Indirect Left Turns Study

Executive Summary

MIAMI-DADE MPO Metropolitan Planning Organization

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INTRODUCTION

This study investigated and evaluated different Indirect Left Turn (ILT) movement treatments and made recommendations for two locations in Miami-Dade County. Throughout the entire study, the Transportation Planning Technical Advisory Committee (TPTAC) served as the Study Advisory Committee (SAC) providing valuable input and insight into the analysis and recommendations for the study.

Background

The severe capacity impact of left turn movements at signalized intersections is well known to traffic engineers. It is recognized and reflected in the Highway Capacity Manual. As traffic volumes increase, the intersection reaches capacity. Oversaturated intersections result in excessive delays for motorist and often create additional operational difficulties such as turn bays filling up and spilling over to through lanes further restricting flow. There is no doubt that removing left turning movements from signalized intersections has great potential to increase intersection capacity and restore efficient flow through congested intersections. This may be possible by reallocating the green signal time from left turning traffic to through movements.

Literature Research

National literature was researched during the investigation of alternative methods of reducing left turn related delays at congested intersections. Six ILT treatments were identified and evaluated using five criteria. The analysis determined that the ILT treatment known as Quadrant Roadway Intersection, where all left turn movements at a congested intersection are rerouted using a roadway (or combination of roadways) on one of the four quadrants of the subject intersection, had the most potential. It is interesting that when the re-routing maneuvers are broken down, each of the four possible routes can be used by itself (or in combination with others) to accommodate any rerouted left turn maneuver. This also means that more than one quadrant of the intersection can be used to reroute left turns. In fact, the original concept of using three right turns to replace one left turn is one of the aforementioned routes.

Intersection Screening

Based on the research described above, a list of eleven criteria was developed to identify and evaluate candidate locations for the implementation of ILT treatments. These criteria included: Level of Service; number of signal phases; turn lane length; type of route; availability and suitability of alternate routes; maintenance agency; constrained right-of-way; planned improvements; residential impacts; and transit left turns. Eighteen potential

locations were identified using the above criteria, aerial photography and input from the TPTAC. The criteria were used to evaluate the suitability of these potential locations for ILT treatments and develop a short list of four locations in conjunction with the TPTAC and TPC. These short listed locations were field reviewed to refine the evaluation. The final two locations selected for detailed concept analysis were:

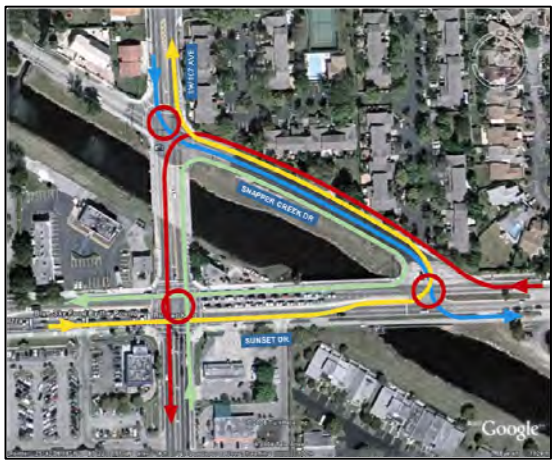
- SW 72 Street/SW 107 Avenue
- NW 27 Avenue/NW 20 Street-N. River Drive

ANALYSIS METHOD

The primary analysis tool used to develop and evaluate our recommendations was the software package Synchro/SimTraffic. This software is based on the widely recognized Highway Capacity Manual. The program also has a visual (animation) component that allows a dynamic representation of the traffic operation conditions resulting from the roadway geometric and signalization plans under consideration. Additionally, the software is capable of generating system-wide measures of effectiveness for the network being analyzed. This feature is important in determining whether there is a net improvement in operating conditions after all the affected intersections are analyzed. The determination of whether a particular ILT concept was feasible was based on:

- Reduction in vehicle delays (including control delay and queue delay) at the primary intersection as well as system-wide
- Suitability of the alternate routes
- Availability of right–of-way
- Order of magnitude of the improvement cost when compared to delay reductions

SW 72 Street/SW 107 Avenue



The subject intersection is located in the Kendall area of Miami-Dade County. SW 72 St. (SR 986, Sunset Drive) is a four lanes divided road, and so is SW 107 Ave. (SR 985). This intersection was selected due to its severe peak hour congestion, as well as its unique location/adjacent roadway network. These include the presence of a diagonal road connector (N. Snapper Creek Drive) and the existing signals at its

intersections with the adjoining arterial roads. Such configuration is ideally suited for the Quadrant Roadway Intersection (QRI) concept for ILT. A rerouting plan based on that concept was developed.

The results of the Synchro software analysis show, in general, the main intersection of SW 72 St/SW 107 Ave, shows a significant reduction in vehicle delay. The two other intersections, for the most part, show an increase in delays. However, the system-wide results still show a noticeable reduction in delay that justifies the recommended improvements, particularly in light of their relative low cost. This is possible because the traffic volumes at the main intersection are greater than the volumes at the other intersections. The delay reduction is 59 seconds per vehicle combined with an improvement in the intersection Level of Service from F to D during the critical afternoon peak hour.

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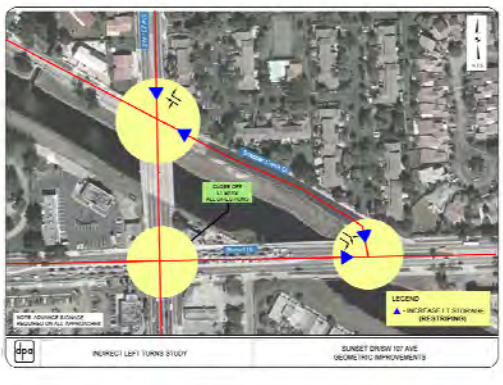
Evaluation of Alternatives
Sunset Dr/SW 107 Ave
Delay (sec/veh)

Intersection	AM Peak				PM Peak			
	Before	After	Recom.	Change	Before	After	Recom.	Change
Sunset Dr/SW 107 Ave	79	58	51	-28	109	70	50	-59
Sunset Dr/N Snapper Creek Dr	9	8	8	-1	21	123	72	51
SW 107 Ave/N Snapper Creek Dr	8	12	12	4	7	17	43	36
Network Total (Weighted)	42	31	28	-14	59	74	55	-4
Percent Change				-33%				-7%

The main elements of the recommendations for this location are:

- Remove the existing left turn bays at the main intersection, remove left turn signals and install no left turn signs
- Adjust signal timing/phasing and progression offsets at the affected signals
- Install advanced directional signage advising rerouted left turn motorist of the new indirect left turn route



- Adjust lane geometry (restriping) and storage bay lengths at the nearby minor intersections

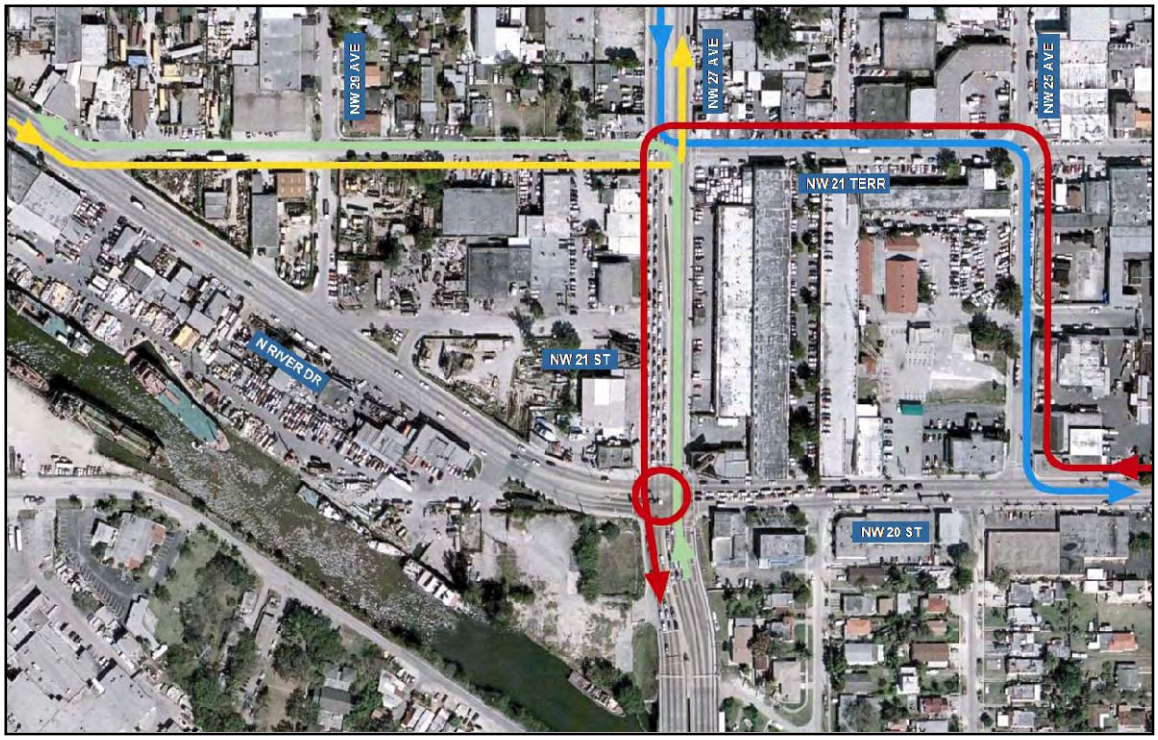
Preliminary cost estimates have been developed based on the concept drawings contained in the study's Final Report. Available road construction/re-construction cost information was secured from the

Miami-Dade Public Works Department (PWD) and/or the Florida Department of Transportation (FDOT). The estimated cost of the improvements at this location is in the range of $130,000 to $200,000.

NW 27 Avenue/NW 20 Street/N River Drive

NW 27Ave. (SR 9, Unity Boulevard) is a six lanes divided road. NW 20 St, and its diagonal extension – N. River Dr, are five lane county arterial roads. This intersection was selected due to its severe peak hour congestion, as well as its unique location/adjacent roadway network. The location, immediately north of the Miami River, results in a high concentration of traffic (and associated congestion) which are further compounded by the frequent opening and closing of the drawbridge on NW 27 Ave. In particular, the northbound and westbound left turn lanes often back up and block the through lanes affecting the ability to move traffic to and from this critical river crossing. However, the adjacent roadway network includes a fairly complete grid system north of NW 20 St as well as a diagonal road - N. River Dr.

A concept plan for re-routing left turns from the main intersection was developed. It was determined that a minimum of three new traffic signals would be required to effectively and efficiently re-route left turns away from the main intersection.



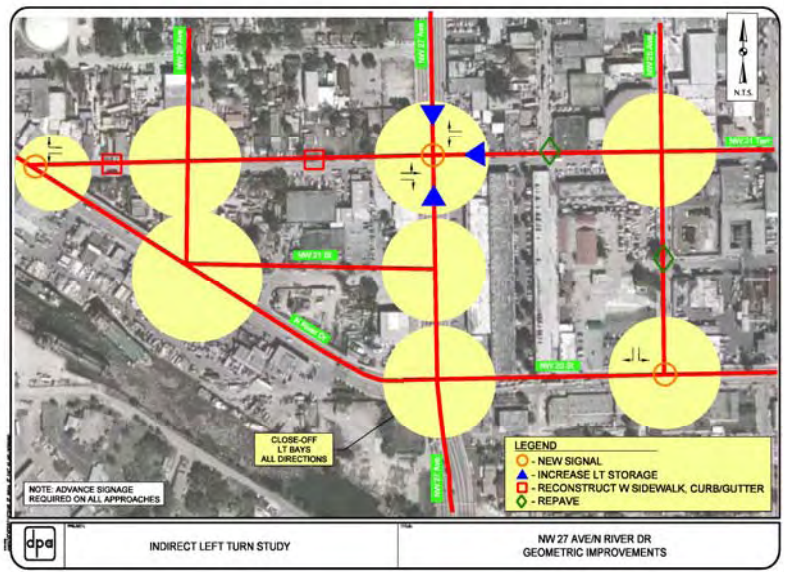
The results of the Synchro software analysis show, in general, a very significant reduction in vehicle delay at the main intersection of NW 27 Ave/NW 20 St-N. River Dr shows. The other adjacent intersections, for the most part, show an increase in delays. However, the system-wide results still show a significant reduction in delay that justifies the relatively high cost caused by the need for three new signals as well as improvement/reconstruction of certain existing street. This overall delay reduction is possible because the traffic volumes at the main intersection are greater than the volumes at the other intersections. The delay reduction is 52 seconds per vehicle during the critical afternoon peak hour even though the actual intersection Level of Service will not change

Indirect Left Turns Study
Evaluation of Alternatives
NW 27 Ave/20 St/N. River Dr
Delay (sec/veh)

Intersection	AM Peak				PM Peak			
	Before	After	Recom.	Change	Before	After	Recom.	Change
NW 27 Ave/N. River Dr	48	24	18	-30	147	100	95	-52
N. River Dr/21 St	NA	NA	NA	NA	NA	NA	NA	NA
NW 27 Ave/21 St	NA	NA	NA	NA	NA	NA	NA	NA
NW 20 St/25 Ave	NA	7	7	NA	8	602	9	1
NW 27 Ave/21 Ter	263	1287	35	-228	370	1400	36	-334
N River Dr/21 Ter	NA	NA	6	NA	NA	NA	9	NA
NW 21 Ter/29 Ave	3	1	1	-2	4	2	2	-2
NW 21 Ter/25 Ave	3	10	10	7	3	19	19	16
Network Total (Weighted)	62	252	14	-48	119	381	37	-82
Percent Change				-77%				-69%

The main elements of the recommendations for this location are:

- Remove the existing left turn bays at the main intersection, remove left turn signals and install no left turn signs
- Adjust signal timing/phasing and progression offsets at the affected signals
- Install advanced directional signage advising re-routed left turn motorist of the new indirect left turn route
- Adjust lane geometry and storage bay lengths at the nearby minor intersections
- Repave/restripe and/or reconstruct selected existing streets in the area, including the removal of some on-street parking



Preliminary cost estimates have been developed based on the concept drawings. The estimated cost of the improvements at this location is in the range of $1,010,000 to $1,180,000.

Implementation

Future efforts will include the topographic surveys and engineering necessary to prepare design plans and specifications for implementing the improvements as well as refinement of concept designs and cost estimates. The main elements of implementation for the recommended improvements are: 1) secure TIP funding; 2) prepare design plans and secure the required construction permits from FDOT; 3) bid and construct the improvements. Both Florida Department of Transportation and the Miami-Dade Publics Works Department have processes in place to accommodate each of these steps and successfully complete implementation of these recommendations. Once funding is secured, it is estimated that the implementation process will take 1 to 1 1/2 years.

ADDITIONAL INFORMATION

In addition to this report, the MPO has an Executive Summary, as well as a PowerPoint presentation for this study. The materials are available in hardcopy (printed reports) format from their office (305-375-4507). Digital versions are also available to be downloaded from the MPO website at www.miamidade.gov/mpo.

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