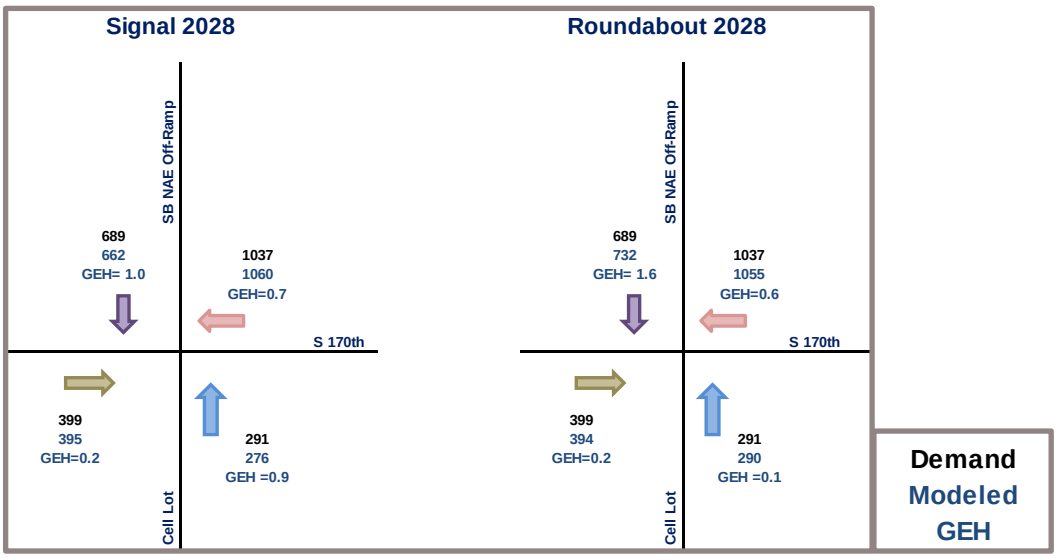

Figure 16 – 2028 Signal and Roundabout Volumes

Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time and is linked to the concept of level of service for un-signalized, signalized intersections and roundabout. Total delay is the difference between travel time experienced and the reference travel time that would result during ideal (free-flow) conditions: in the absence of traffic control, of geometric delay, incidents, and when there are no vehicles on the road. The level of service is based only on the part of delay that is called control delay and includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. According to the Highway Capacity Manual (HCM), control delay is approximately 30% greater than stopped delay.

Queue length is an important measure of effectiveness needed to determine the amount of storage required for turn lanes and to determine whether spillover occurs at upstream facilities.

Delay times and queue lengths were calculated at all the approaches of the intersection of S.170th Street with the southbound NAE off-ramp/cell phone entrance/exit. The approaches are shown in Figure 17.

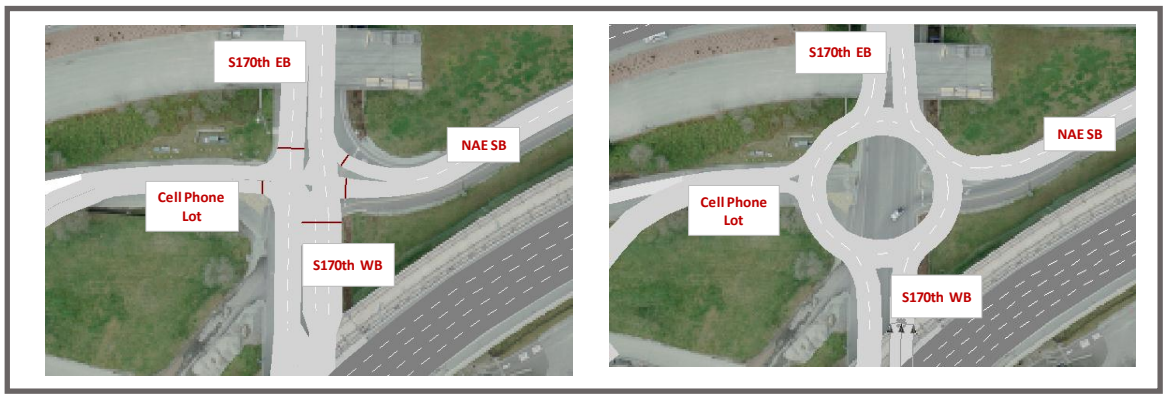

Figure 17 – Site Location Approaches

Table 1[7] and Table 2 show delay times and average queues for all the intersection approaches for the 2014 alternatives. Table 1 shows that the greatest delay times occur in the two-way stop-controlled alternative for the southbound NAE off-ramp. This indicates that a traffic control improvement to the intersection is needed in order to accommodate the increased traffic volumes. An average queue of over 3,800 feet is much longer than the length of the off-ramp (approximately 800 feet). This is an indicator of spillovers occurring at the North Airport Expressway.

Table 1 – 2014 No-Action and Two-Way Stop Delays and Queues

Intersection	Approach	Movement	2014					
			No-Action			Two-Way Stop		
			Delay Time sec	Stopped Delay sec	Average Queue ft	Delay Time sec	Stopped Delay sec	Average Queue ft
S 170th St and NAE SB	NAE SB	Right	41	12	871	47	17	3,877
		Through				228	95	3,881
		Left	145	50	870	222	91	3,881
		Total	**80**	**27**	**871**	**183**	**75**	**3,880**
	S 170th St WB	Through	5	1	15	1	0	6
		Left				43	33	7
		Total	**5**	**1**	**15**	**3**	**2**	**6**
	Cell Phone Lot	**Total**				30	10	37
	S 170th St EB	Right				0	0	0
		Through	0	0	0	0	0	0
		Total	**0**	**0**	**0**	**0**	**0**	**0**

Both a signal and a roundabout are able to serve the traffic with reasonable delay times and queues in 2014. However, as Table 2 indicates, the roundabout alternative shows better overall performances. In the roundabout alternative, queues lengths are slightly longer on the southbound Expressway off-ramp but still much shorter than the ramp length. Longer queues and delays occur in the signal option for the westbound approach along S.170th Street. Delay times and queues from the cell phone lot are longer in the signal compared to the roundabout alternative.

Table 2 – 2014 Signal and Roundabout Delays and Queues

Intersection	Approach	Movement	2014					
			Signal			Roundabout		
			Delay Time sec	Stopped Delay sec	Average Queue ft	Delay Time sec	Stopped Delay sec	Average Queue ft
S 170th St and NAE SB	NAE SB	Right	9	3	6	4	0	24
		Through	14	5	21	9	2	24
		Left	12	4	21	18	4	22
		Total	**12**	**4**	**17**	**13**	**2**	**23**
	S 170th St WB	Through	22	11	80	3	0	2
		Left	21	12	80	3	0	2
		Total	**22**	**11**	**80**	**3**	**0**	**2**
	Cell Phone Lot	**Total**	**33**	**13**	**37**	**1**	**0**	**0**
	S 170th St EB	Right	0	0	8	1	0	1
		Through	11	5	8	5	0	1
		Total	**11**	**5**	**8**	**5**	**0**	**1**

[7] Total delays and queues are calculated as weighted averages with the weight being the volume for each movement.

Table 3 shows delays and queues for the signal and roundabout alternatives in the 2028, future year. (The two-way stop alternative was not modeled in the future because it was shown to be inadequate at 2014 traffic volumes.). Results for signal and roundabout alternatives are similar to the 2014 scenario. Queues and delays for the southbound off-ramp are longer for the roundabout compared to the signal alternative but still reasonable. On the other hand, the queue on the westbound approach becomes longer than 200 feet in the signal alternative, blocking access to the Doug Fox parking lot. In the signal alternative, the delay time is also longer for the cell phone lot approach and the average queue length is over 200 feet (more than 10 vehicles waiting).

Table 3 – 2028 Signal and Roundabout Delays and Queues

Intersection	Approach	Movement	2028					
			Signal			Roundabout		
			Delay Time sec	Stopped Delay sec	Average Queue ft	Delay Time sec	Stopped Delay sec	Average Queue ft
S 170th St and NAE SB	NAE SB	Right	12	4	6	15	4	118
		Through	16	5	22	31	12	118
		Left	14	4	22	52	19	115
		Total	**14**	**4**	**18**	**38**	**14**	**117**
	S 170th St WB	Through	37	19	205	7	0	11
		Left	47	33	205	6	0	11
		Total	**38**	**20**	**205**	**7**	**0**	**11**
	Cell Phone Lot	**Total**	**116**	**44**	**218**	**5**	**0**	**0**
	S 170th St EB	Right	0	0	11	1	0	2
		Through	11	5	11	6	0	1
		Total	**11**	**5**	**11**	**6**	**0**	**1**

Travel times were also calculated for several sections in the study area. These sections are shown in Figure 18.

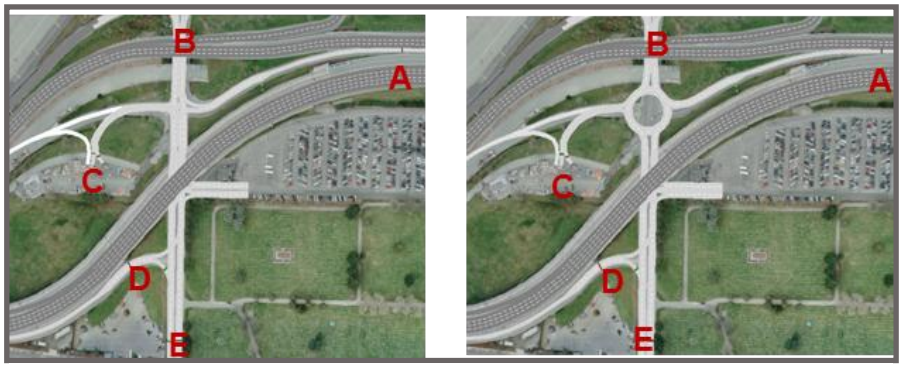

Figure 18 – Travel Time Sections

As Table 4 indicates, in the 2014 scenario, the no-action alternative shows long travel times for all roadway sections starting at the Airport Expressway off-ramp. However, the longest travel times occur in the two-way stop-controlled alternative. For this alternative, the model calculates a travel time of almost seven minutes to reach the cell phone lot and over six minutes to reach S.170th Street eastbound from the southbound NAE off-ramp. Travel times for the signal and roundabout alternatives are generally

comparable. The signal alternative performs slightly better in the section between the Airport Expressway off-ramp and S.170th Street eastbound. This is reasonable because a left turn is necessary and this movement is easier when it is controlled by a signal. However, the roundabout alternative shows shorter travel times in all the other sections.

Table 4 – 2014 Travel Times

Travel Time Section		2014				
		No-Action sec	Two-Way Stop sec	Signal sec	Roundabout sec	Δ Travel Time Signal Minus Roundabout sec
A-B	NAE SB to S 170th St (WB)	101	202	29	22	7
A-C	NAE SB On to Cell Phone Lot	0	400	44	35	9
A-E	NAE SB to S 170th St (EB)	205	378	38	46	-8
A-F	NAE SB to Doug Fox	195	385	40	42	-2
C-B	Cell Phone Lot to S 170th St (WB)	0	46	49	20	29
D-B	NAE NB to S 170th St (WB)	46	37	65	40	25
D-C	NAE NB to Cell Phone Lot	0	89	69	48	22
E-B	S 170th St (EB) to S 170th St (WB)	29	21	43	25	19
E-C	S 170th St (EB) to Cell Phone Lot	0	70	47	30	17

In the 2028 scenario, all movements from the Airport Expressway off-ramp shows travel times longer for the roundabout alternative and shorter for the signal alternative. On the other hand, all of the remaining sections show travel time much longer for the signal. Special concerns can be raised in regard to the time required to the cell phone users to reach S.170th Street westbound and, consequently the airport curb.

Table 5 – 2028 Travel Times

Travel Time Section		2028		
		Signal sec	Roundabout sec	Δ Travel Time Signal Minus Roundabout sec
A-B	NAE SB to S 170th St (WB)	34	38	-3
A-C	NAE SB On to Cell Phone Lot	45	61	-16
A-E	NAE SB to S 170th St (EB)	41	84	-43
A-F	NAE SB to Doug Fox	117	87	30
C-B	Cell Phone Lot to S 170th St (WB)	131	24	107
D-B	NAE NB to S 170th St (WB)	105	53	52
D-C	NAE NB to Cell Phone Lot	97	60	38
E-B	S 170th St (EB) to S 170th St (WB)	63	31	33
E-C	S 170th St (EB) to Cell Phone Lot	62	37	25

7.Conclusions

The two-way stop alternative performed extremely poor in terms of delay, travel times and queue lengths at the intersection of S.170th Street with the southbound NAE off-ramp. Improvements are necessary to avoid long delays, travel times, and queues spilling over the Airport Expressway, potentially impacting airport operations.

The modeling results clearly support the recommendation of a roundabout over a signal to mitigate the traffic impacts of relocating the cell lot from Air Cargo Road to the south side of S.170th Street. With few exceptions, the roundabout out performs the signal in terms of delay times, queue lengths and travel time.

Roundabouts have several advantages over a traffic signal that were not analyzed as part of this modeling effort: 1) they are less costly to maintain than a traffic signal, 2) they potentially reduce the risk of accidents due to slower speeds and a reduced number of conflict points, 3) roundabouts are assumed to provide a higher level of service in the off-peak hours because traffic is allowed to flow uninterrupted – which has the added benefit of reducing carbon emissions from idling vehicles. Conversely, traffic signals generate unnecessary delay because a signal needs to provide a minimum green time for each movement in every cycle even when no vehicles are entering the intersection and , 'lost time' is associated with startup and termination of a green phase, which detracts from the amount of time available for moving traffic.

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Appendices

S 170th Baseline - No Action - Volumes - 2014
Based on Flight Schedule and Doug Fox Access Study - Late Morning/Early Afternoon Peak

Westbound

	Vissim Output (vph)	Demand Volumes (vph)	Difference	Ratio	%	GEH Statistic
International Blvd START	634	631	3	1.0	0.4%	0.1
NAE NB On (left turn, to WB)	151	150	2	1.0	1.1%	0.1
NAE NB On (left turn to WB) to Doug Fox Off	784	781	3	1.0	0.4%	0.1
Doug Fox Off	17	25	-8	0.7	-32.3%	1.8
Doug Fox Off to Doug Fox On	766	756	10	1.0	1.4%	0.4
Doug Fox On	17	17	0	1.0	-1.2%	0.0
Doug Fox On to Cell Phone Off (left turn)	782	773	8	1.0	1.1%	0.3
Cell Phone Off (left turn)						
Cell Phone Off (left turn) to NAE SB On/Cell Phone On (to WB)	781	773	7	1.0	0.9%	0.3
NAE SB On/Cell Phone On (to WB)	315	289	27	1.1	9.2%	1.5
NAE SB On (to WB) to Air Cargo NB Off	1094	1062	32	1.0	3.0%	1.0
Air Cargo NB Off	1062	1053	8	1.0	0.8%	0.3
Air Cargo NB Off to Air Cargo SB Off	29	38	-9	0.8	-22.9%	1.5
Air Cargo SB Off	7	13	-6	0.5	-48.6%	2.0
West of Air Cargo END	30	25	5	1.2	20.0%	1.0

Eastbound

	Vissim Output (vph)	Demand Volumes (vph)	Difference	Ratio	%	GEH Statistic
West of Air Cargo START	34	33	1	1.0	2.7%	0.2
Air Cargo Off	22	22	0	1.0	1.3%	0.1
Air Cargo SB Off to Air Cargo SB On	12	11	1	1.1	5.6%	0.2
Air Cargo SB On	258	269	-11	1.0	-4.1%	0.7
Air Cargo SB On to Air Cargo NB On	270	280	-10	1.0	-3.7%	0.6
Air Cargo NB On	15	14	1	1.0	3.6%	0.1
Air Cargo NB On to Cell Phone Lot Off	284	294	-10	1.0	-3.4%	0.6
Cell Phone Lot Off (right turn)						
Cell Phone Lot Off to Cell Phone Lot On/NAE SB On (left turn)	284	294	-10	1.0	-3.5%	0.6
NAE SB On/Cell Phone Lot Off (Left turn)	251	255	-4	1.0	-1.7%	0.3
Cell Phone Lot On/NAE SB On (left turn) to Doug Fox Off (left turn)	535	549	-15	1.0	-2.7%	0.6
Doug Fox Off (left turn)	9	15	-6	0.6	-40.1%	1.7
Dough Fox Off (left turn) to Doug Fox On (left turn)	526	534	-9	1.0	-1.7%	0.4
Doug Fox On (left turn)	25	26	0	1.0	-1.6%	0.1
Doug Fox On to NAE NB On	551	560	-9	1.0	-1.7%	0.4
NAE NB ON (right turn, to EB)	399	422	-23	0.9	-5.5%	1.2
West of NAE NB ON (right turn, to EB) END	949	983	-34	1.0	-3.4%	1.1

S 170th Baseline - Two-Way Stop-Controlled Alternative - Volumes - 2014
Based on Flight Schedule and Doug Fox Access Study - Late Morning/Early Afternoon Peak

Westbound

	Vissim Output (vph)	Demand Volumes (vph)	Difference	Ratio	%	GEH Statistic
International Blvd START	631	631	0	1.0	0.0%	0.0
NAE NB On (left turn, to WB)	138	150	-11	0.9	-7.6%	1.0
NAE NB On (left turn to WB) to Doug Fox Off	768	781	-13	1.0	-1.6%	0.5
Doug Fox Off	15	25	-10	0.6	-38.8%	2.1
Doug Fox Off to Doug Fox On	753	756	-3	1.0	-0.4%	0.1
Doug Fox On	26	17				2.0
Doug Fox On to Cell Phone Off (left turn)	779	773	5	1.0	0.7%	0.2
Cell Phone Off (left turn)	37	36				0.2
Cell Phone Off (left turn) to NAE SB On/Cell Phone On (to WB)	740	737	3	1.0	0.4%	0.1
NAE SB On/Cell Phone On (to WB)	280	289	-8	1.0	-2.9%	0.5
NAE SB On (to WB) to Air Cargo NB Off	1020	1026	-6	1.0	-0.6%	0.2
Air Cargo NB Off	982	1053	-72	0.9	-6.8%	2.3
Air Cargo NB Off to Air Cargo SB Off	37	38	-1	1.0	-2.3%	0.1
Air Cargo SB Off	7	13	-6	0.5	-49.4%	2.0
West of Air Cargo END	38	25	13	1.5	52.4%	2.3

Eastbound

	Vissim Output (vph)	Demand Volumes (vph)	Difference	Ratio	%	GEH Statistic
West of Air Cargo START	33	33	0	1.0	0.0%	0.0
Air Cargo Off	22	22	0	1.0	-1.9%	0.1
Air Cargo SB Off to Air Cargo SB On	11	11	1	1.0	4.7%	0.2
Air Cargo SB On	271	269	2	1.0	0.7%	0.1
Air Cargo SB On to Air Cargo NB On	282	280	2	1.0	0.9%	0.1
Air Cargo NB On	15	14	1	1.1	5.7%	0.2
Air Cargo NB On to Cell Phone Lot Off	297	294	3	1.0	1.0%	0.2
Cell Phone Lot Off (right turn)	0	0				
Cell Phone Lot Off to Cell Phone Lot On/NAE SB On (left turn)	297	294	3	1.0	1.0%	0.2
NAE SB On/Cell Phone Lot Off (Left turn)	146	255	-109	0.6	-42.8%	7.7
Cell Phone Lot On/NAE SB On (left turn) to Doug Fox Off (left turn)	443	549	-106	0.8	-19.4%	4.8
Doug Fox Off (left turn)	8	15	-7	0.5	-47.5%	2.1
Dough Fox Off (left turn) to Doug Fox On (left turn)	435	534	-99	0.8	-18.6%	4.5
Doug Fox On (left turn)	17	26	-9	0.6	-35.7%	2.0
Doug Fox On to NAE NB On	451	560	-109	0.8	-19.4%	4.8
NAE NB ON (right turn, to EB)	356	422	-66	0.8	-15.7%	3.4
West of NAE NB ON (right turn, to EB) END	807	983	-175	0.8	-17.8%	5.9

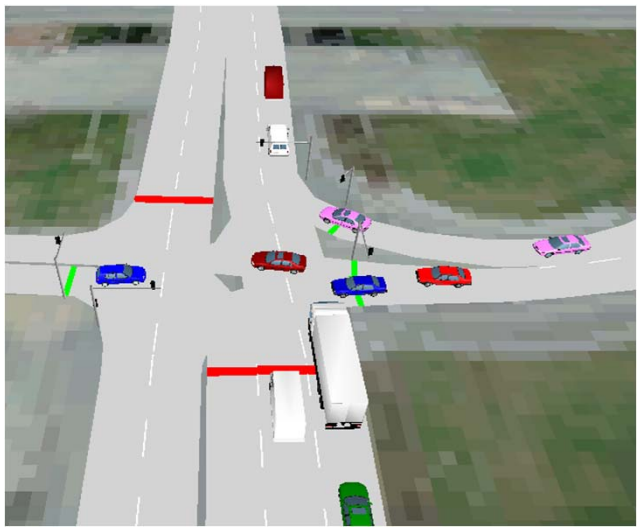
S 170th Baseline - Signal Alternative - Volumes - 2014
Based on Flight Schedule and Doug Fox Access Study - Late Morning/Early Afternoon Peak

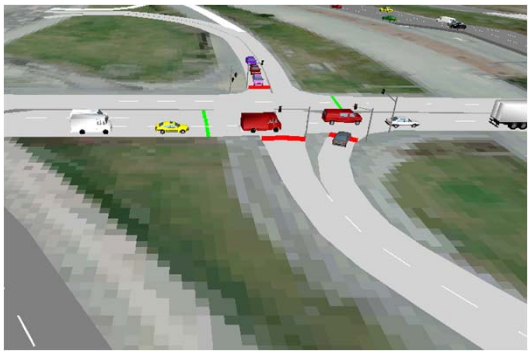
Westbound

	Vissim Output (vph)	Demand Volumes (vph)	Difference	Ratio	%	GEH Statistic
International Blvd START	631	631	0	1.0	0.0%	0.0
NAE NB On (left turn, to WB)	146	150	-4	1.0	-2.5%	0.3
NAE NB On (left turn to WB) to Doug Fox Off	776	781	-5	1.0	-0.6%	0.2
Doug Fox Off	17	25	-8	0.7	-31.1%	1.7
Doug Fox Off to Doug Fox On	759	756	3	1.0	0.3%	0.1
Doug Fox On	26	17				
Doug Fox On to Cell Phone Off (left turn)	783	773	10	1.0	1.3%	0.4
Cell Phone Off (left turn)	53	36	17	1.5	46.7%	2.5
Cell Phone Off (left turn) to NAE SB On/Cell Phone On (to WB)	729	737	-8	1.0	-1.1%	0.3
NAE SB On/Cell Phone On (to WB)	353	289	64	1.2	22.3%	3.6
NAE SB On (to WB) to Air Cargo NB Off	1080	1026	54	1.1	5.2%	1.7
Air Cargo NB Off	1054	1053	1	1.0	0.1%	0.0
Air Cargo NB Off to Air Cargo SB Off	22	38	-15	0.6	-40.8%	2.8
Air Cargo SB Off	7	13	-6	0.5	-47.9%	2.0
West of Air Cargo END	24	25	-2	0.9	-6.0%	0.3

Eastbound

	Vissim Output (vph)	Demand Volumes (vph)	Difference	Ratio	%	GEH Statistic
West of Air Cargo START	33	33	0	1.0	0.0%	0.0
Air Cargo Off	22	22	0	1.0	-1.9%	0.1
Air Cargo SB Off to Air Cargo SB On	11	11	1	1.0	4.7%	0.2
Air Cargo SB On	271	269	2	1.0	0.8%	0.1
Air Cargo SB On to Air Cargo NB On	282	280	3	1.0	0.9%	0.1
Air Cargo NB On	15	14	1	1.1	5.7%	0.2
Air Cargo NB On to Cell Phone Lot Off	297	294	3	1.0	1.1%	0.2
Cell Phone Lot Off (right turn)	0	0				
Cell Phone Lot Off to Cell Phone Lot On/NAE SB On (left turn)	297	294	3	1.0	1.0%	0.2
NAE SB On/Cell Phone Lot Off (Left turn)	341	255	86	1.3	33.5%	5.0
Cell Phone Lot On/NAE SB On (left turn) to Doug Fox Off (left turn)	638	549	88	1.2	16.1%	3.6
Doug Fox Off (left turn)	18	15	3	1.2	21.2%	0.8
Dough Fox Off (left turn) to Doug Fox On (left turn)	619	534	85	1.2	15.9%	3.5
Doug Fox On (left turn)	17	26				
Doug Fox On to NAE NB On	635	560	75	1.1	13.4%	3.1
NAE NB ON (right turn, to EB)	398	422	-25	0.9	-5.8%	1.2
West of NAE NB ON (right turn, to EB) END	1032	983	49	1.0	5.0%	1.5





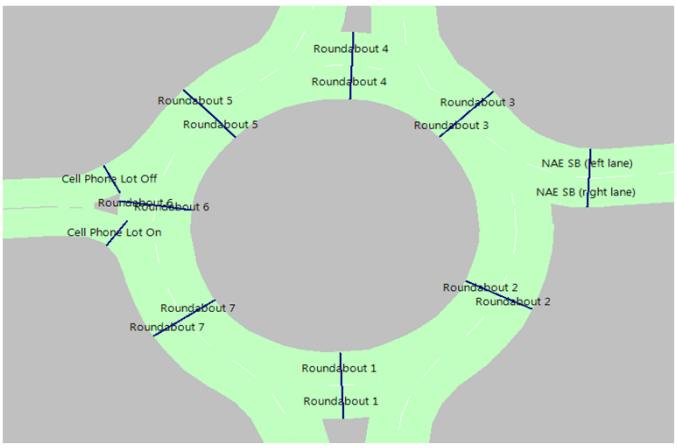
S 170th Baseline - Roundabout Alternative - Volumes - 2014
Based on Flight Schedule and Doug Fox Access Study - Late Morning/Early Afternoon Peak

Westbound

	Vissim Output (vph)	Demand Volumes (vph)	Difference	Ratio	%	GEH Statistic
International Blvd START	631	631	0	1.0	0.0%	0.0
NAE NB On (left turn, to WB)	149	150	-1	1.0	-0.8%	0.1
NAE NB On (left turn to WB) to Doug Fox Off	779	781	-2	1.0	-0.3%	0.1
Doug Fox Off	17	25	-8	0.7	-31.5%	1.7
Doug Fox Off to Doug Fox On	762	756	5	1.0	0.7%	0.2
Doug Fox On	16	17	-1	0.9	-5.2%	0.2
Doug Fox On to Roundabout	777	773	4	1.0	0.5%	0.1
Roundabout 1 (On)	214	215	-1	1.0	-0.5%	0.1
Roundabout 2	990	988	2	1.0	0.2%	0.1
NAE SB On	574	508	66	1.1	13.1%	2.9
Roundabout 3	1564	1496	67	1.0	4.5%	1.7
Roundabout 4 (Off)	470	470	-1	1.0	-0.2%	0.0
Roundabout to Air Cargo NB Off	1093	1026	67	1.1	6.6%	2.1
Air Cargo NB Off	1063	1053	9	1.0	0.9%	0.3
Air Cargo NB Off to Air Cargo SB Off	28	38	-9	0.8	-25.0%	1.6
Air Cargo SB Off	8	13	-5	0.6	-41.6%	1.7
West of Air Cargo END	29	25	4	1.1	14.4%	0.7

Eastbound

	Vissim Output (vph)	Demand Volumes (vph)	Difference	Ratio	%	GEH Statistic
West of Air Cargo START	33	33	0	1.0	-0.3%	0.0
Air Cargo Off	22	22	0	1.0	0.9%	0.0
Air Cargo Off to Air Cargo SB On	11	11	0	1.0	-0.8%	0.0
Air Cargo SB On	271	269	2	1.0	0.6%	0.1
Air Cargo SB On to Air Cargo NB On	281	280	2	1.0	0.5%	0.1
Air Cargo NB On	15	14	1	1.1	5.7%	0.2
Air Cargo NB On to Roundabout	296	294	2	1.0	0.7%	0.1
Roundabout 4 (On)	470	470	-1	1.0	-0.2%	0.0
Roundabout 5	765	764	1	1.0	0.1%	0.0
Cell Phone Lot Off	175	215	-40	0.8	-18.4%	2.8
Roundabout 6	590	549	40	1.1	7.3%	1.7
Cell Phone On	214	215	-1	1.0	-0.5%	0.1
Roundabout 7	804	764	39	1.1	5.1%	1.4
Roundabout 1 (Off)	214	215	-1	1.0	-0.5%	0.1
Roundabout to Doug Fox Off (left turn)	589	549	40	1.1	7.2%	1.7
Doug Fox Off (left turn)	12	15	-3	0.8	-21.2%	0.9
Dough Fox Off (left turn) to Doug Fox On (left turn)	576	534	42	1.1	7.8%	1.8
Doug Fox On (left turn)	27	26	1	1.0	2.7%	0.1
Doug Fox On to NAE NB On	603	560	42	1.1	7.5%	1.8
NAE NB ON (right turn, to EB)	476	422	54	1.1	12.7%	2.5
West of NAE NB ON (right turn, to EB) END	1078	983	95	1.1	9.7%	3.0



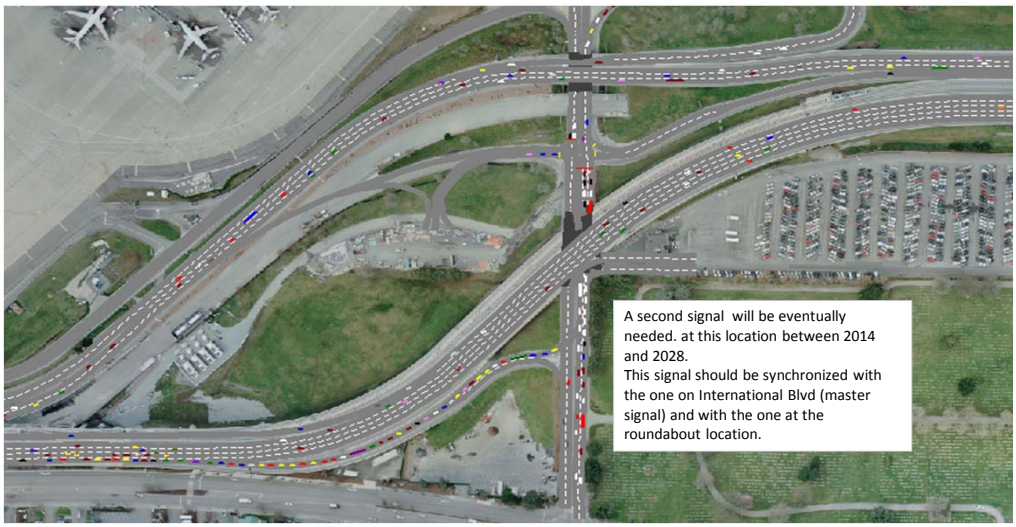
S 170th Baseline - Signal Alternative - Volumes - 2028
Based on Flight Schedule and Doug Fox Access Study - Late Morning/Early Afternoon Peak

Westbound

	Vissim Output (vph)	Demand Volumes (vph)	Difference	Ratio	%	GEH Statistic
International Blvd START	856	856	0	1.0	0.0%	0.0
NAE NB On (left turn, to WB)	212	187	25	1.1	13.4%	1.8
NAE NB On (left turn to WB) to Doug Fox Off	1064	1043	21	1.0	2.0%	0.6
Doug Fox Off	24	32	-8	0.8	-23.7%	1.4
Doug Fox Off to Doug Fox On	1038	1011	27	1.0	2.7%	0.8
Doug Fox On	26	17	9	1.5	51.7%	1.9
Doug Fox On to Cell Phone Off (left turn)	1060	1028	31	1.0	3.1%	1.0
Cell Phone Off (left turn)	66	47	19	1.4	40.0%	2.5
Cell Phone Off (left turn) to NAE SB On/Cell Phone On (to WB)	991	981	10	1.0	1.0%	0.3
NAE SB On/Cell Phone On (to WB)	427	394	34	1.1	8.5%	1.7
NAE SB On (to WB) to Air Cargo NB Off	1415	1375	40	1.0	2.9%	1.1
Air Cargo NB Off	1383	1411	-28	1.0	-2.0%	0.8
Air Cargo NB Off to Air Cargo SB Off	27	42	-15	0.6	-35.0%	2.5
Air Cargo SB Off	10	17	-6	0.6	-38.4%	1.7
West of Air Cargo END	27	25	2	1.1	8.4%	0.4

Eastbound

	Vissim Output (vph)	Demand Volumes (vph)	Difference	Ratio	%	GEH Statistic
West of Air Cargo START	45	42	3	1.1	6.9%	0.4
Air Cargo Off	30	28	1	1.1	5.2%	0.3
Air Cargo SB Off to Air Cargo SB On	15	14	2	1.1	11.1%	0.4
Air Cargo SB On	361	365	-5	1.0	-1.2%	0.2
Air Cargo SB On to Air Cargo NB On	376	379	-3	1.0	-0.8%	0.2
Air Cargo NB On	20	19	1	1.0	3.7%	0.2
Air Cargo NB On to Cell Phone Lot Off	395	398	-2	1.0	-0.6%	0.1
Cell Phone Lot Off (right turn)	0	0	0			
Cell Phone Lot Off to Cell Phone Lot On/NAE SB On (left turn)	395	398	-3	1.0	-0.7%	0.1
NAE SB On/Cell Phone Lot Off (Left turn)	241	342	-101	0.7	-29.5%	5.9
Cell Phone Lot On/NAE SB On (left turn) to Doug Fox Off (left turn)	637	740	-104	0.9	-14.0%	4.0
Doug Fox Off (left turn)	13	20	-7	0.7	-34.2%	1.7
Dough Fox Off (left turn) to Doug Fox On (left turn)	623	720	-97	0.9	-13.5%	3.8
Doug Fox On (left turn)	16	26	-10	0.6	-37.2%	2.1
Doug Fox On to NAE NB On	638	746	-108	0.9	-14.5%	4.1
NAE NB ON (right turn, to EB)	694	589	105	1.2	17.8%	4.1
West of NAE NB ON (right turn, to EB) END	1331	1335	-5	1.0	-0.3%	0.1



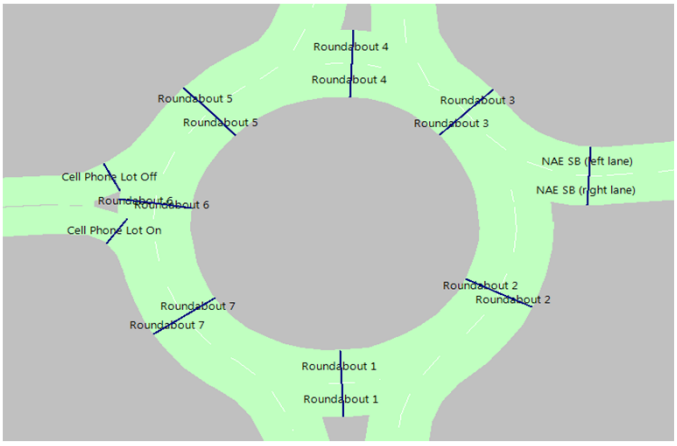
S 170th Baseline - Roundabout Option 3 - Volumes - 2028
Based on Flight Schedule and Doug Fox Access Study - Late Morning/Early Afternoon Peak

Westbound

	Vissim Output (vph)	Demand Volumes (vph)	Difference	Ratio	%	GEH Statistic
International Blvd START	856	856	0	1.0	0.0%	0.0
NAE NB On (left turn, to WB)	214	187	27	1.1	14.7%	1.9
NAE NB On (left turn to WB) to Doug Fox Off	1067	1043	24	1.0	2.3%	0.7
Doug Fox Off	26	32	-6	0.8	-19.3%	1.2
Doug Fox Off to Doug Fox On	1040	1011	29	1.0	2.9%	0.9
Doug Fox On	16	17	-1	0.9	-5.8%	0.2
Doug Fox On to Roundabout	1055	1028	27	1.0	2.6%	0.8
Roundabout 1 (On)	290	291	-1	1.0	-0.3%	0.1
Roundabout 2	1344	1319	25	1.0	1.9%	0.7
NAE SB On	541	687	-146	0.8	-21.3%	5.9
Roundabout 3	1883	2006	-124	0.9	-6.2%	2.8
Roundabout 4 (Off)	630	631	-1	1.0	-0.2%	0.1
Roundabout to Air Cargo NB Off	1446	1375	71	1.1	5.2%	1.9
Air Cargo NB Off	1408	1411	-4	1.0	-0.3%	0.1
Air Cargo NB Off to Air Cargo SB Off	35	42	-6	0.8	-15.0%	1.0
Air Cargo SB Off	10	17	-6	0.6	-37.8%	1.7
West of Air Cargo END	35	25	10	1.4	41.6%	1.9

Eastbound

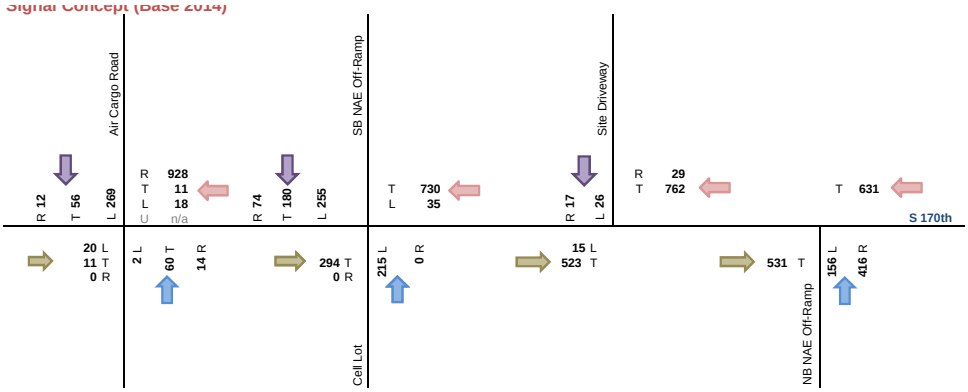
	Vissim Output (vph)	Demand Volumes (vph)	Difference	Ratio	%	GEH Statistic
West of Air Cargo START	45	42	3	1.1	6.9%	0.4
Air Cargo Off	30	28	2	1.1	7.0%	0.4
Air Cargo Off to Air Cargo SB On	15	14	1	1.1	7.5%	0.3
Air Cargo SB On	360	365	-5	1.0	-1.3%	0.3
Air Cargo SB On to Air Cargo NB On	375	379	-4	1.0	-1.1%	0.2
Air Cargo NB On	20	19	1	1.0	3.7%	0.2
Air Cargo NB On to Roundabout	394	398	-4	1.0	-0.9%	0.2
Roundabout 4 (On)	630	631	-1	1.0	-0.2%	0.1
Roundabout 5	829	1029	-201	0.8	-19.5%	6.6
Cell Phone Lot Off	227	289	-62	0.8	-21.3%	3.8
Roundabout 6	601	740	-139	0.8	-18.8%	5.4
Cell Phone On	290	291	-1	1.0	-0.4%	0.1
Roundabout 7	891	1031	-140	0.9	-13.6%	4.5
Roundabout 1 (Off)	290	291	-1	1.0	-0.3%	0.1
Roundabout to Doug Fox Off (left turn)	601	740	-139	0.8	-18.8%	5.4
Doug Fox Off (left turn)	9	20	-11	0.4	-55.3%	2.9
Dough Fox Off (left turn) to Doug Fox On (left turn)	592	720	-129	0.8	-17.8%	5.0
Doug Fox On (left turn)	26	26	1	1.0	2.3%	0.1
Doug Fox On to NAE NB On	618	746	-128	0.8	-17.2%	4.9
NAE NB ON (right turn, to EB)	600	589	11	1.0	1.9%	0.4
West of NAE NB ON (right turn, to EB) END	1424	1335	89	1.1	6.7%	2.4



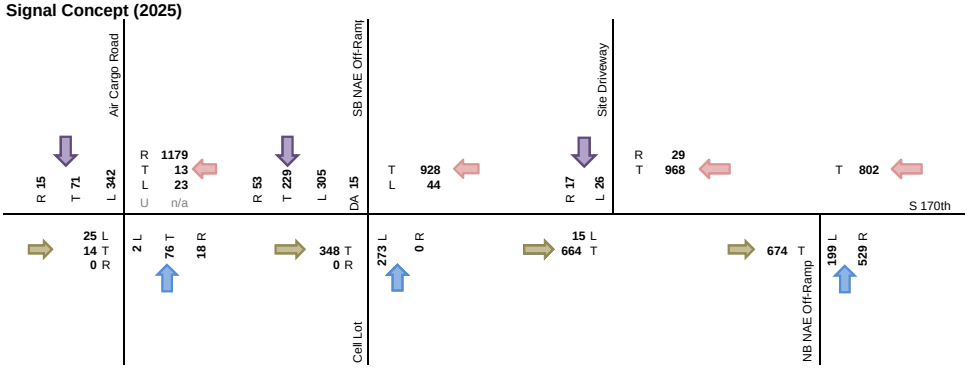
Doug Fox Access Study *November 2011*

Signal @ SB NAE Off-Ramp - Doug Fox Direct Access - Ingress Only at S 170th

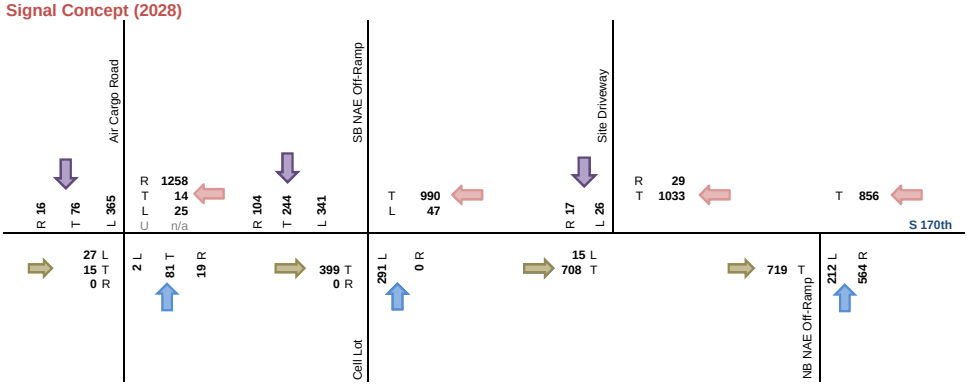
Adjustment to lower Port numbers to within 10% of City



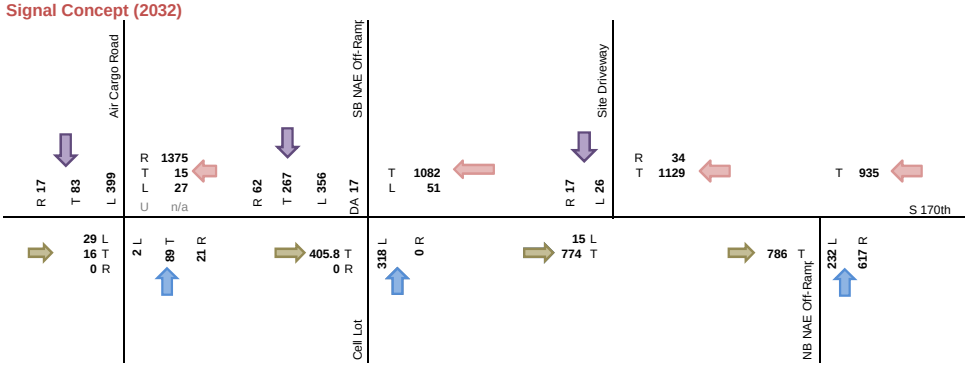
Signal Concept (2025)



Signal Concept (2028)



Signal Concept (2032)



S 170th Baseline - Signalized Option - Routings 2014
Based on Flight Schedule and Doug Fox Access Study - Late Morning/Early Afternoon Peak

Cell Phone Volume (TO) 215
Cell Phone Volume (FROM) 215

	Vehicle Type/Class			
International Blvd START	Hotel/Motel Shuttle	Parking Shuttle	Lower Drive Traffic	Other
631	105	272	5	249
	100% to 3rd Level	100% to 3rd Level	100% to Cell Phone	4% to Doug Fox
			(**2%** of total to Cell Phone)	1% to West of Air Cargo NB
				93% to Air Cargo NB
				2% to Air Cargo SB
NAE NB	Taxi		Lower Drive Traffic	Other
572	50		31	491
	100% to Taxi Lot		100% to Cell Phone	3% to Doug Fox
			(**14%** of total to Cell Phone)	1% to West of Air Cargo NB
				9% to Air Cargo NB
				1% to Air Cargo SB
				86% to International Blvd
Doug Fox				Other
43				43
				60% to International Blvd
				40% to Air Cargo NB
NAE SB	Taxi	Rental Car	Lower Drive Traffic	Other
508	0	32	179	297
	100% to Cell Phone Lot	100% to RCF	100% to Cell Phone	12% to West of Air Cargo NB
			(**84%** of total to Cell Phone)	1% to Air Cargo NB
				1% to Air Cargo SB
				5% to Doug Fox
				81% to International Blvd
Cell Phone (FROM)			Lower Drive Traffic	Other
215			215	0
			100% to Air Cargo NB	
			0% to International Blvd	
West of Air Cargo	Cargo Traffic			Other
33	33			0
	33% to International Blvd			
	67% to Air Cargo NB			
	0% to Air Cargo SB			
Air Cargo SB	Cargo Traffic			Other
337	68			269
	10% to International Blvd			100% to In 100% to International Blvd
	80% to Air Cargo SB			
	10% to West of Air Cargo			
Air Cargo NB	Cargo Traffic			Other
76	62			14
	99% to Air Cargo NB			100% to International Blvd
	1% to West of Air Cargo			

S 170th Baseline - Signalized Option - Routings 2028
Based on Flight Schedule and Doug Fox Access Study - Late Morning/Early Afternoon Peak

Cell Phone Volume (TO) 291
Cell Phone Volume (FROM) 291

	Vehicle Type/Class			
International Blvd START	Hotel/Motel Shuttle	Parking Shuttle	Lower Drive Traffic	Other
856	157	407	6	286
	100% to 3rd Level	100% to 3rd Level	100% to Cell Phone	4% to Doug Fox
			(**2%** of total to Cell Phone)	1% to West of Air Cargo NB
				93% to Air Cargo NB
				2% to Air Cargo SB
NAE NB	Taxi		Lower Drive Traffic	Other
776	50		41	685
	100% to Taxi Lot		100% to Cell Phone	3% to Doug Fox
			(**14%** of total to Cell Phone)	1% to West of Air Cargo NB
				9% to Air Cargo NB
				1% to Air Cargo SB
				86% to International Blvd
Doug Fox				Other
43				43
				60% to International Blvd
				40% to Air Cargo NB
NAE SB	Taxi	Rental Car	Lower Drive Traffic	Other
687	0	47	242	398
	100% to Cell Phone Lot	100% to RCF	100% to Cell Phone	12% to West of Air Cargo NB
			(**84%** of total to Cell Phone)	1% to Air Cargo NB
				1% to Air Cargo SB
				5% to Doug Fox
				81% to International Blvd
Cell Phone (FROM)			Lower Drive Traffic	Other
291			291	0
			100% to Air Cargo NB	
			0% to International Blvd	
West of Air Cargo	Cargo Traffic			Other
42	42			0
	33% to International Blvd			
	67% to Air Cargo NB			
	0% to Air Cargo SB			
Air Cargo SB	Cargo Traffic			Other
457	92			365
	10% to International Blvd			100% to In 100% to International Blvd
	80% to Air Cargo SB			
	10% to West of Air Cargo			
Air Cargo NB	Cargo Traffic			Other
102	83			19
	99% to Air Cargo NB			100% to International Blvd
	1% to West of Air Cargo			