

16.0 ALIGNMENT

The alignment developed in Part I of this study has undergone many refinements, described in Section 10.0, Study Refinement . During this refinement process , site reconnaissance was completed to verify the effects of the alignment on the general surroundings, and the optimum location for the turnaround was examined. For a turnaround at NE 41st Street and NE 2nd Avenue, the only site to locate the switch to accomplish the turnaround, given the direction of traffic flow, is the parking lane in front of the school at NE 2nd Avenue. Observations of general operations at the school during the morning hours indicated that the school buses and parents used the parking lanes to drop off students. Therefore, another option was needed to avoid detrimental effects to the school from removal of the parking lane. After examining all the streets located in the Miami Design District, it was determined that a loop would best accomplish the turnaround. NE 39th Street was first examined as the primary eastbound corridor to NE 2nd Avenue because of the perpendicular intersection with NE 1st Avenue and 55 ft of right-of-way but was rejected because of high east-west traffic volumes. NE 38th Street was chosen instead for the eastbound connection to NE 2nd Avenue even though the 50 ft of right-of-way on this section may constrain the location of a station stop on NE 38th Street.

NE 41st Street and NE 40th Street were examined for the connection from NE 2nd Avenue to NE 1st Avenue. NE 41st Street has 50 ft of right-of-way compared with 66 ft of right-of-way on NE 40th Street. In addition, NE 41st Street has fewer development opportunities while the existing commercial character of NE 40th Street would be more transit supportive and this roadway was determined to be the best option for the westbound return from NE 2nd Avenue to NE 1st Avenue. Therefore, the loop was created using NE 38th Street and NE 40th Street.

These refinements, and those discussed in Section 10.0, resulted in the refined Phase I alignment shown in Figure 10.1.1 .

16.1 Design Criteria

Streetcar design criteria were needed to develop a horizontal alignment. Based on the understanding that the Portland Streetcar is the model for the proposed system, the vehicle was assumed to be the same as the Skoda-Inekon Astra vehicle used in Portland. Therefore, the design criteria utilized were as shown in Table 16.1.1.

16.2 Horizontal Alignment

The horizontal alignment was further refined, using the Phase 1 recommended alignment, the design criteria, and the latest controlled aerial photographs available from Miami-Dade County. The alignment sheets were prepared at a scale of 1 inch equals 50 feet. These sheets, shown in the *City of Miami Streetcar Corridor Feasibility Study: Preliminary Alignment Plans*, June

Table 16.1.1 Design Criteria

Design Element	Current Standard
Vehicle Manufacturer	Skoda-Inekon Astra (LTM. 10.08)
Vehicle Width	
<ul style="list-style-type: none"> ▪ Exterior Body ▪ Mirrors Extended ▪ Dynamic Envelope (due to potential suspension motion) 	<p>8 ft 1 in.</p> <p>8 ft 10.6 in.</p> <p>10 ft 9 in.</p> <p>(minimum 11 ft travel lane)</p>
Vehicle Height	
<ul style="list-style-type: none"> ▪ No pantograph ▪ Lowered pantograph 	<p>11 ft 3.5 in.</p> <p>12 ft 8.5 in.</p>
Vehicle Length	66 ft
Vehicle Weight (empty)	63,500 lb
Vehicle Voltage	
<ul style="list-style-type: none"> ▪ Primary ▪ Control 	<p>750 Vdc</p> <p>24 Vdc</p>
Vehicle Acceleration Rate	3 mph/sec
Vehicle Deceleration Rate	3 mph/sec
Vehicle Motors	
<ul style="list-style-type: none"> ▪ Number ▪ Power 	<p>4</p> <p>115 hp</p>
Vehicle Passenger Capacity	
<ul style="list-style-type: none"> ▪ Seated ▪ Standing 	<p>30</p> <p>127</p>
Track Gauge	56.5 in.
Track Slab	
<ul style="list-style-type: none"> ▪ Material ▪ Min. Width 	<p>Concrete</p> <p>8 ft 2 in.</p>
Minimum Horizontal Curve	60 ft
Spiral Length	25 ft
Assumes No Track Super-elevation	
Minimum Vertical Curve Radius	620 ft
Maximum Grade	9 %
Maximum Speed	
<ul style="list-style-type: none"> ▪ Operating ▪ Design 	<p>30 mph</p> <p>42 mph</p>
Minimum Vertical Clearance	14 ft
Maximum Cross Slope	1 %

2004 (under separate cover), provide a multitude of information such as alignment stationing, typical roadway sections for all the effected roadways, general station (boarding) stop locations, and conceptual station stop layouts in plan and section view. It should be noted that the alignment is laid out with simple radius curves only. The final alignment will require the use of spiral curves prior to and after each horizontal curve as described in the design criteria.

The alignment generally consists of multiple loops, and rail alignments are typically stationed from north to south. Therefore, the best location to start the alignment stationing was determined to be the beginning of the loop in the Miami Design District near the intersection of NE 38th Street and NE 1st Avenue. The alignment goes through the Miami Design District and Midtown Miami, continues south to Government Center, and then returns to the Miami Design District, completing the loop at the same location as the start. The total streetcar alignment forms a 35,642 ft loop, or 6.75 miles round trip from Government Center to the Miami Design District and back. The alignment can be divided into two main components, single-track segments and double-track segments (i.e., those with tracks in both the southbound and northbound directions). The total length of single-track segments is 3.16 miles, and the total length of double track segments is 1.79 miles . The following describes the streetcar alignment in detail.

16.2.1 Miami Design District

The alignment begins at Station 100+00, just east of the intersection of NE 38th Street and NE 1st Avenue, and goes east toward NE 2nd Avenue. Nearing NE 2nd Avenue,



Miami, Florida - NE 2nd Avenue, at NE 39th Street looking north

the alignment turns left, or northward, onto NE 2nd Avenue. The intersection of NE 38th Street and NE 2nd Avenue would require the installation of a signal. The signal could be designed to operate only for the streetcar, stopping automobile traffic until the streetcar turning movements have been completed.

Once on NE 2nd Avenue, the streetcar would operate in the northbound through lane, crossing NE 39th Street. The signal at the NE 39th Street and NE 2nd Avenue is expected to require modifications to accommodate the streetcar system. The alignment turns westbound, or left, onto NE 40th Street. A signal, potentially for the streetcar only, would have to be installed at this intersection. The alignment continues westbound on NE 40th Street, turning southbound onto NE 1st Avenue. The intersection of NE 40th Street and NE 1st Avenue may also require a signal, which could be a streetcar-only signal. It is noted that on streets with low traffic volume, streetcar drivers commonly operate the vehicle like a bus, yielding to cross-street traffic and using stop signs for side street traffic control.

The alignment continues southbound, passing NE 38th Street, where double track begins. The alignment proceeds south, crossing under I-195, passing by the Iglesia Episcopal de la Santa Cruz Anglo Catolica, and crossing NE 36th Street. The intersection of NE 1st Avenue and NE 36th Street must be signalized because of the heavy cross-street volumes and because this is a main entry way to the Midtown project. The understanding is that a signal is to be installed at this location by the Midtown Miami development; however, modifications would be needed to make the signal compatible with the streetcar system. Once the alignment crosses NE 36th Street, it is within the Midtown Miami development.

16.2.2 Midtown Miami

The streetcar would operate on two new roadways to be constructed within the Midtown Miami development. It would operate in a north-south direction within the outside travel lanes while on Buena Vista Avenue (the equivalent of the existing NE 1st Avenue) for approximately 350 ft. At that point, the alignment changes to an east-west direction, passing across a plaza to Midtown Boulevard. At Midtown Boulevard, the alignment changes back to the north-south, crossing NE 34th Street and NE 32nd Street, which are both new proposed intersections. In addition, the alignment passes NE 30th Street. These three intersections are likely to require the use of signals to avoid conflicts with automobile and pedestrian traffic. Approximately 300 ft south of NE 30th Street, the alignment merges onto NE 29th Street toward NE 2nd Avenue, leaving the Midtown Miami development. The intersection of NE 29th Street and Midtown Boulevard would require the installation of a signal and minor curb modifications. It is anticipated that this signal would be installed by the

Midtown Miami development. Modifications would be necessary to make the signal compatible with the streetcar system.

Once on NE 29th Street, the streetcar would travel east-west toward NE 2nd Avenue. The alignment crosses the Florida East Coast (FEC) Railway line at-grade on both sides of the roadway, that is, in both directions of travel, within the outside travel lane. The at-grade, rail-to-rail crossing would have concrete embedded track work and would require installation of a remote interlocking signal system to meet Federal Railroad Administration (FRA) requirements. In addition, the existing crossing protection system must be upgraded with a signal and gate system. The FEC Railway track must also be isolated from stray electrical current produced by the overhead catenary wires for the streetcar. To accommodate the streetcar/rail signal system, the median within NE 29th Street must be raised with curb and gutter. It is understood that a raised median is being installed at the rail crossing by the Midtown Miami development. The FEC Railway crossing would also require a high vertical clearance of 25 ft for the overhead catenary system (OCS), which would entail vehicle modifications to maintain power supply via the pantograph. Once past the FEC Railway tracks, the alignment turns onto NE 2nd Avenue and goes toward downtown on double track.

16.2.3 NE 2nd Avenue (NE 29th Street to NE 9th Street)

The intersection of NE 29th Street and NE 2nd Avenue would require modifications to the curb in the southwest corner and overall signal modifications to accommodate the streetcar. Along NE 2nd Avenue, it is recommended that the existing four-lane roadway with

temporary parking be converted to a two-lane roadway with dedicated parking facilities from NE 29th Street to NE 17th Street, where there is an existing parking lane. The *City of Miami Streetcar Corridor Feasibility Study Preliminary Alignment Plans*, June 2004, show a schematic layout of the proposed curb line and parking. Once the alignment passes NE 17th Street, the typical section changes to three lanes with on-street parking on both sides of the roadway. The streetcar would operate in the outside travel lanes in this location until NE 14th Street, where the double-track section ends on NE 2nd Avenue because the two-way roadway converts to a one-way roadway. The southbound single-track section continues with a lane transition to the center lane to cross under I-395. The alignment transitions back to the outside travel lane just south of NE 11th Street and turns west onto NE 9th Street.

Several proposed projects are under design in this segment of the alignment. From NE 14th Street to NE 11th Terrace, the Florida Department of Transportation (FDOT) is designing milling and resurfacing improvements to convert NE 2nd Avenue from one-way traffic to two-way traffic. At the time of this writing, only a typical section package had been completed and the 60 percent design plans were underway. The end of the FDOT project ties to a Miami-Dade County milling and resurfacing project that extends from NE 11th Street to NE 6th Street along both NE 2nd Avenue and NE 1st Avenue. Both of these projects have minor impacts on the alignment and should be incorporated into the next phase of the streetcar project.

16.2.4 NE 9th Street (NE 2nd Avenue to North Miami Avenue)

To minimize impacts on adjacent properties, the streetcar would make a slight swing-out maneuver prior to and after the turn from NE 2nd Avenue onto NE 9th Street. Once the turn is completed, the streetcar would operate in the westbound travel lane until the intersection with NE 1st Avenue. This intersection would require a new traffic signal. In addition, the streetcar would cross itself, requiring complex track work. Once across NE 1st Avenue, the streetcar would continue in the westbound travel lane, pass the Technology Center of the Americas, and turn southbound onto North Miami Avenue, where a new traffic signal would be required. No parking impacts are anticipated within the NE 9th Street corridor.



Miami, Florida - NE 9th Street, at Miami Avenue looking east

16.2.5 North Miami Avenue (NE 9th Street to NW 3rd Street)

After turning from NE 9th Street, the streetcar would turn into the far west travel lane of North Miami Avenue and continue southbound. It would cross NE 8th Street,

where a traffic signal modification would be required to accommodate the streetcar. Approximately 500 ft south of NE/NW 8th Street is the location of the proposed crossing of the FEC Railway line. The at-grade, rail-to-rail crossing would have concrete embedded track work and would require installation of a remote interlocking signal system to meet FRA requirements. In addition, the existing crossing protection system must be upgraded with a signal and gate system. The FEC Railway track must also be isolated from stray electrical current produced by the overhead catenary wires for the streetcar.

South of the FEC Railway crossing, the alignment crosses NE/NW 6th Street, NE/NW 5th Street, and NE 4th Street. These existing signalized intersections would require modifications to the traffic signals to accommodate the streetcar passing through the intersections. In this immediate area, the Federal Courthouse and related buildings currently have intense security measures in place. The alignment would not disturb these measures. Approximately 350 ft south of NE 4th Street, the alignment turns to the west onto NW 3rd Street through the intersection of NE/NW 3rd Street and North Miami Avenue. The existing intersection is signalized and would require modifications to accommodate the streetcar maneuvers.

16.2.6 NW 3rd Street (North Miami Avenue to NW 1st Avenue)

The alignment turns onto NW 3rd Street from North Miami Avenue. NE/NW 3rd Street is currently a one-way westbound street. The turning movement is accomplished from the western travel lane on North Miami Avenue to the southern travel lane on NW 3rd Street. This alignment to the southern travel lane was selected because it minimizes impacts on the

intersection with North Miami Avenue. The alignment continues westbound to the intersection with NW 1st Avenue. NW 3rd Street is planned for conversion to two-way traffic in the *Miami Downtown Transportation Master Plan, 2003*, and is part of the planned alignment for the proposed Bay Link project. If this segment is converted to two-way traffic or if the Bay Link project is implemented then the streetcar should operate in the northern outside travel lane going westbound. However, this shift will require a corner clip at the intersection of North Miami Avenue and NW 3rd Street.

16.2.7 NW/SW 1st Avenue (NW 3rd Street to SW 1st Street)

The existing signalized intersection of NW 1st Avenue and NW 3rd Street would require modifications to accommodate the streetcar turning maneuvers. The streetcar would turn from NW 3rd Street in the southernmost lane onto NW 1st Avenue traveling southbound. From NW 3rd Street to approximately 100 ft south of NW 2nd Street, the alignment is located in the western travel lane. However, 200 ft north of NW 1st Street, the alignment shifts to the inner lane to cross NW 1st Street and West Flagler Street. Both NW 1st Street and West Flagler Street are signalized intersections, which would require modifications to accommodate the streetcar. Approximately 250 ft south of West Flagler Street, the alignment turns from SW 1st Avenue onto SW 1st Street.

16.2.8 SW/SE 1st Street (SW 1st Avenue to SE 1st Avenue)

The existing signalized intersection of SW 1st Avenue and SW 1st Street would require modifications to accommodate the streetcar turning maneuvers. The streetcar would turn from the inside lane on SW 1st Avenue to the southern outside lane on SW 1st Street.

The location of the streetcar on the southernmost lane eliminates impacts at the intersection and allows right-side boarding. In addition, as the streetcar travels to the east, the southern alignment minimizes impacts on the existing parking and conflicts with garage entrances where the sight distance is minimal due to the Metromover piers. The alignment crosses the South Miami Avenue intersection, where the existing traffic signal would have to be modified. It then continues east on SE 1st Street in the southernmost lane, reaching the intersection with SE 1st Avenue.

16.2.9 SE/NE 1st Avenue (SE 1st Street to NE 14th Street)

The streetcar would have to turn left from SE 1st Street, in the southernmost lane, and to the north, into the easternmost lane onto SE 1st Avenue. The left turn across traffic is a complex maneuver requiring detailed traffic signal modifications. Once on SE 1st Avenue, the streetcar would cross East Flagler Street, where the street name changes to NE 1st Avenue. In addition, at this location the existing signal would have to be modified. While traveling toward the north, the streetcar would remain in the outside eastern lane, crossing NE 1st Street, NE 2nd Street, NE 3rd Street, NE 5th Street, and NE 6th Street, where each traffic signal would require modifications to accommodate the streetcar.

Approximately 150 ft north of NE 6th Street, the alignment crosses the FEC Railway line. The at-grade, rail-to-rail crossing would utilize concrete embedded track work and would require installation of a remote interlocking signal system to meet Federal Railroad Administration (FRA) requirements. In addition, the existing crossing protection system must be upgraded with a signal and gate system. The FEC Railway track

must also be isolated from stray electrical current produced by the overhead catenary wires for the streetcar.

The alignment continues northward, crossing NE 8th Street, where the traffic signal would require modifications to accommodate the streetcar. At NE 9th Street, a new traffic signal would be needed because the alignment crosses itself, requiring complex track work at this location. Continuing northward, the alignment crosses NE 10th Street and NE 11th Street, where the existing traffic signals would require modifications to accommodate the streetcar. Approximately 150 ft north of NE 11th Street, the alignment passes under I-395, where the clearance height is substandard at 13 ft 9 in. At this location, the entire roadway must be lowered to accommodate the 14 ft minimum clearance requirements for the streetcar. In addition, the ramps and traffic signals must be modified, including the signals on NE 12th Street. The alignment continues northward, crossing NE 13th Street, where the traffic signal would require modifications to accommodate the streetcar, and approaches the intersection with NE 14th Street.

16.2.10 NE 14th Street (NE 1st Avenue to NE 2nd Avenue)

In order for the streetcar to make the right turn from NE 1st Avenue onto NE 14th Street, the curb and the existing traffic signal would have to be modified. The streetcar would operate in an eastbound direction within the outside travel lane. As the alignment approaches the intersection of NE 2nd Avenue, NE 14th Street turns gently to the south, creating the need for complex geometry. In addition, the streetcar would cross itself within the intersection, requiring special track work as well as the interlocking signal modification discussed previously.

16.3 Typical Sections

The streetcar would operate in mixed traffic, utilizing a reinforced concrete track slab, approximately 12 in thick and approximately 8 ft 2 in wide, located at the outside edge of the travel lane. A typical section was prepared for each of the roadways within which the streetcar would operate. These typical sections are shown in the *City of Miami Streetcar Corridor Feasibility Study: Preliminary Alignment Plans, June 2004* (under separate cover).

As shown in the typical sections, the track slab should not exceed a cross slope of 1 percent. This shallow slope contained within an existing 2 to 3 percent cross slope requires substantial milling and resurfacing of the roadway. The need for milling and resurfacing is also increased because some portions of the roadways have parabolic cross sections without specific crown locations.

Utility locations are not shown on the typical sections because they are not fully known at this time. The utilities potentially affected include water, sewer, gas, and telephone. It is assumed that most utility companies would not want parallel facilities under the track slab, and that these facilities would need to be relocated.

16.4 Traffic Controls

Streetcar operations along most of the recommended alignment would occur much like existing bus transit operations; i.e., moving with existing street traffic under standard traffic signal control. Because the streetcar would operate in mixed traffic and priority lanes are not provided where only through movements occur, there is no need for special transit signalization. Transit priority at signals may be provided via signal

pre-emption (using standard systems such as Opticom). This may be used by streetcar operators primarily to maintain schedule or to extend green time through a congested intersection to avoid lane blockage by the back of the vehicle.

At intersections requiring left turns, the streetcar would need to operate under an exclusive transit phase to allow it to turn left from the outside (typically right-hand) lane of the roadway. This maneuver would be necessary at the locations listed below where transit and standard traffic signalization would be required. The transit signal phase would be inactive between streetcar operations, which are expected to occur at 5- to 10-minute intervals on one-way service roadways and at 2.5- to 5-minute intervals on bi-directional service roadways (such as the intersection at NE 2nd Avenue and NE 29th Street). At these locations, a phase would be added to the current traffic signal phasing, adding a slight delay, typically less than 15 seconds, at the intersection for non-transit users for each operation of the streetcar through the intersection. During a peak 60-minute period, this would result in additional traffic



Portland, Oregon - Typical rail transit signal and roadway traffic signal shown together for mixed traffic operations

delays of 90 to 360 seconds per hour. For an average 120 second cycle length, this would add approximately 9 to 12 seconds of delay per cycle.

The following intersections are anticipated to require signal modifications to accommodate streetcar operations:

New Signal (Streetcar Only)

- NE 40th Street and NE 1st Avenue*
- NE 39th Street and NE 1st Avenue*
- Buena Vista Avenue (NE 1st Avenue) and Midtown Miami Plaza
- Midtown Miami Plaza and Midtown Boulevard (NE 1st Place)
- *Midtown Boulevard (NE 1st Place) and NE 34th Street**
- *Midtown Boulevard (NE 1st Place) and NE 32nd Street**
- *Midtown Boulevard (NE 1st Place) and NE 30th Street**

**These locations may operate under standard Manual of Uniform Traffic Control Devices (MUTCD) stop control depending upon future traffic volumes.*

New Signal (Streetcar and Traffic)

- NE 38th Street and NE 2nd Avenue
- NE 40th Street and NE 2nd Avenue
- NE 36th Street and NE 1st Avenue
- NE 29th Street and Midtown Boulevard (NE 1st Place)
- NE 9th Street and NE 1st Avenue
- NE/NW 9th Street and North Miami Avenue

Potential Signal Modifications (Through Movement)

- NE 39th Street and NE 2nd Avenue
- NE 19th Street and NE 2nd Avenue
- NE 17th Street and NE 2nd Avenue

- NE 15th Street and NE 2nd Avenue
- NE 13th Street and NE 2nd Avenue
- NE 12th Street and NE 2nd Avenue
- NE 11th Terrace and NE 2nd Avenue
- NE 11th Street and NE 2nd Avenue
- NE 10th Street and NE 2nd Avenue
- NE/NW 8th Street and North Miami Avenue
- NE/NW 6th Street and North Miami Avenue
- NE/NW 5th Street and North Miami Avenue
- NW 1st Street and NW 1st Avenue
- West Flagler Street and NW/SW 1st Avenue
- SW/SE 1st Street and North Miami Avenue
- East Flagler Street and SE/NE 1st Avenue
- NE 1st Street and NE 1st Avenue
- NE 2nd Street and NE 1st Avenue
- NE 3rd Street and NE 1st Avenue
- NE 5th Street and NE 1st Avenue
- NE 6th Street and NE 1st Avenue
- NE 8th Street and NE 1st Avenue
- NE 10th Street and NE 1st Avenue
- NE 11th Street and NE 1st Avenue
- NE 11th Terrace and NE 1st Avenue
- NE 12th Street and NE 1st Avenue

Signal Modifications Required (Turning Movement)

- NE 29th Street and NE 2nd Avenue
- NE 14th Street and NE 2nd Avenue
- NE/NW 3rd Street and North Miami Avenue
- NW 3rd Street and NW 1st Avenue
- SW 1st Street and SW 1st Avenue
- SE 1st Street and NE 1st Avenue
- NE 14th Street and NE 1st Avenue

16.5 Alignment Impacts

Implementation of the streetcar on the alignment described above would involve impacts on the existing infrastructure. The following are the impacted intersections requiring modification of the curb to accommodate the turning movement of the streetcar (listed in the order of stationing in the Preliminary Alignment Plans):

- NE 1st Avenue and NE 38th Street
- Midtown Boulevard (NE 1st Place) and NE 29th Street (proposed)
- NE 29th Street and NE 2nd Avenue
- NE 2nd Avenue and NE 9th Street
- North Miami Avenue and NW 3rd Street
- NW 3rd Street and NW 1st Avenue (very minor, possibly can be avoided)
- NE 2nd Avenue and NE 14th Street

Parking impacts are also anticipated. It is assumed that approximately two to three on-street parking spaces would be lost to accommodate the station locations for the single-car stations, and approximately five to six parking spaces to accommodate the two-car stations in instances where the Bay Link system would share the station stops.

The addition of streetcar platforms in the road network would result in a potential loss of 80 to 110 on-street parking spaces. However, along NE 2nd Avenue from NE 29th Street to NE 17th Street, a total of approximately 100 to 150 on-street parking spaces are proposed to be added along both sides of the street. Parking now occurs in the outside travel lane of the existing four-lane undivided roadway but is either not metered or not

enforced. The inclusion of on-street parking and intersection bulb-outs would allow the streetcar to function better by increasing pedestrian functionality and providing station locations.

In addition, potential impacts would occur in conjunction with the need to raise the sidewalk to accommodate the boarding platform at locations where stations are adjacent to the sidewalk and no parking spaces are present. Because station locations have some flexibility, they should be shifted to ensure that impacts on the businesses and surrounding buildings are minimized.

Lastly, a significant project impact would be associated with the lowering of NE 1st Avenue under Interstate 395, which would be required to meet the minimum 14 ft clearance under the overpass. Other solutions may be available and should be examined in the preliminary engineering phase of the project.

16.6 NE 2nd Avenue “Road Diet” Feasibility

“Road diet” is a new term used to describe the conversion of existing multilane roadways into facilities that are leaner, more efficient, and friendlier to transit, bicycles, and pedestrians by reducing the number of lanes. The most common road diet involves converting a four-lane undivided roadway to a three-lane roadway having one through lane in each direction and a two-way left-turn lane or a median with turn bays, along with bike lanes or on-street parking. Numerous communities across the country have successfully made four- to three-lane roadway conversions on facilities carrying up to 25,000 vehicles per day.



Miami, Florida - NE 2nd Avenue, south of NE 29th Street looking south



Miami, Florida - NE 2nd Avenue, north of NE 15th Street looking north

16.6.1 NE 2nd Avenue Existing Conditions

Between NE 17th Street and NE 29th Street, NE 2nd Avenue is a four-lane undivided minor arterial measuring 46 ft from curb to curb and a potential candidate for a conversion to three lanes. In this segment, on-street parking is allowed within the outside lanes during off-peak hours, although observations

indicate that the parking is used infrequently in many locations. No exclusive left- or right-turn lanes are provided. According to the *City of Miami Comprehensive Plan, Transportation Element, Data Inventory and Analysis*, November 2003, the current two-way peak-hour volume on this segment is 1,528 vehicles, and the roadway operates at a vehicular level of service (LOS) of “D”. Based on the City’s person trip methodology, however, this segment operates at an overall person trip LOS “B”. City policy allows NE 2nd Avenue to reach 120 percent of vehicular and person trip capacity for LOS “E” due to its location in the urban infill area with the presence of transit service operating with less than 20-minute headways. As such, NE 2nd Avenue is operating acceptably during peak periods today.

The segment of NE 2nd Avenue between NE 14th and 17th Streets has two southbound lanes and one northbound lane, with on-street parking on both sides of the street. With a two-way peak-hour volume of 1,523 vehicles, this segment now operates at LOS “F”, although it operates at LOS “B” based on the person trip methodology. It should be noted, however, that the capacity used to determine the existing vehicular LOS is based on a two-lane undivided roadway, and thus reflects only the operating conditions in the northbound direction. No exclusive turn lanes are provided in this roadway segment.

Between NE 29th Street and NE 14th Street, there are six signalized intersections along NE 2nd Avenue:

- NE 2nd Avenue/NE 29th Street
- NE 2nd Avenue/NE 20th Street
- NE 2nd Avenue/NE 19th Street
- NE 2nd Avenue/NE 17th Street

- NE 2nd Avenue/NE 15th Street
- NE 2nd Avenue/NE 14th Street

The signal at each of these intersections operates as part of a coordinated system, with the exception of the 29th Street intersection, which operates as an isolated intersection. The only intersections that currently have exclusive left-turn phases are NE 20th Street (northbound left turns) and NE 19th Street (southbound left turns). Because of the simple nature of the signal timings, with few exclusive phases for turning traffic, the northbound and southbound directions get a large percentage of the total cycle time, ranging from 55 to 80 percent. Without an exclusive left-turn phase at most of the signalized intersections, however, northbound and southbound vehicles making left turn movements block the inside lane until there is a gap of acceptable size in the opposing traffic stream. This effectively reduces the number of through lanes in each direction to one.

16.6.2 Advantages of NE 2nd Avenue Road Diet

NE 2nd Avenue, between NE 14th Street and NE 29th Street would reap several benefits from conversion to three lanes :

- Reduced speeds—In a three-lane section, the prudent driver sets the speed for following vehicles, and aggressive driving at higher speeds and with multiple lane changes is minimized or eliminated.
- Improved sight distance—Vehicles making left turns from a center turn lane have better visibility than those making the same turn from the left through lane of a four-lane road, where visibility of oncoming traffic can be obscured by vehicles waiting to turn left from the opposite

direction. A three-lane section also improves the sight distance for vehicles turning onto the roadway from side streets or driveways.

- Reduced crash rates—Studies of road diets have shown that crash rates are reduced after conversion to three-lane sections; for example, moving left-turning vehicles out of the through lanes into an exclusive turn lane reduces the frequency of rear-end crashes.
- Improved safety for pedestrians and transit users—Pedestrians and transit users tend to have difficulty crossing four-lane streets, but a three-lane street allows pedestrians to cross one direction of traffic at a time; the center turn lane offers a refuge area, which can be further enhanced by mid-block crosswalks and pedestrian refuge islands. With the potential for increased transit use in the NE 2nd Avenue corridor, improvements to the pedestrian environment are especially critical.
- Improved emergency response time—Emergency vehicles can use the center turn lane to move around traffic in the outside lane without having to negotiate the opposing traffic lanes or opposing traffic flow.
- Vehicular capacity—The capacity of a three-lane roadway during peak hours is similar to that of a four-lane undivided roadway. On a four-lane section, the inside lane is used by left-turning traffic, which reduces the through vehicle capacity to one lane in many locations, such as at intersections.
- Minimal traffic diversion—After conversion to three lanes, most roadways experience little to no diversion of traffic to other routes. Downtown Miami has a grid street network. Therefore, any diverted traffic has several options for traveling

north and south parallel to NE 2nd Avenue, such as on Biscayne Boulevard/US 1 (a principal arterial) or North Miami Avenue (a minor arterial), which are both within 0.25 mile of NE 2nd Avenue.



Portland, Oregon - Bike lane treatment at a Streetcar station

16.6.3 NE 2nd Avenue Issues and Options

To complete a road diet on NE 2nd Avenue, there are several issues and options to consider. These include the proposed cross section of the street, station requirements and potential conflicts, and necessary infrastructure modifications.

Several options are available on the northern portion of the segment between NE 17th Street and NE 29th Street, as follows:

- Option 1—Convert the cross section to three lanes with on-street parking on both sides of the street. This can be accomplished with three 10-ft lanes (including the center two-way left-turn lane) and 8-ft parking lanes.
- Option 2—Convert the cross section to three lanes with bike lanes. This can be accomplished



Portland, Oregon - Cyclist follows bike lane behind station platform



Portland, Oregon - Bike lane treatment at a Streetcar station



Portland, Oregon - Bike lane rejoins roadway beyond the station

with three 12-ft lanes and 5-ft bike lanes. Additionally, by narrowing the vehicle lane widths to 10 ft, the extra space created could be used to provide a 3-ft landscape buffer between the sidewalk and the edge of roadway. It is important to note that the Miami-Dade Metropolitan Planning Organization's (MPO's) *Bike Facilities Plan, 2001*, includes NE 2nd Avenue between NE 87th Street and NE 17th Street as a Priority II on-road bicycle facility within the 2025 Minimum Revenue Plan of the Long Range Bicycle Plan.

- Option 3—A hybrid option between Options 1 and 2 is to convert the cross section to three lanes with bike lanes and with on-street parking on only one side of the street. To fit within the existing 46-ft width, this would require 9.5-ft through lanes, a 10-ft center turn lane, an 8-ft parking lane, a 5-ft bike lane adjacent to the parking lane, and a 4-ft bike lane on the side of the street opposite the parking lane. Providing a minimum 5-ft bike lane is imperative whenever the lane is located adjacent to on-street parking so that bicyclists have adequate space to avoid

getting “doored” by motorists exiting parked vehicles.

These options need to be further evaluated with respect to the dynamic envelope of the selected streetcar vehicle. The dynamic envelope of the Skoda-Inekon Astra is 10 ft 9in. which would preclude reducing travel lane widths to less than this dimension.

The segment of NE 2nd Avenue between NE 17th Street and NE 14th Street, measuring 49 ft from curb to curb, has three lanes (two southbound lanes and one northbound lane, each 11 ft wide) with on-street parking on both sides of the street. Because this segment is already configured as three lanes, the only recommended change to the cross section is to convert the inside southbound lane to a two-way left-turn lane.

The inclusion of on-street parking or bike lanes in the cross section of NE 2nd Avenue would allow for proper streetcar station design as a curb extension to be raised to the appropriate height to allow Americans with Disabilities Act (ADA)-compliant boarding and alighting.

The primary infrastructure modifications required for the above options for the segment between NE 29th Street and NE 17th Street include the following:

- Relocation of curbs, with a narrow landscape buffer on each side of the roadway if Option 2 is selected
- Potential signal modifications, particularly re-alignment of signal heads over the correct lanes and potential signal-timing adjustments

However, if bike lanes are included in the design, there must be adequate provisions for bicyclists to travel past the streetcar station areas. While an on-street parking lane simply ends prior to the streetcar station, a bike lane should be carried through. However, it cannot be carried through between the streetcar track and the curb, as the streetcar track must be located directly adjacent to the curb at the stations. Also, maneuvering the bike lane to the left of the streetcar track at the stations would require the bicyclist to cross the track, increasing the potential for bicyclist accidents.

The City of Portland has addressed this concern regarding bike lanes at the streetcar stations by ramping the bike lane up to the sidewalk level and directing cyclists behind the station platform and shelter. The bike lane then ramps back down to street level once past the streetcar station. Although this configuration avoids a conflict between bikes and the streetcar tracks, it creates another potential conflict between bicyclists and pedestrians between the sidewalk and the station platform.