



**ANSIN BOULEVARD CONNECTION TO
PEMBROKE ROAD AND
TRUCK MANEUVERABILITY STUDY**

Prepared for:



Hallandale Beach

PROGRESS. INNOVATION. OPPORTUNITY

Prepared by:



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On behalf of:

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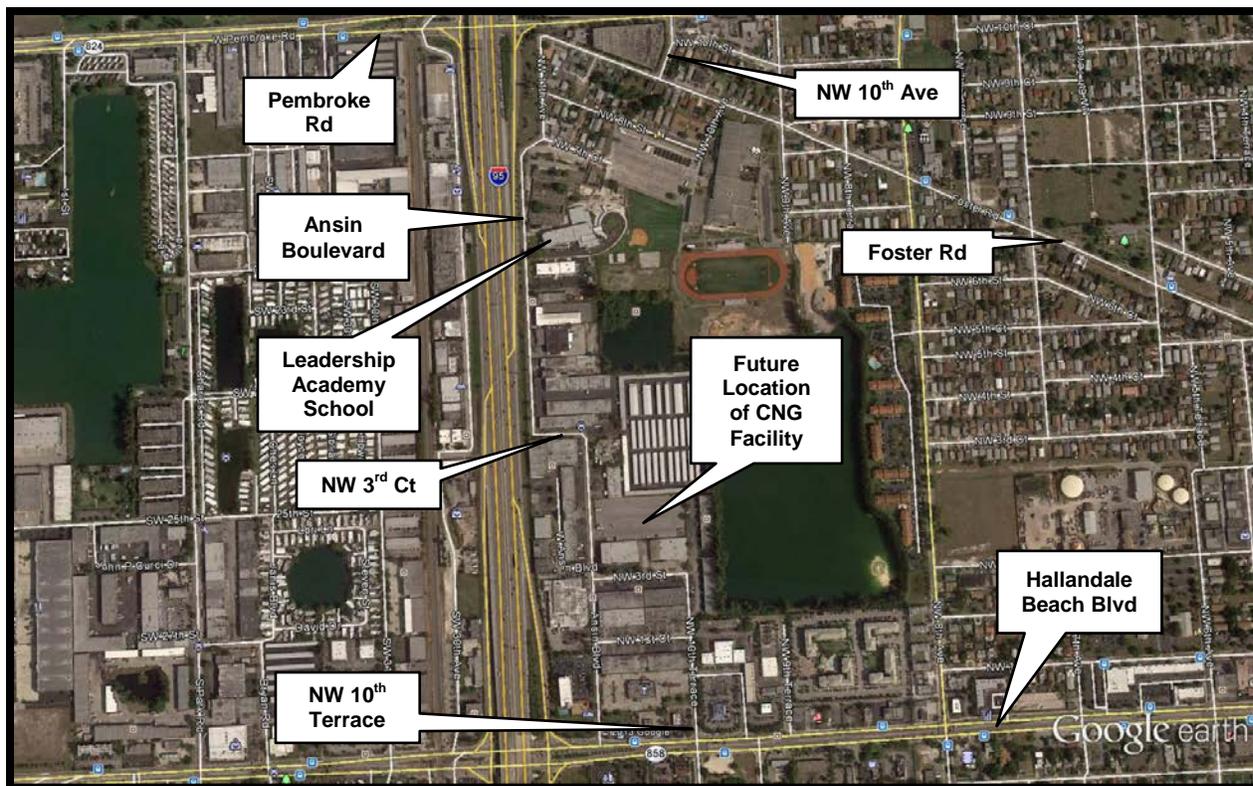


INTRODUCTION

The City of Hallandale Beach is currently performing an assessment/feasibility study for a future Compressed Natural Gas (CNG) facility to be located on the east side of Ansin Boulevard between Hallandale Beach Blvd (SR-858) and Pembroke Rd (SR-824). This facility will serve as a CNG fueling station. As a result, large semitrailers trucks (WB-50) will be traversing the corridor to access this site. The City is consequently performing a maneuverability/feasibility study to determine if the existing geometry of Ansin Boulevard is able to handle this type of vehicle. The study will analyze several alternatives and routes for the future WB-50 vehicles to access the future CNG facility. The swept path analysis for the WB-50 vehicle traversing the existing roadway network and some proposed connections to Pembroke Road will be performed using the latest version of the AutoTurn software. The City's consultant, Hazen and Sawyer, has contracted The Corradino Group on behalf of the City to perform such study.

EXISTING CONDITIONS

Ansin Boulevard is comprised of a two-lane undivided roadway typical section with 11-foot travel lanes. It is a north-south corridor parallel to I-95 with curb and gutter from Hallandale Beach Boulevard to NW 3rd Court, roadside swales from NW 3rd Court to Foster Road. Ansin Boulevard connects to Hallandale Beach Boulevard (SR-858) to the south, but lacks a direct connection to Pembroke Road (SR-824) to the north. At the north end of the corridor, there is a sharp turn into Foster Road which connects with Pembroke Road via NW 10th Court (please refer to Figure 1: Project Location Map shown below). From the Hallandale Beach Boulevard intersection to just south of the existing Leadership Academy School an existing drainage system is in place. The rest of the corridor north to Foster Road handles the runoff via swales.



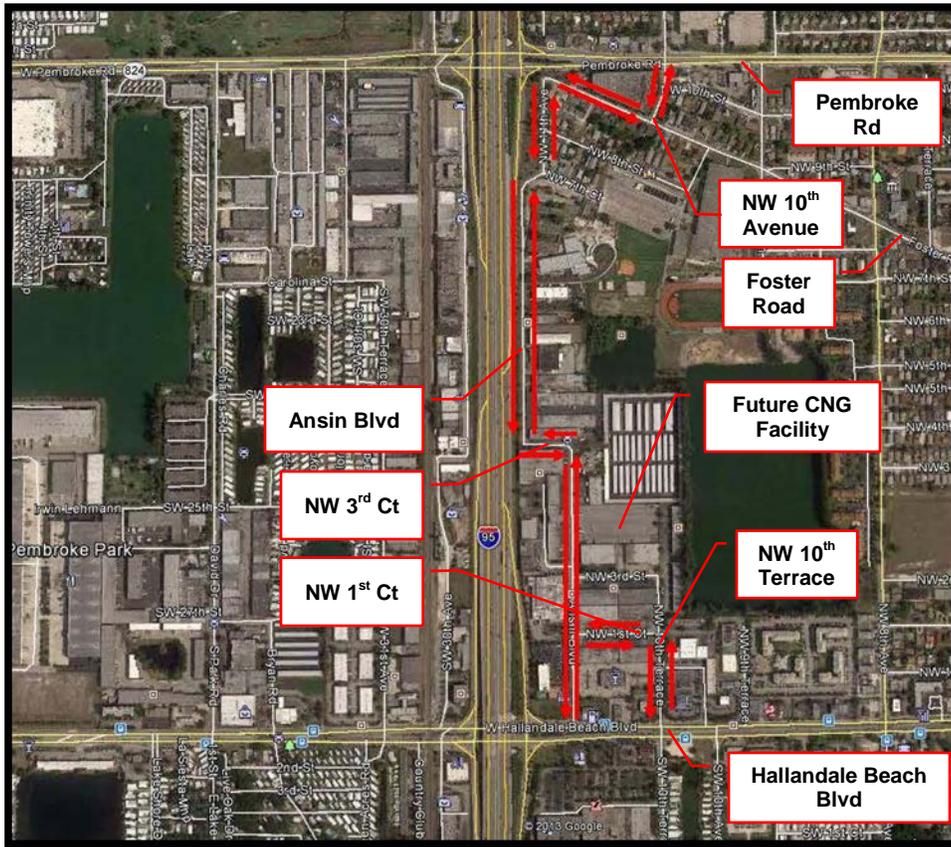
**FIGURE 1
PROJECT LOCATION MAP**

The land use throughout the corridor is mixed. South of the Leadership Academy School, the land use is commercial / industrial. North of the Leadership Academy School, the land use is residential. The proposed CNG facility will be located within the commercial / industrial area.

ALTERNATIVE ANALYSIS

Two possible routes for accessing and exiting the future CNG facility were used to analyze alternatives 1 through 4. For alternative 1 through 3, route one was used and for alternative 4, route 2 was used. These possible routes are as follows:

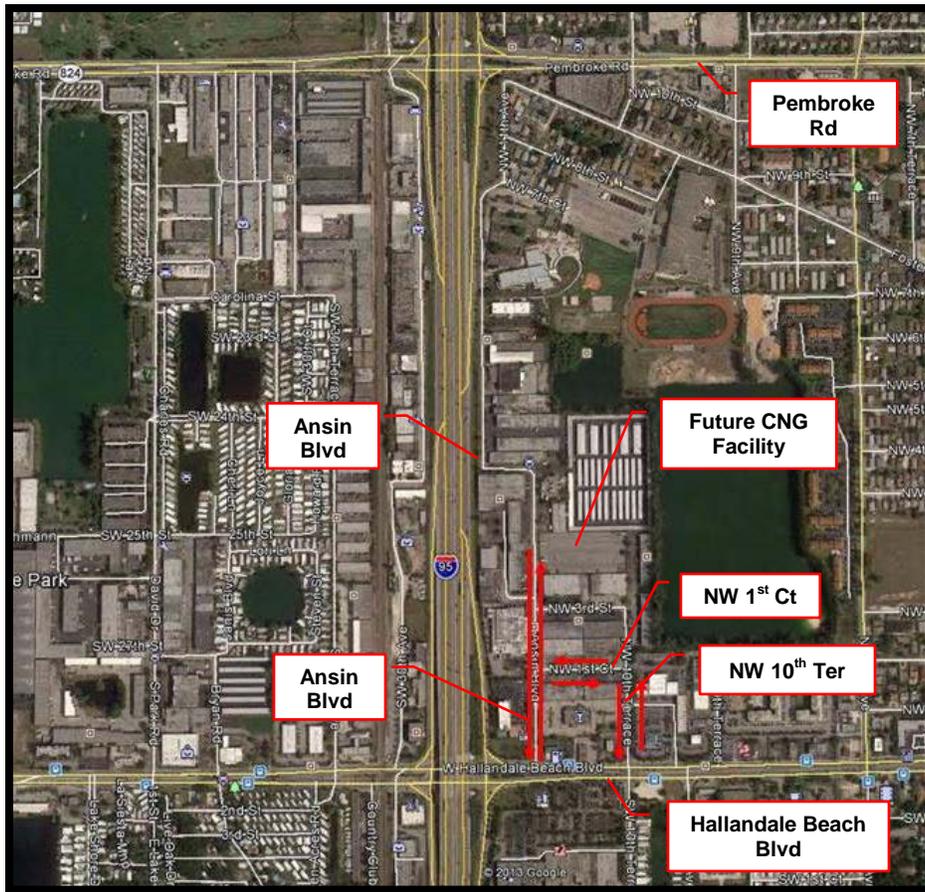
- The first route is to access the future CNG facility from the south by heading north on NW 10th Terrace at the intersection with Hallandale Beach Boulevard and using the existing street network to connect to Ansin Boulevard for access to the future CNG facility. Once the WB-50 vehicle leaves the future CNG facility it will then traverse northbound along Ansin Boulevard and use either a new connection directly to Pembroke Road or the existing street network to access Pembroke Road at the existing signalized intersection with NW 10th Avenue.



**FIGURE 2
POSSIBLE ACCESS ROUTE 1**

- The second possible route for the WB-50 vehicle is to use the same access route previously presented. However, once the vehicles exit the facility, instead of going northbound, they will travel southbound along Ansin Boulevard. Once on Ansin Boulevard, vehicles will have two choices: for westbound vehicles, they can continue south along Ansin Boulevard towards the intersection with Hallandale Beach Boulevard and once there, they could access I-95 if they want to head North or South. For vehicles that wish to head eastbound, they will head south on Ansin Boulevard and use the existing street network to access the signalized intersection at Hallandale Beach Boulevard and NW 10th Terrace.

A detailed analysis for each alternative is presented as follows.



**FIGURE 3
POSSIBLE ACCESS ROUTE 2**

Alternative 1: No Build. Leave Existing Corridor As Is

The existing roads connecting to Ansin Boulevard as well as the future CNG facility itself were analyzed using AutoTurn software to determine the maneuverability of a WB-50 vehicle within the existing roadway network. Refer to Figure 2 for route analyzed

Figures 4 thru 8 clearly demonstrate that a WB-50 vehicle is barely able to make the required turning maneuvers and in many locations the vehicle is forced to mount the existing curbs and sidewalks to complete the turning maneuver. Regardless of the location, the WB-50 vehicle needs to cross into the opposite lane to be able to make the turns. This creates operational problems and possible safety concerns since there is the possibility of head-on collisions with oncoming vehicles.



Ansin Boulevard Connection To Pembroke Road And Truck Maneuverability Study

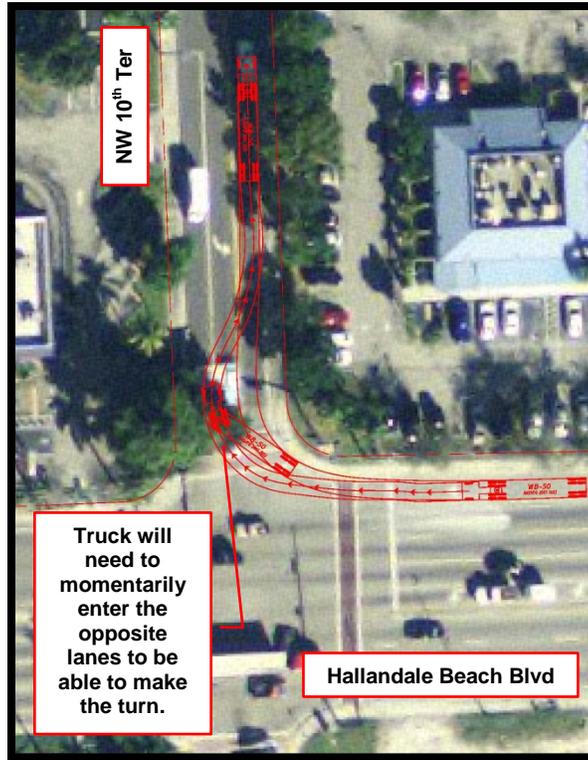


FIGURE 4



FIGURE 5



Ansín Boulevard Connection To Pembroke Road And Truck Maneuverability Study



FIGURE 6

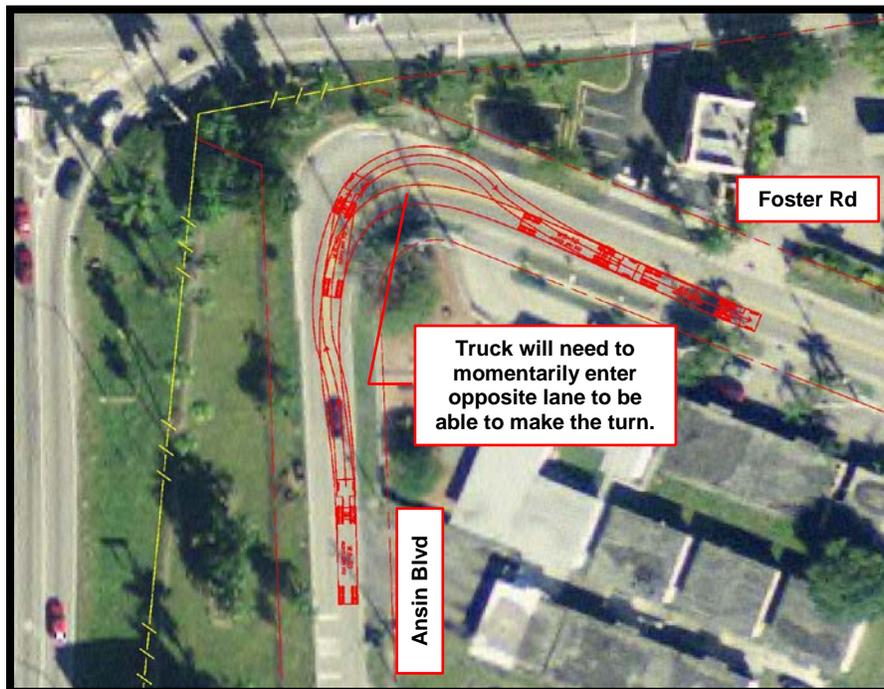


FIGURE 7



Ansin Boulevard Connection To Pembroke Road And Truck Maneuverability Study

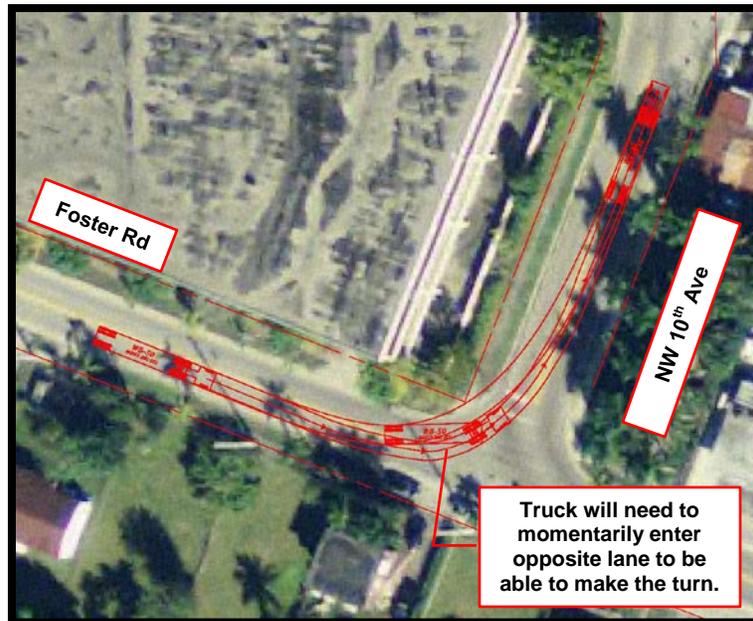


FIGURE 8

Alternative 2: Improve Existing Turning Radii on Existing Roadway Network to Accommodate WB-50 vehicles.

From the Autoturn animations shown on *Figures 4 to 8*, it is evident that the existing intersections along the corridor are not designed for this type of vehicle. Therefore, this alternative analysis identifies the magnitude of curb return radii improvements and right-of-way impacts necessary to properly accommodate these types of vehicles while traversing the route analyzed in *Alternative 1* and shown on *Figure 2*.

The existing R/W information was obtained from FDOT and was drawn over an aerial picture to assess the existing conditions and to determine the future impacts. It is worth noting that these lines are only an approximation and by no means are intended to substitute for an official survey. The R/W lines shown for the local roads and many portions of Ansin Blvd were assumed and estimated to be 50' in width.

The 2011 Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways (commonly known as the Florida Greenbook) as well as the Geometric Design of Highway and Streets, 5th Edition, (commonly known as the 2004 AASHTO standards (2011 AASHTO (latest edition) does not provide criteria for a WB-50 truck)), were utilized to determine the design criteria for a road that would be handling these vehicles. The design criteria shown on pages 583 to 601 of the AASHTO standards were used to make the proposed geometric changes to the existing roads. These design criteria were also used for alternatives 3 and 4. The proposed design criteria were also corroborated with the Autoturn software animations.



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Figures 9 to 14 show all the different intersections that need to be improved to make this corridor adequate for a WB-50 vehicle. Impacts to the existing properties are shown in each figure. The Autoturn software animation is also being displayed in these figures.

In general all intersections will require R/W acquisition to allow for the necessary improvements. Each intersection also requires harmonization inside each affected property. The implementation of the necessary geometric improvements will also require utility relocations, drainage improvements and in the case of the intersection at NW 10th Terrace and Hallandale Beach Boulevard, major signalization improvements to the north leg of the intersection.

While the proposed improvements greatly improve the right turn movements at each intersection, there is still some minor encroachment into the opposite lanes at all intersections except for the intersections of NW 10th Terrace and Hallandale Beach Boulevard and Ansin Boulevard and NW 1st Court. However, the left turning movements at all the intersections still encroach into the opposite lane of traffic.

Some intersections present certain constraints that should be worth mentioning. The first is the intersection of NW 10th Terrace and NW 1st Court (see *Figure 10*). There is an existing building at the southwest corner of the intersection that is only a few feet away from the west edge of pavement of NW 10th Terrace. With the proposed improvements at this corner of the intersection, this offset to the building becomes smaller and the building seems to be right on the back of the proposed curb and gutter. This represents a problem since this is a permanent structure which does not meet the minimum horizontal clearance or setback from the edge of the road. This issue, could be improved if the existing road is realigned towards the east but due to lack of R/W information this realignment was not able to be investigated further.

A similar situation occurs at Ansin Boulevard and NW 3rd Court. At this location, there are two existing buildings located on the north and south side of the road which create a geometric constraint. The worst case scenario occurs at the easternmost curve located within this portion of Ansin Boulevard (see *Figure 12*). Due to the proximity of the building to the Ansin Boulevard corridor at this location, there is no way to improve the geometry without removing the existing building. Furthermore, it is worth noting that the two existing 90 degree turns within this portion of the study segment, are located only 135 feet apart. This makes turning maneuvers extremely cumbersome for a WB-50.



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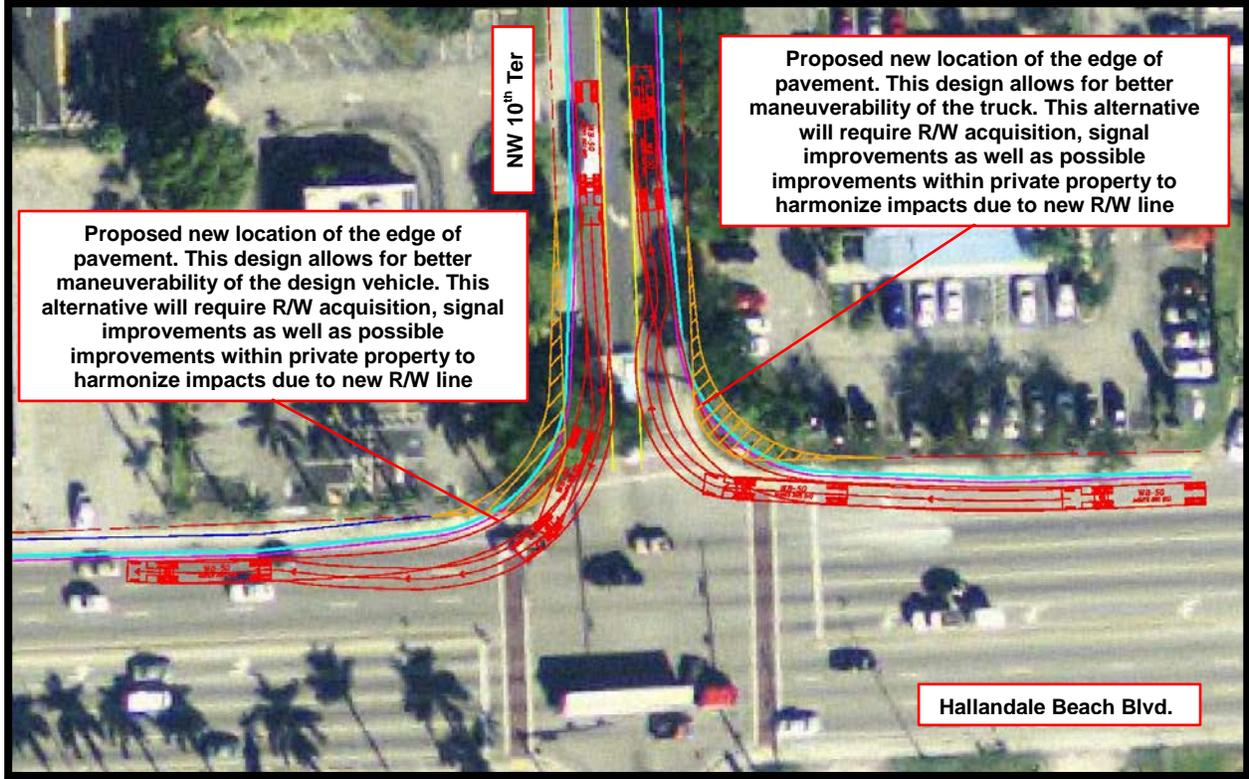


FIGURE 9

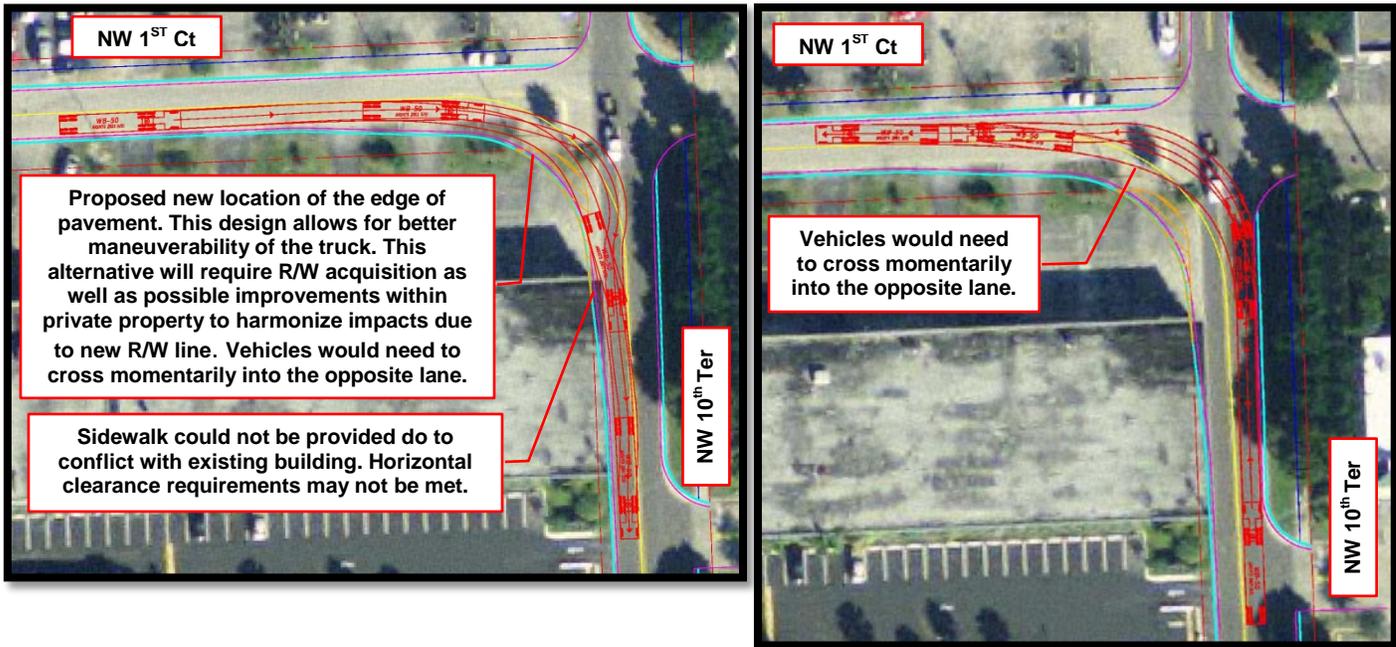


FIGURE 10

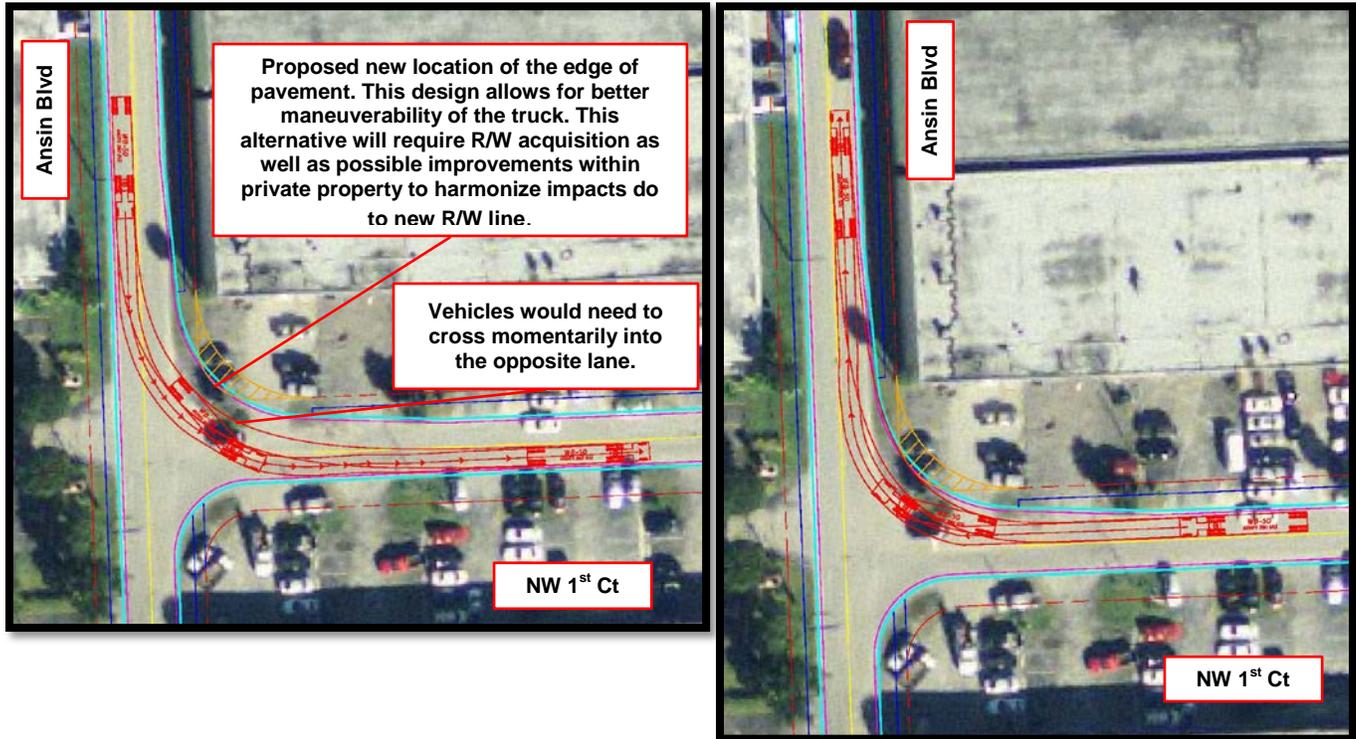


FIGURE 11

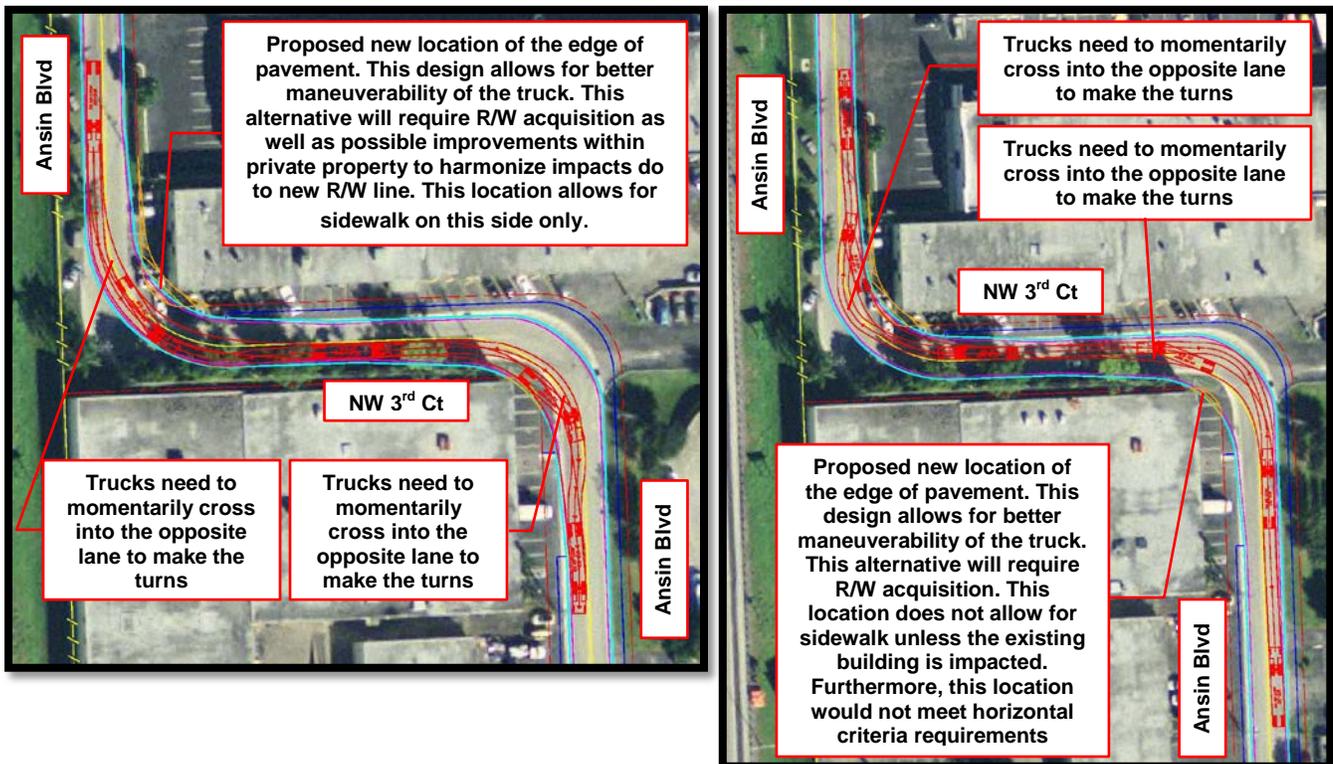


FIGURE 12

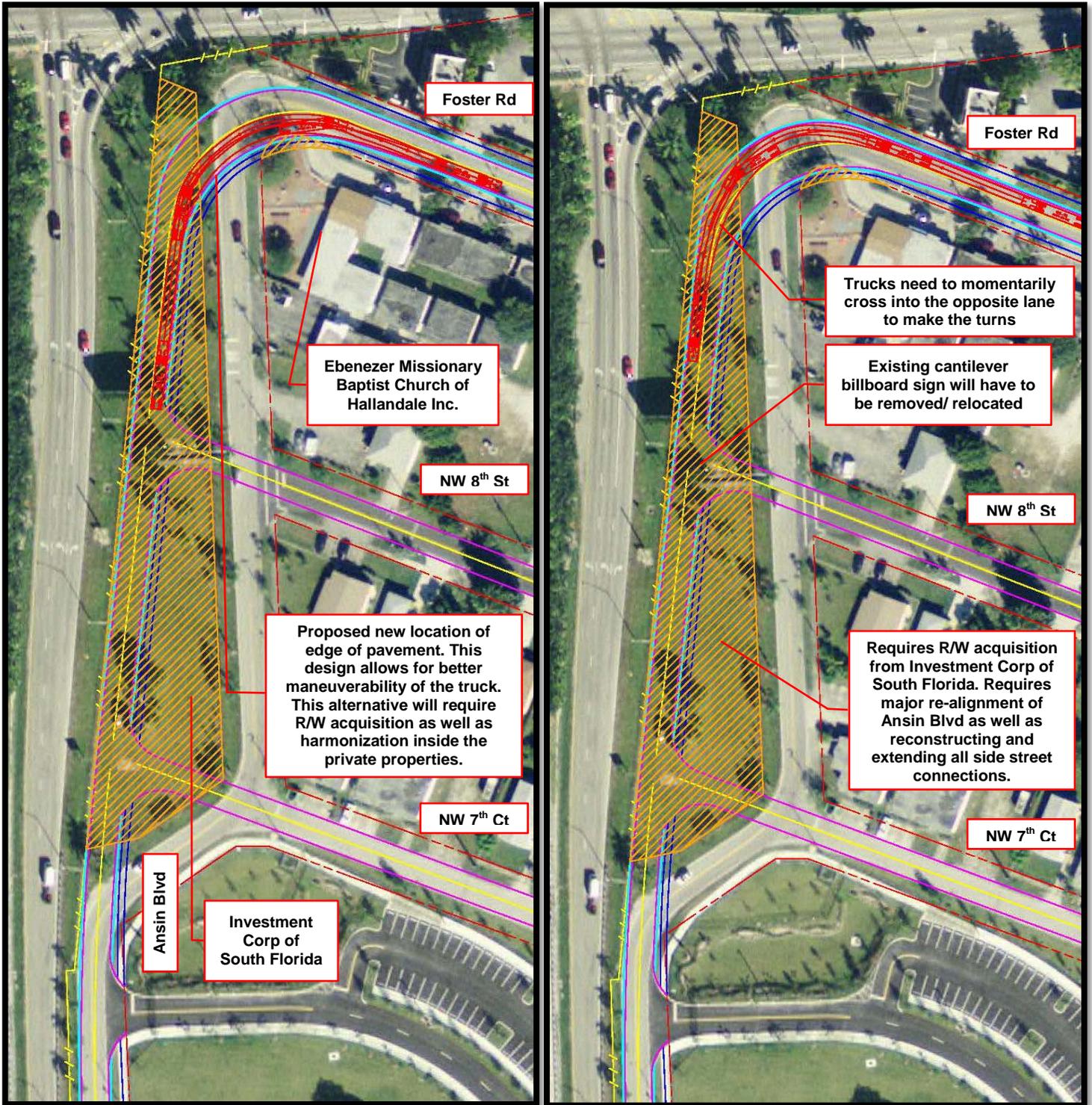


FIGURE 13

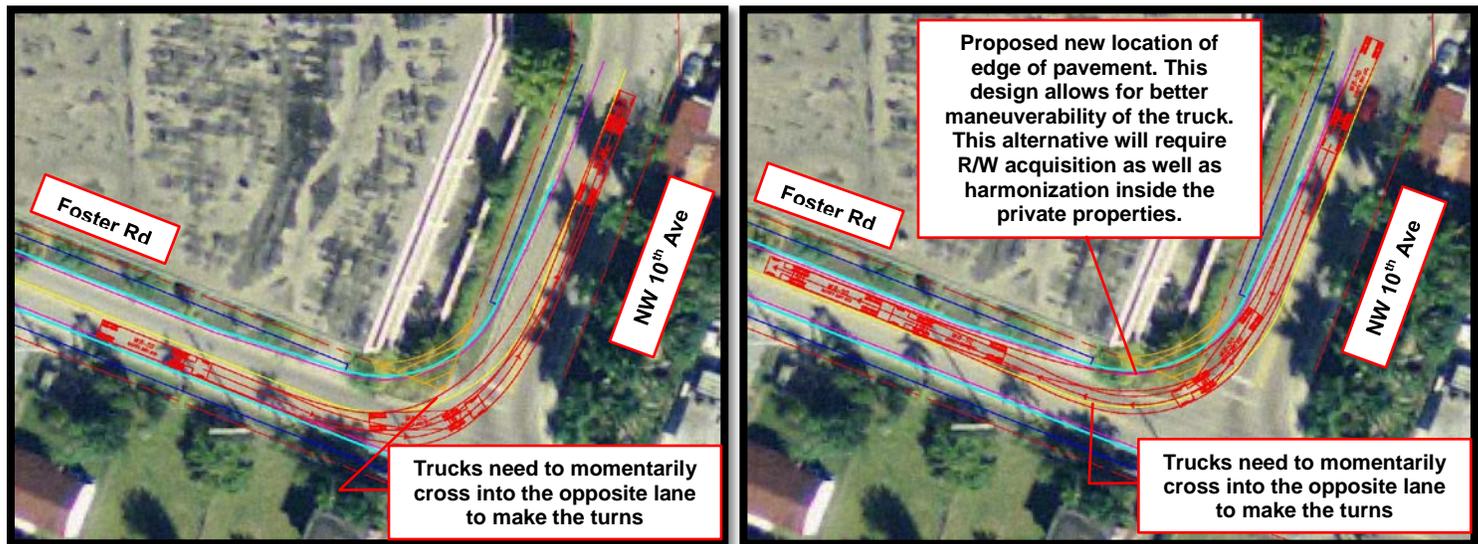


FIGURE 14

As shown in *Figure 13*, instead of using the existing alignment for Ansin Boulevard, a new alignment was proposed to improve the turning maneuver of the WB-50 into Foster Road. Although this alternative shows large areas of R/W acquisition, the area that is mostly impacted belongs to a firm called: “Investment Corp of South Florida”. This private firm is solely using this parcel for outdoor advertisement. If this realignment does not take place, the existing turning radius would have to be increased for vehicles to be able to make a turn into Foster Road. This in turn would create more impact for the private property located at the south-east corner of this intersection which is currently being used as a school by the “Ebenezer Missionary Baptist Church of Hallandale Inc.”. The location of this property is also shown on *Figure 13*.

Alternative 3: Assess feasibility of a direct connection between Ansin Boulevard and Pembroke Road.

For this alternative, access route one as shown in *Figure 2* was used for the analysis. The analysis concentrates on the north portion of this route since the primary focus of this alternative is to determine the impacts of a direct connection between Ansin Boulevard and Pembroke Road. The impacts for all roads and intersections south of the Leadership Academy School are summarized in the analysis of *Alternative 2*.

Prior to establishing a connection point, the FDOT access management requirements were examined to determine the allowable connection spacing to an FDOT facility. For that, the 2013 FDOT Plans Preparation Manual was consulted and under Chapter 1, section 1.8 and table 1.8.2 the criteria was obtained and it is presented under *Appendix A*. To determine the correct classification for this facility the FDOT GIS Maps and Data was checked and it was determined that Pembroke Road is classified as an access class 6. Pembroke Road along this segment has a design speed of 45 mph which signifies that a connection spacing can only occur every 245 feet.



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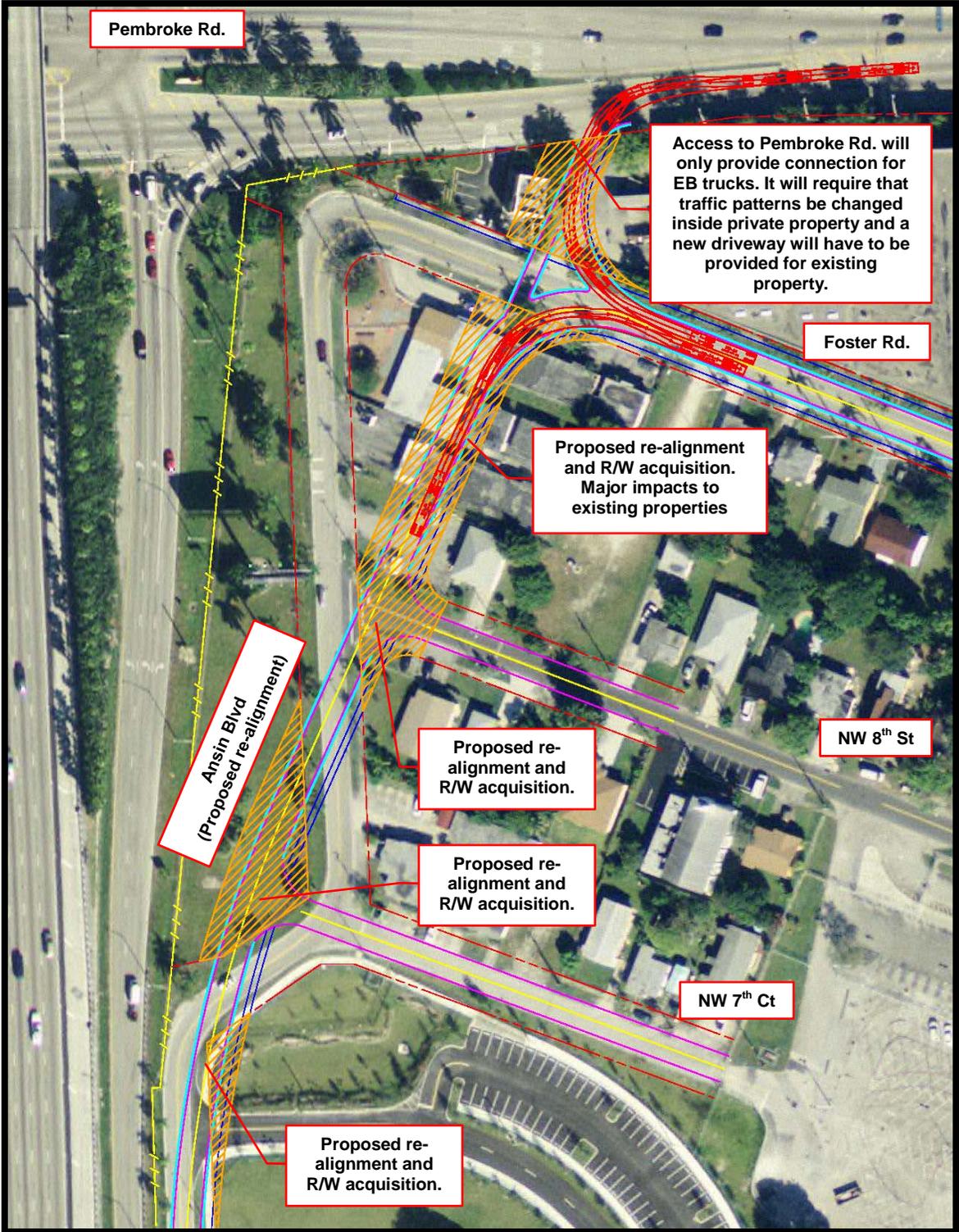


FIGURE 15

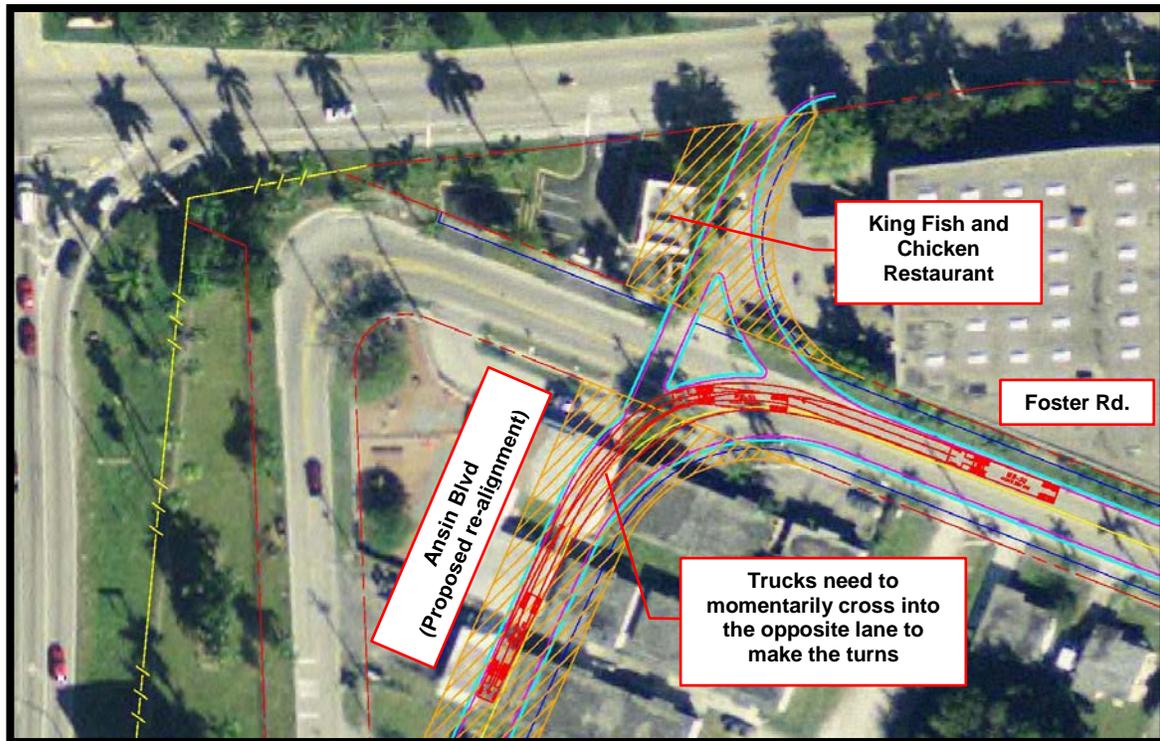


FIGURE 16

The 245 feet measured from the end of the PC (Point of Curvature) of the Northbound I-95 off-ramp provides a location that is just east of the existing King Fish and Chicken restaurant and mostly within the driveway of the unidentified building to the east of the restaurant (see *Figure 16*).

This new point of connection creates major impacts to the property owners around this area. For many, these impacts constitute full acquisition of their respective properties. The existing roadway network will also be impacted as it requires the reconstruction of Ansin Boulevard within this segment as well as every point of connection due to the proposed new alignment. These impacts are presented in detail in *Figures 15* and *16*.

Alternative 4: Maintain Truck Traffic South of the CNG Facility

After the preliminary investigation of the existing roadway network and once the initial swept path analysis using the AutoTurn software were completed, the difficulties in maneuvering a WB-50 vehicle within the Ansin Boulevard corridor became very apparent. Many of these difficulties and impacts are observed in the previously presented alternatives. Hence, a meeting with City of Hallandale Beach representatives was requested to present and further evaluate these matters and to determine if a possible fourth alternative was possible. This meeting took place on January 3rd, 2014 (meeting minutes are included in *Appendix B*).



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As a result of this meeting, it was agreed that this study would also analyze a route that keeps all WB-50 traffic accessing and exiting the proposed CNG site south of the proposed CNG facility. This route keeps the WB-50 vehicles out of much of the tight geometry that would be encountered north of the proposed CNG facility and eliminates the cost and the impacts of realigning Ansin Boulevard south of the connection with Foster Road.

The results of analyzing this newly proposed route are presented below and are also depicted in the figures being cited:

- Vehicles accessing the proposed CNG facility will use the NW 10th Terrace and Hallandale Beach intersection (see *Figure 9*). This intersection will also serve as the point where vehicles exiting the proposed CNG facility will gain access to Hallandale Beach Boulevard in order to travel east or west and can also access I-95 to head north or south.
- Vehicles wishing to access the proposed CNG facility will then head north on NW 10th Terrace and navigate the intersections of NW 10th Terrace and NW 1st Court (*Figure 10*) and NW 1st Court and Ansin Boulevard (*Figure 11*).
- Once on Ansin Boulevard they will head north to access the proposed CNG facility and will head back south on Ansin Blvd to travel to their desired destination (see *Figure 17*).



FIGURE 17



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- After they have exited the facility, vehicles have two choices: they can head back towards NW 10th Terrace or proceed south towards the intersection of Ansin Boulevard and Hallandale Beach Boulevard. Vehicles wishing to proceed to all directions including east, can use the signalized intersection at NW 10th Terrace and Hallandale Beach Boulevard. However, vehicles approaching the intersection of Hallandale Beach Boulevard and Ansin Boulevard can head in all directions except east (see *Figures 9 and 18*). This is due to the fact that the intersection of Ansin Boulevard and Hallandale Beach Boulevard is a restricted intersection where the only movements allowed are a right turn onto Ansin Boulevard and right turn out onto Hallandale Beach Boulevard.

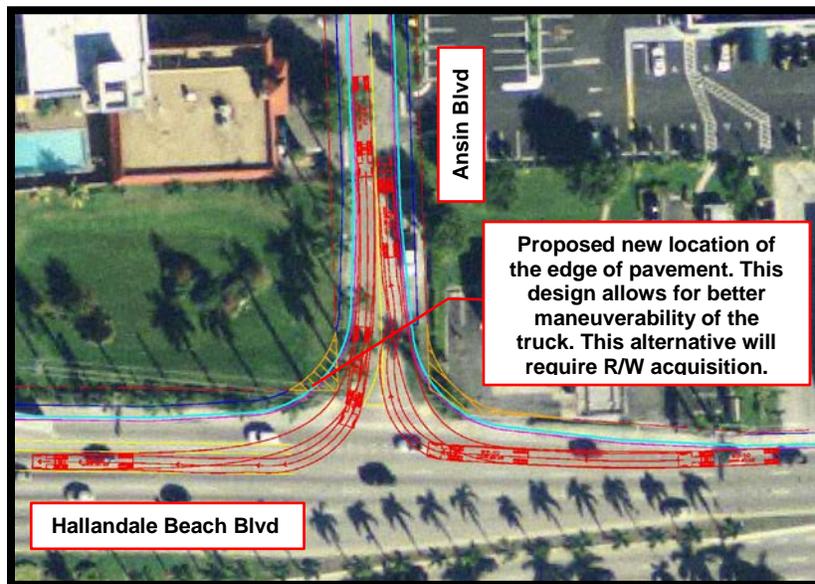


FIGURE 18

CONCLUSIONS

Based on the analysis, it is recommended to proceed with Alternative 4 as it is the alternative with the least amount of impacts to the existing condition. In addition to having the least amount of geometric and right-of-way impacts, this alternative restricts the large WB-50 vehicles from traversing through the largely residential area that exists north of the proposed CNG facility site. Even though this alternative creates the least amount of impacts there are still significant measures that need to be taken to make this a viable route for the WB-50 vehicles that will access the future CNG facility. These measures include right-of-way acquisition, traffic signal improvements, and realigning NW 10th Terrace to be able to provide an adequate corridor for the proposed semi-trailer trucks (WB-50). Close coordination with FDOT should take place due to the traffic impacts to Hallandale Beach Blvd. In addition, coordination with property owners through public meetings, as well as coordination with existing utility owners should take place to determine the complete impacts and the public opinion of these improvements.

Appendix A

FLORIDA DOT ACCESS MANAGEMENT GUIDELINES RULE 14-97

Table 1.8.1 Freeway Interchange Spacing

Access Class	Area Type	Segment Location	Interchange Spacing (miles)
1	Area Type 1	CBD & CBD Fringe For Cities In Urbanized Areas	1.0
	Area Type 2	Existing Urbanized Areas Other Than Area Type 1	2.0
	Area Type 3	Transitioning Urbanized Areas And Urban Areas Other Than Area Type 1 or 2	3.0
	Area Type 4	Rural Areas	6.0

Table 1.8.2 Arterial Access Management Classifications & Standards

Access Class	Medians "Restrictive" physically prevent vehicle crossing. "Non-Restrictive" allow turns across at any point.	Connection Spacing (feet)		Median Opening Spacing (feet)		Signal Spacing (feet)
		>45 mph	≤45 mph	Directional	Full	
2	Restrictive with Service Roads	1320	660	1320	2640	2640
3	Restrictive	660	440	1320	2640	2640
4	Non-Restrictive	660	440			2640
5	Restrictive	440	245	660	*2640/ 1320	*2640/1320
6	Non-Restrictive	440	245			1320
7	Both Median Types	125		330	660	1320

* 2640 feet for >45 mph; 1320 feet for ≤45 mph

Appendix B

Meeting Minutes

Reference: Meeting for Ansin Blvd Connection to Pembroke Road and Truck Maneuverability Study

Meeting Date: January 3, 2014 @ 9:30 AM

Location: City of Hallandale Beach, Public Works Bldg.

Attendees:

Mr. Steven F. Parkinson	City of Hallandale Beach	(954) 457-1611
Mr. John Chidsey	City of Hallandale Beach	(954) 457-3045
Ms. Janeen M. Wietgreffe	Hanzen & Sawyer	(954) 987-0066
Mr. Juan Carlos Alcantara	The Corradino Group, Inc.	(305) 594-0735
Mr. Carlos Verson	The Corradino Group, Inc.	(305) 594-0735

-
- ❑ The meeting started with everybody introducing themselves and exchanging business cards.
 - ❑ Mr. Carlos Verson proceeded to show the preliminary research performed in regards to the existing R/W information along Ansin Blvd and the FDOT access classification for Pembroke Rd. Furthermore, he showed the preliminary sketches of 2 alternatives for the connection to Pembroke Rd. one showing a connection at 245' to the east of the I-95 off ramp and another one to improve the turn from Ansin Blvd into Foster Rd and then gaining access to NW 10th Terrace which connects to Pembroke Rd. Based on the sketches and the amount of R/W impacts that were determined to occur if a direct connection to Pembroke Rd would take place, it was decided by Mr. Parkinson that a better alternative was to re-align/ improve Ansin Blvd and the sharp turn into Foster Rd. This way the design vehicles would be able to maneuver better and gain access to NW 10th Ave which is a signalized intersection. Utilization of the existing signalized intersection of Pembroke Road and NW 10th Avenue allows the future traffic eastbound and westbound access on Pembroke Road.
 - ❑ Mr. Parkinson also suggested the idea of using the R/W currently owned by the county between the FDOT R/W and the city's R/W at the NB Exit Ramp from I-95 into Pembroke Rd. This property is currently being used by an advertising company with an overhead billboard and the rest is covered with sod. If this property could be acquired by the City, there would be less impacts to existing properties and will allow for a more appropriate design for semi-trailer trucks. Mr. Verson and Mr. Alcantara agreed to look further into this alternative.

- Mr. Alcantara then continued to discuss the issue of the closely spaced 90 degree curves that occur along Ansin Blvd just north of the proposed CNG facility. Mr. Alcantara and Mr. Verson explained that the existing road would not be able to accommodate the turning maneuver of a semi-trailer truck (WB-50) and that improving the road will adversely impact the parking and possibly the buildings for the adjacent properties.
- Mr. Parkinson and Mr. Chidsey agreed and also raised the concern that there is a future project by the city to try to provide sidewalk along this corridor. They also stated that if the improvements to the road are performed and the sidewalks are added, the impacts to these properties will be significantly increased.
- At that point Mr. Chidsey suggested a different alternative. This alternative was to use Hallandale Beach Blvd and NW 10th Terrace intersection for the design vehicles to travel north up to the future CNG facility. The vehicles could turn inside the facility and travel south along Ansin Blvd to gain access to Hallandale Beach Blvd if the vehicles want to travel West. If vehicles want to travel East after fueling, they could head south from the future facility to the signalized intersection at NW 10th Terrace. This option eliminates any geometric improvements along north of the proposed CNG Facility and also keeps the WB-50's out of the primarily residential area that exists north of the proposed CNG Facility. Mr. Alcantara and Mr. Verson agreed to look into the possibility of using this route and will research/ investigate the feasibility and the possible impacts of this route.
- Mr. Chidsey then invited Ms. Wietgreffe, Mr. Alcantara, and Mr. Verson to the field and to travel the above mentioned roads to better understand the field conditions.
- All present were in agreement and the meeting was adjourned.

By: Carlos Verson, P.E.
Project Engineer

Copies: Attendees, File