# Adding Turbo Lanes to T-intersections Study

## Executive Summary

May 2010

# BACKGROUND

The Citizens Transportation Advisory Committee (CTAC) of the Miami Urbanized Area Metropolitan Planning Organization (MPO) requested that the Miami-Dade Public Works Department (PWD) provide a list of intersections that can safely be converted into turbo-lanes (Resolution #1-08). As a result of this request, PWD prepared the document "Identification of Signalized 3-Leg Intersections on County Roads that can be Safely Converted to Turbo-lane Operations". This report listed a total of 105 locations classified as follows:

a. 8 intersections are already converted to turbo-lanes
b. 30 intersections are suitable for the conversion to turbo-lanes
c. 21 intersections need further analysis
d. 46 intersections are not suitable for conversion to turbo-lanes

On March 26, 2009, under Resolution #14-09, the MPO Governing Board approved the Scope of Work and budget for this study.

**What is a turbo-lane?**
A turbo-lane is an intersection geometric arrangement, supported by special traffic signalization that allows continuous flow on one or more of the through lanes of the main street. **Exhibit 1** shows photographs of two existing turbo-lanes in Miami-Dade.

For the purpose of this study, the 51 locations listed in (b) and (c) above were considered for the development of this study.

**Exhibit 1**
**Existing Turbo-lanes**

Location a: Old Cutler Road / Deering Bay


Location b: NW 12 St / Dolphin Mall

## PURPOSE OF THE STUDY

The objective of this study is to evaluate a list of T-intersections turbo-lane conversion candidates identified by the PWD and to prepare schematic concept diagrams for 25 intersections that can potentially be converted from conventional signalized T-intersections to turbo-lane configuration. The evaluation took into consideration factors such as:

- available right-of-way
- minimum or no environmental impact
- low costs
- construction should not take more than three years including design

In addition, the study also evaluates the benefits, presents preliminary costs estimates and suggests priorities for implementation.

## INTERSECTION SCREENING

The initial screening of the PWD list of 51 candidates was based on fatal flaws identified from aerial photography and other readily available information (Google Earth, MD GIS data, etc.). Fatal flaw criteria included: right of way (ROW), environmental issues, excessive cost and permitting/construction time due to potentially complex design. The objective was to select the 25 locations most suitable for conversion to turbo-lane operation.

Further screening was conducted through the gathering of additional data. The primary data source was field observations including:

- Aerial photography
- Street views
- Right-of-way lines

The reports prepared by FDOT and other roadway design criteria sources were used to develop a set of preliminary concept design parameter for the various elements of typical turbo-lanes by type. The initial 25 recommended locations were presented to the MPO and PWD for concurrence in the form of a report with preliminary recommendations. Field review and the application of these parameters resulted in the replacement of a few candidate locations that did not meet basic criteria for turbo-lanes. Also, some of the initial turbo-lane types recommended by PWD were changed in order to comply with the aforementioned criteria.

Each or the suggested locations was field inspected and additional information was gathered to facilitate the subject screening. Field information includes items such as:

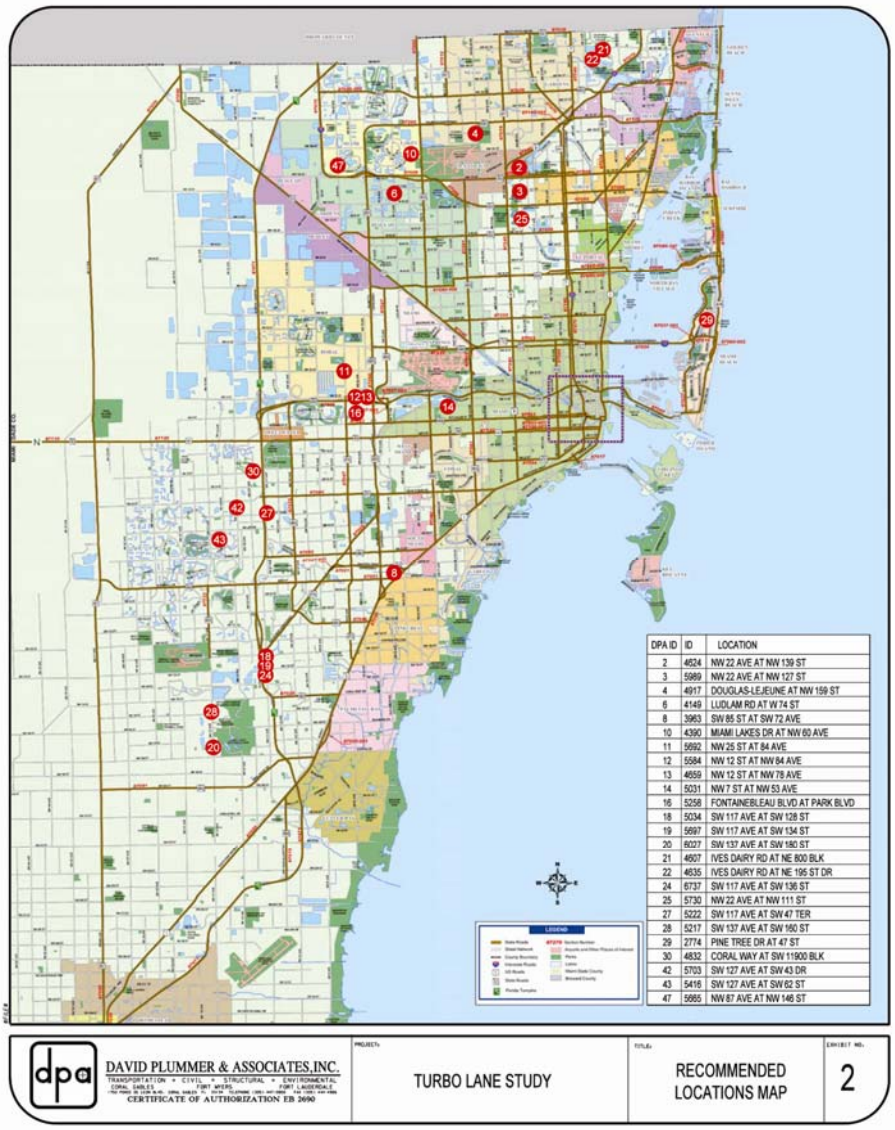
- Proximity of median openings
- Presence of major driveways
- Proximity of signals
- Presence of dual left turn lanes
- Posted speed limit
- Number of lanes

## ANALYSIS/BENEFITS

The screening process described above and the field visits resulted in a list of the 25 most suitable locations for conversion to turbo are shown in **Exhibit 2.**

During the preparation of concept schematics, additional analysis was undertaken to further define the configuration of the selected locations which include details such as:

- Need for an actuated pedestrian phase to stop the proposed turbo-lanes upon the presence and actuation of a pedestrian signal push button.
- Need for special advance signage to advise motorist as to best lane usage for downstream locations.
- Need to modify minor street lanes and signal timing.




Capacity increase was used as the primary measurement of benefit in as much as more capacity results in less delay, shorter queues and better level of service. While it is understood that turbo-lanes increase the capacity of the respective approach to the intersection, the degree of improvement can vary widely.
The factors that enter into this calculation include:

- Number of approach lanes
- Number of turbo-lanes
- Existing green signal time allocation for the through movement on the turbo-lane approach.

The calculations were performed for the peak hour of the day as determined by the maximum green time allocation for the subject approach. This means that the approach capacity improvement during off-peak periods can be even greater. It also means that the greater the existing green time percent allocated to the main street, the lower the benefit of the turbo-lane. Nevertheless, the range in the percent improvement in approach capacity for the recommended locations was estimated to be between 7% and 173%.

It should be noted that most of the recommended locations include pedestrian crossing treatments. All existing pedestrian crossings across the main street are being replaced with a special pedestrian phase. This requires:

- Signalization of all through lanes on the main street
- Special pedestrian actuated signal phase and signal
- Optically programmed signal heads to provide separate indications to the through turbo and non-turbo-lanes

Pedestrian phases are recommended in a few additional cases where the need was apparent. While pedestrian phases reduce the potential capacity of the turbo-lane configuration, the capacity reduction occurs only upon actuation and pedestrian activity is expected to be light at most intersections.

Renderings of several types of turbo-lanes recommended at selected locations **(Exhibits 3 and 4)** have been included here to provide an easy to understand illustration of the concept and differences among the various turbo-lane types.

Exhibit 3: Location 2 (Type A with pedestrian crossing): NW 22 Ave @ NW 139 St

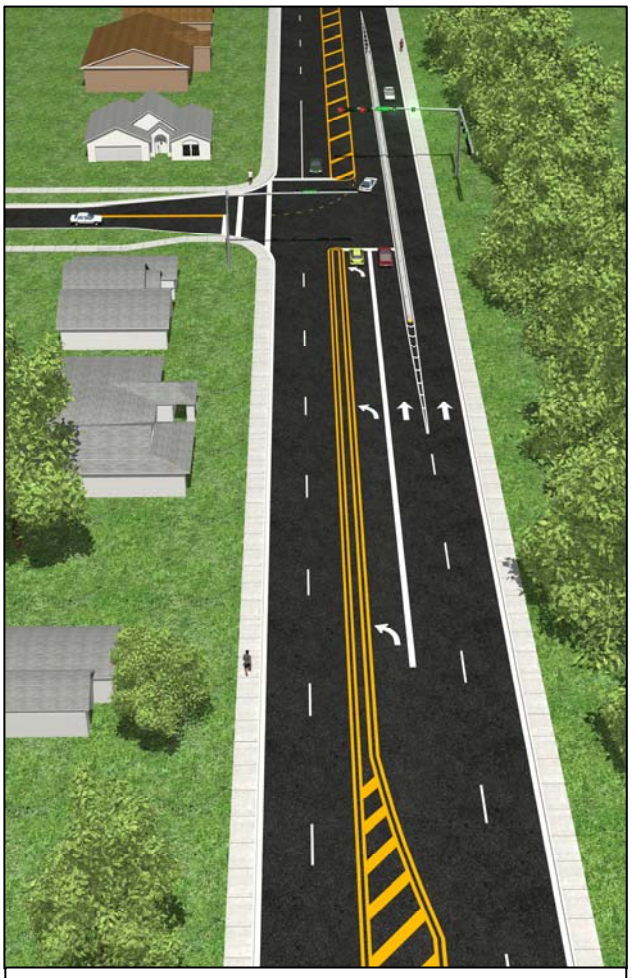


Exhibit 4: Location 4 (Type D without pedestrian crossing): Douglas-LeJeune @ NW 159 St

## RECOMMENDATIONS

The conceptual recommendations for each of the 25 location listed above are shown in the final report. These recommendations are organized by location and include for each location (**See Exhibits 5 and 6)**:

- Location map
- Narrative of the location existing features and implementation issues
- General specifications table including recommended turbo-lane type, benefits, estimated cost estimate, priority and schedule.
- Ground level picture
- Schematic plan overlayed on a current aerial photo

**Exhibit 5**

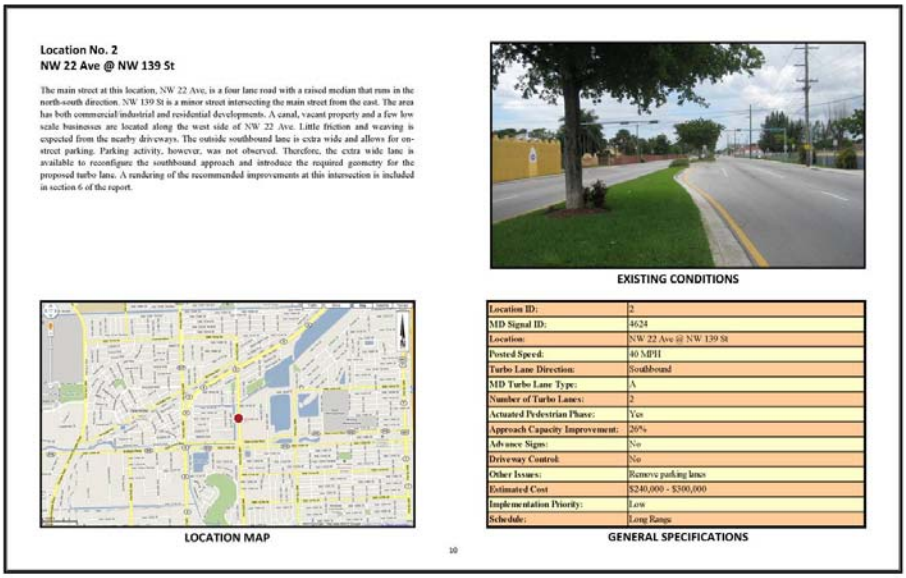
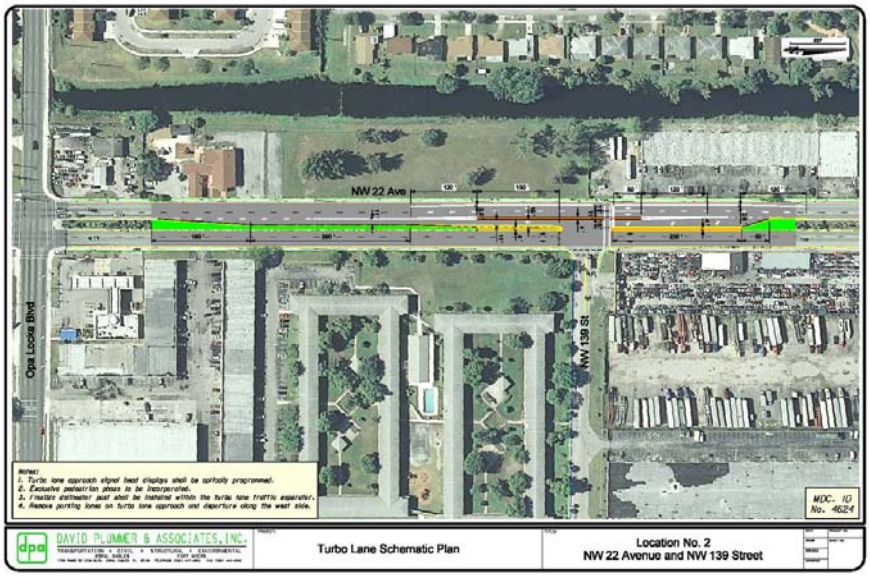



**Exhibit 6**




## IMPLEMENTATION PLAN

This section describes: the study coordination effort (expected to simplify implementation); the development of cost estimates; and the recommended priorities and schedule.

## STUDY COORDINATION

The study recommendations were developed in close coordination with representatives of the Miami Dade PWD, the MPO and other committees of the MPO. The coordination took place both in the form of meetings and distribution of recommendation materials for review and comments. Implementation should proceed based on available PWD funding for these types of projects. All the intersections are located on Miami-Dade County roads.

## ESTIMATED COSTS

Conceptual cost estimates, based on typical configurations were developed. For each turbo-lane type, a cost range was established. This was further stratified into a low, mid and high cost range. Each recommended location was then identified as a low, mid or high cost range location as shown in the general specifications. **Exhibit 7** provides the cost ranges.

**Exhibit 7**
**Preliminary Cost Estimates by Turbo-lane Type**

| Turbo-lane Type | Low | Mid | High |
|---|---|---|---|
| Type A or B | $215,000 | $270,000 | $325,000 |
| Type C | $135,000 | $170,000 | $205,000 |
| Type D | $95,000 | $120,000 | $145,000 |

Source: David Plummer and Associates

## PRIORITIES/SCHEDULE

Priority recommendations are presented in this section. These priorities are based on 3 major factors, namely:

- Percent capacity improvement
- Cost
- Implementation issues

A 3 point system was used for each factor resulting a possible score range between 3 and 9 (the higher the score the higher the recommended priority).

The suggested implementation schedule, provided funding becomes available, is as follows:
- Short Term: 6 – 12 months (High Priority)
- Mid Term: 1 – 2 years (Medium Priority)

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