



**SOUTH FLORIDA EAST COAST (FEC)
ALTERNATIVES ANALYSIS**

F.M. NO. 417031-1-22-01

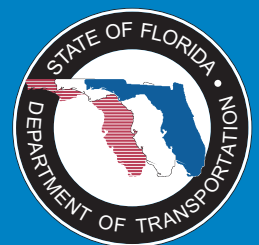
CONTRACT: C-8F66

***FEC - SFRC Connections
Tech Memo***

Prepared by:



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September 2008

To: Scott Seeburger

From: Earle M. Hughes

Date: September 22, 2008

Subject: South Florida East Coast Corridor (SFECC) Transit Analysis Study:
SFRC - FEC Connections Technical Memorandum

This memorandum describes possible connections between the South Florida Rail Corridor (SFRC) and the Florida East Coast Railroad (FEC) throughout the length of the SFECC study area. These connections would allow Tri-Rail and Amtrak passenger services, which currently use the SFRC, to operate in the future over the FEC and possibly, for future FEC passenger services to establish connections with destinations on the SFRC. Such connections would enable additional service options, increase service and operational flexibility, and enhance the overall transportation network.

INTRODUCTION

The SFECC study area is more than 80 miles long running from Jupiter in Palm Beach County through Broward County to its southern terminus in Downtown Miami in



SFECC Area

Miami-Dade County. The larger SFECC study area is centered on the alignment of the FEC and generally runs parallel to the SFRC, US Route 1 and Dixie Highway and Interstate 95.

BACKGROUND

The analysis documented here builds upon work that was started in an earlier project phase which considered a number of north end alignment options in order to create connections between the SFRC and FEC. That work confined itself largely to rough assessments as to the feasibility of inserting rail alignments into the existing development patterns in these areas using aerial images and was performed without the benefit of engineering analysis. While the level of engineering performed in preparation of this Technical Memorandum does not constitute conceptual engineering, some engineering challenges have been examined in order to more fully understand the relative advantages and disadvantages of the different connection options.

The Phase I analysis explored six main options, most with sub-options, which resulted in a total of 12 variations. Three options were recommended for further study:

- C-17 (Earman River) Canal option;
- Lewis Terminals Connector Option - Florida Power & Light (FP&L) Right-of-Way; and,
- Waterworks Connection, in West Palm Beach.

After a more detailed level of scrutiny, the above options were supplemented with additional options, which were considered to require further study. In addition, for the purposes of this corridor-length analysis, two connectors which lie further south have also been included. Ultimately, an examination throughout the SFECC study area has uncovered ten potentially practical options for connections between the SFRC and the FEC. These are listed geographically, from northernmost to southernmost:

North Section – North End Connections between the SFRC north of the existing Mangonia Park Station and the FEC in the vicinity of Riviera Beach:

1. C-17 (Earman River) Canal
2. Lewis Terminals Connector- Florida Power & Light (FP&L) Right-of-Way

North and Middle Sections – Connections between the SFRC and the FEC in the City of West Palm Beach, both north of, and in, downtown West Palm Beach:

3. St. Mary's Hospital Connection
4. Current Northwood alignment
5. Modified Northwood alignment
6. Waterworks
7. Evernia
8. Okeechobee

Middle and South Sections – Connections between the SFRC and the FEC in the vicinity of Pompano Beach:

9. Pompano

South Section- Connections between the SFRC and the FEC in the vicinity of north Miami:

10. North Miami/Little River connector.

Each of these options is described in subsequent pages.

Some mention should be made of the circumstances under which some formerly rejected options were reconsidered. This would apply to Option 4, the existing Northwood connector and Option 8, Okeechobee. Northwood resurfaced as an option because when a more detailed study was made of the area, two misconceptions in the earlier work were uncovered. The first was that a lot adjacent to Evergreen Cemetery, assumed to be a park, is a vacant lot. The second was that land adjacent to and west of the Storm of 1928 Historical Cemetery was determined to be unconnected to that use and thus could be used for a connector. Lastly, Okeechobee reemerged as a potential route through West Palm Beach assuming it could be grade separated.

OPTIONS

The options are presented in the order identified above. Each option has been described with respect to the following characteristics:

- Operational considerations, including how transit vehicles would physically negotiate the alignment,
- Passenger service considerations, include station and passenger accessibility issues,
- Engineering considerations, including issues related to the construction and maintenance of transit facilities,
- Physical considerations, including issues related to the physical characteristics of the proposed alignments,
- Feasibility, including how “buildable” the option is,
- Cost Considerations and Effectiveness, including how relatively expensive the option might prove to be to construct or operate versus any extraordinarily positive effects,
- Suitability, including the ability of the option to fulfill its purpose, and
- Additional considerations, which are not addressed in the categories above.

All options include one or more 500 foot curve. These are “tight” curves, forcing transit vehicles to slow to approximately 15 miles-per-hour. This has a lesser effect on options where a station stop is positioned in nearby proximity to such a speed restriction. The use of relatively small radius curves of approximately 500 ft radius to accommodate right-of-way limitations may require installation of rail lubricators and/or restraining rails, both of which increase capital and maintenance costs.

Another note is that new sections for all of the options presented have been conceptually designed to passenger-operational standards, except for Northwood which must carry freight, and are assumed to accommodate only passenger vehicles. That having been stated, freight and passenger operational separation has not yet been established for the project and, at present, it is assumed that both the SFRC and FEC will be required to accommodate continued and projected future levels of freight traffic.

Lastly, it is assumed that for all options, including those currently in active use, there will be a need, at a minimum, for right-of-way system renewal.

1. C-17 (Earman River) Canal

Description:

The Earman River Canal (C-17) is in the northeastern part of Palm Beach County and runs through Riviera Beach from Clear Lake in West Palm Beach to a point near US-1 in Palm Beach Gardens.



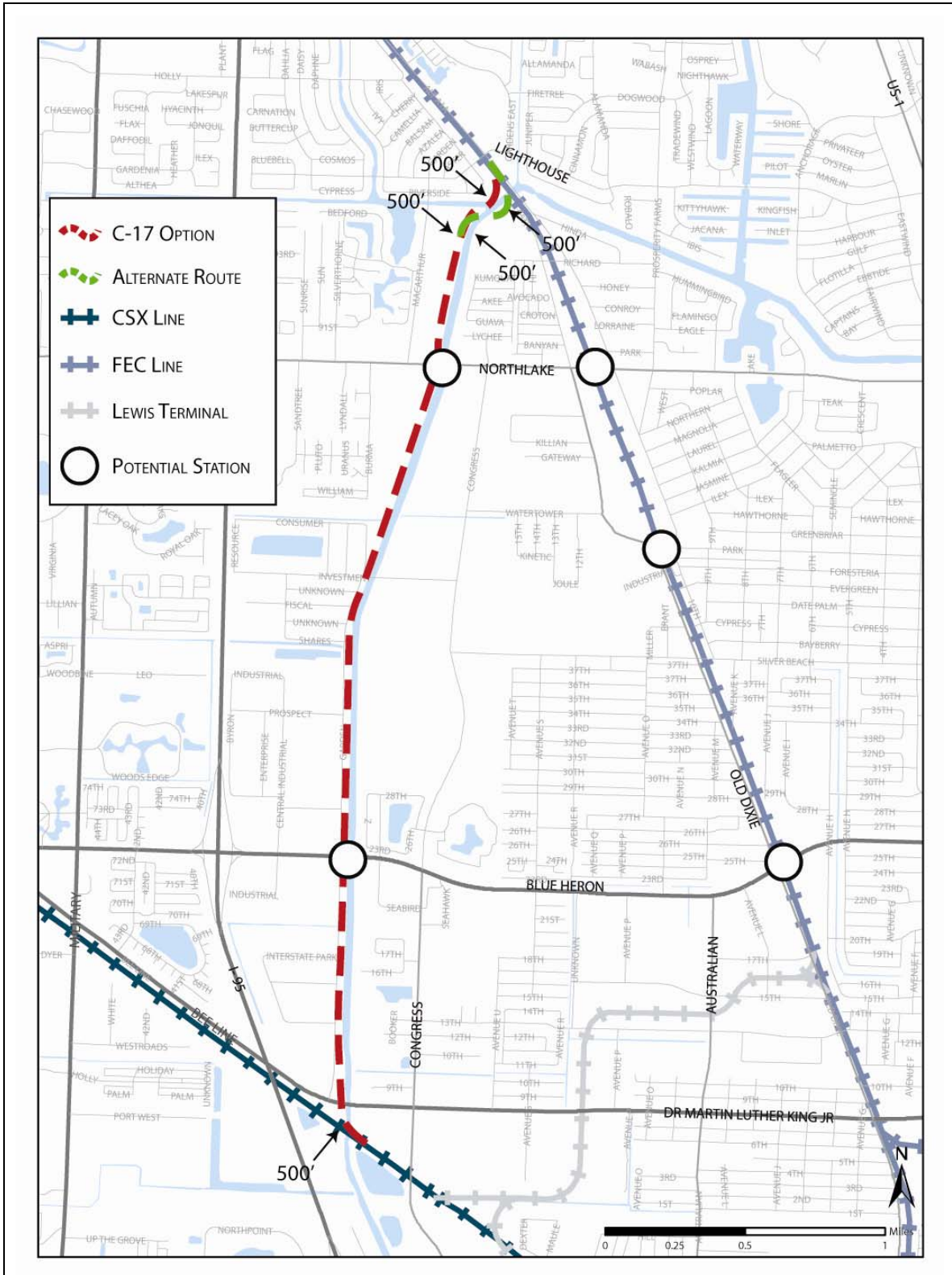
Location of C-17 (Earman River) Canal option related to the SFEC area (left, at red star) and other north-end connection options.

The main section of the canal is between 50 and 130 feet in width. Because of its purpose, for stormwater management and flood control, its wide banks (estimated to be between 85 and 125 feet wide), on both sides, are undeveloped. Use of this right-of-way would be for passenger rail only by means of an at-grade alignment. The alignment follows Canal C-17 from the SFRC at Milepost SX 965.3, one mile north of Mangonia Park and west of Congress Avenue, to FEC Milepost 291.8 (near Lighthouse Drive). The length of the alignment is approximately 3½ miles.

This option makes use of the canal's west bank because of the possibility of adjacent, supportive land uses. Though residential land uses would be physically closer to transit using the east bank, access to and from these gated, east bank, residential communities is oriented away from the canal, closing off direct access to or from this direction.

Operational Characteristics:

The C-17 option makes use of the west bank of the canal. This requires crossing the Canal in at least two locations.



Two options exist on the northern section of this option as it meets the FEC. In the first instance, vehicles remain on the west bank and must make a comparatively "tight" turn (a minimum 500 foot radius) to the north-west, crossing a branch of the Canal before meeting the FEC. An alternative routing allows a slightly more generous curve radius (at least 515 feet), and therefore somewhat higher speeds, by crossing over to the Canal's east bank, making use of part of a residential property and then crossing the Canal again before joining the FEC.

Passenger Service Considerations:

Two areas are considered to be potentially appropriate for the creation of stations as part of this option: North Lake Boulevard and Blue Heron Boulevard.

Proximate residential land uses to the east are comprised of gated communities which face away from the canal, making pedestrian access circuitous. Land uses closer to the proposed alignment, on the west bank, appear to be primarily low-density, light industrial uses, not ideal concentrations of transit patronage.

Engineering Constraints:

Construction of new track on the canal embankment may be subject to soils issues including water seepage from the canal into the track subgrade and the associated impact on allowable bearing capacity. This could require mitigation such as raising the elevation of the track by adding a layer of suitable soil to the existing embankment and/or driving steel sheet piles into the canal embankment between the canal and the tracks.

As many as three new bridges may be required to cross the canal at different points, depending upon the exact alignment ultimately designed for this option.

Physical Constraints:

Right-of-way limitations at the junction points and new residential housing in the vicinity of the junction with the SFRC constrain the potential alignment, requiring use of limited radius curves with maximum operating speeds as low as 15 mph. However, the C-17 option may, in detailed design, permit larger radius curves to be fitted to the right-of-way, which would allow higher maximum speeds through curves.

Feasibility:

This option appears to be quite feasible, from an engineering and constructability view, however meetings with the South Florida Water Management District (SFWMD) have indicated little receptivity to using their right-of-way for this purpose.

Cost Considerations and Cost-effectiveness:

Physically, at roughly 3.5 miles, this is one of the longest connections. With the requirement for new right-of-way, multiple bridge structures and the inclusion of two stations, this option could be among the most expensive to construct.

This option may permit higher speed operation than other options. Also, stations in this area may serve a population receptive to transit service.

Suitability:

This option fulfills the requirement of connecting the two mainline alignments. If SFWMD permission can be garnered and restrictions may be overcome, there appear to be no obvious fatal flaws.

Additional Considerations:

This option would require the cooperation of the SFWMD, upon whose land this would largely be built. If SFWMD permits use of their right-of-way, it is likely that no permanent buildings could be located on SFWMD property. In addition, stormwater management for any supporting infrastructure for the service would be required. Lastly, SFWMD requires that there be no impediment to movement of their maintenance equipment within their right-of-way.

SFWMD records indicate a significant Seacoast Utilities water main under the west bank of the C-17 Canal, running diagonally near Northlake Boulevard.

Advantages of this option:

- There is limited need for residential or business relocation related to this option.
- This option has the potential to permit higher operating speeds than most other options in both curves and tangent sections.

Disadvantages of this option:

- As one of the longer options, with multiple water crossings, this could be one of the more expensive options.
- This option makes use of SFWMD right-of-way, requiring SFWMD permission, a stormwater management plan and, probably, no permanent buildings on the right-of-way.
- Utility line will need to be accommodated.

2. Lewis Terminals Connector Option - Florida Power & Light (FP&L) Right-of-Way

Description:

The Lewis Terminals Connector - Florida Power & Light (FP&L) Right-of-Way option would connect the SFRC to the FEC in the vicinity of the existing Lewis Terminals Connector (also called the "Mission Spur" or the "Riviera Beach Connection") using the 200-foot wide FP&L power right-of-way which is immediately south of West First Street. This new connection would leave the SFRC in the vicinity of 53rd Street and Hill Avenue. Relocation of a vehicle impoundment yard and an office building surface parking lot would be required. This alignment is approximately 1¾ miles long.



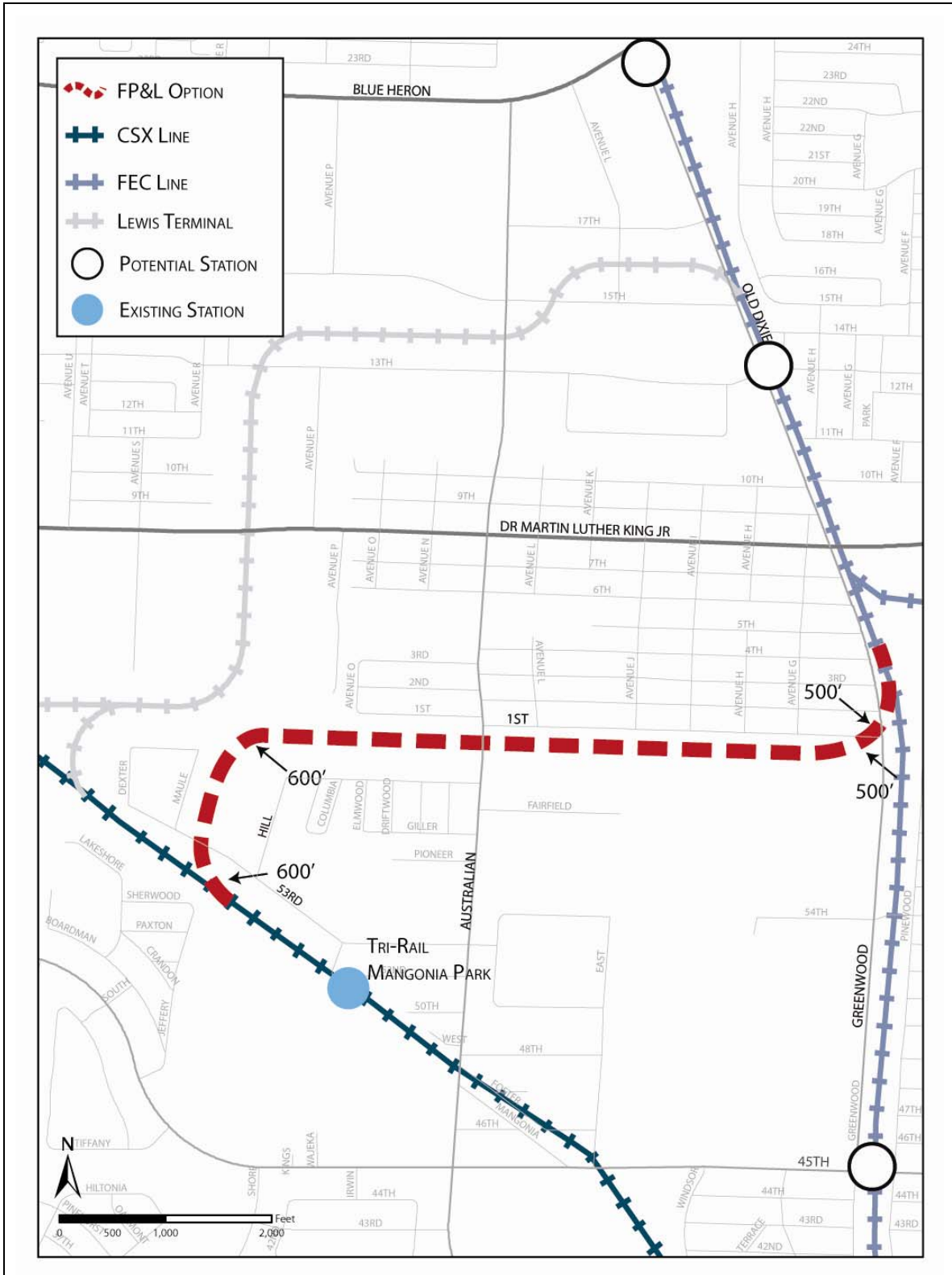
Location of Florida Power & Light (FP&L) option related to the SFEC study area (left, at red star) and other north-end connection options.

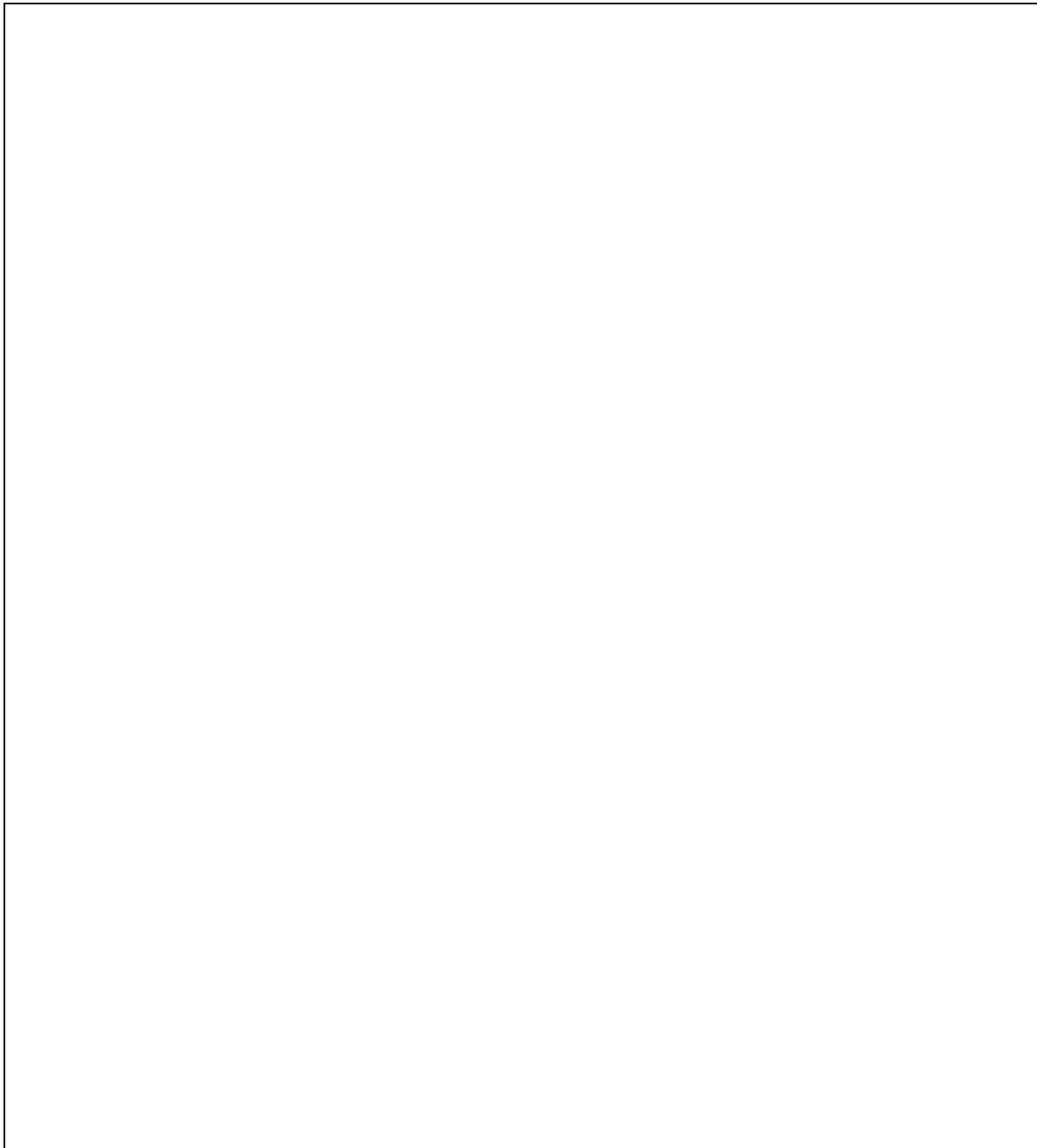
Operational Characteristics:

Access into the FP&L from the SFRC is made by way of two 600 foot radius turns which complete a roughly 135 degree turn to the east. On the eastern end of the right-of-way, another greater-than-90-degree turn is required. The curvature in this location is estimated to be on an approximately 500 foot radius, which will require

diminished speeds to negotiate.

The Lewis Terminals Connector, on the map below, was dismissed in the analysis conducted in Tier I (*South Florida East Coast Corridor Transit Analysis Study, North End Railroad Connection Alignments Draft Technical Memorandum*, dated June 5, 2006). The conditions which gave rise to the dismissal of this option (circuitous alignment with weak operating performance) still exist.





Passenger Service Considerations:

There are currently no planned potential station locations along this alignment.

Engineering Constraints:

This option is located in an industrial area, with the potential for contamination. Significant overhead power lines are located in the right-of-way, and may need to be relocated.

Physical Constraints:

Right-of-Way limitations at the junction points constrain the potential alignment, requiring use of limited radius curves with maximum operating speeds as low as 15 mph.

Sharing the FP&L right-of-way requires minimum horizontal and vertical clearances between the tracks and power transmission poles and lines.

Feasibility:

This option appears to be feasible; however, Florida Power & Light has thus far been unsupportive of using their right-of-way.

Cost Considerations and Cost-effectiveness:

This option is of moderate length and therefore may have moderate capital cost for rail infrastructure though the requirement for new right-of-way and the likely substantial costs for reconfiguring power poles and transmission wire alignment to accommodate a transit mode in the right-of-way will raise the cost of this option.

Suitability:

This option does fulfill the requirement of connecting the two alignments, though at a reduced rate-of-speed, particularly at the western end. At least one residential property owner will need to be relocated in order to accommodate this option.

Additional Considerations:

This option would require the cooperation of FP&L, upon whose land this would largely be built. No formal meeting has taken place in this regard.

Florida Department of Transportation (FDOT) has studied the use of this right-of-way for highway construction (SR-710). FP&L has not been supportive of shared use for highway purposes.

Advantages of this option:

- Use of existing utility corridor.

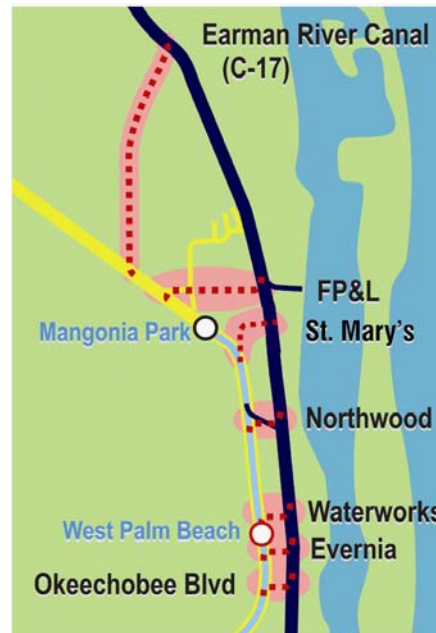
Disadvantages of this option:

- Use of FP&L right-of-way will require FP&L concurrence.
- Utility modification or realignment may be a substantial issue and cost.
- Circuitous routing with slow operating speeds.

3. St. Mary's Hospital Connection

Description:

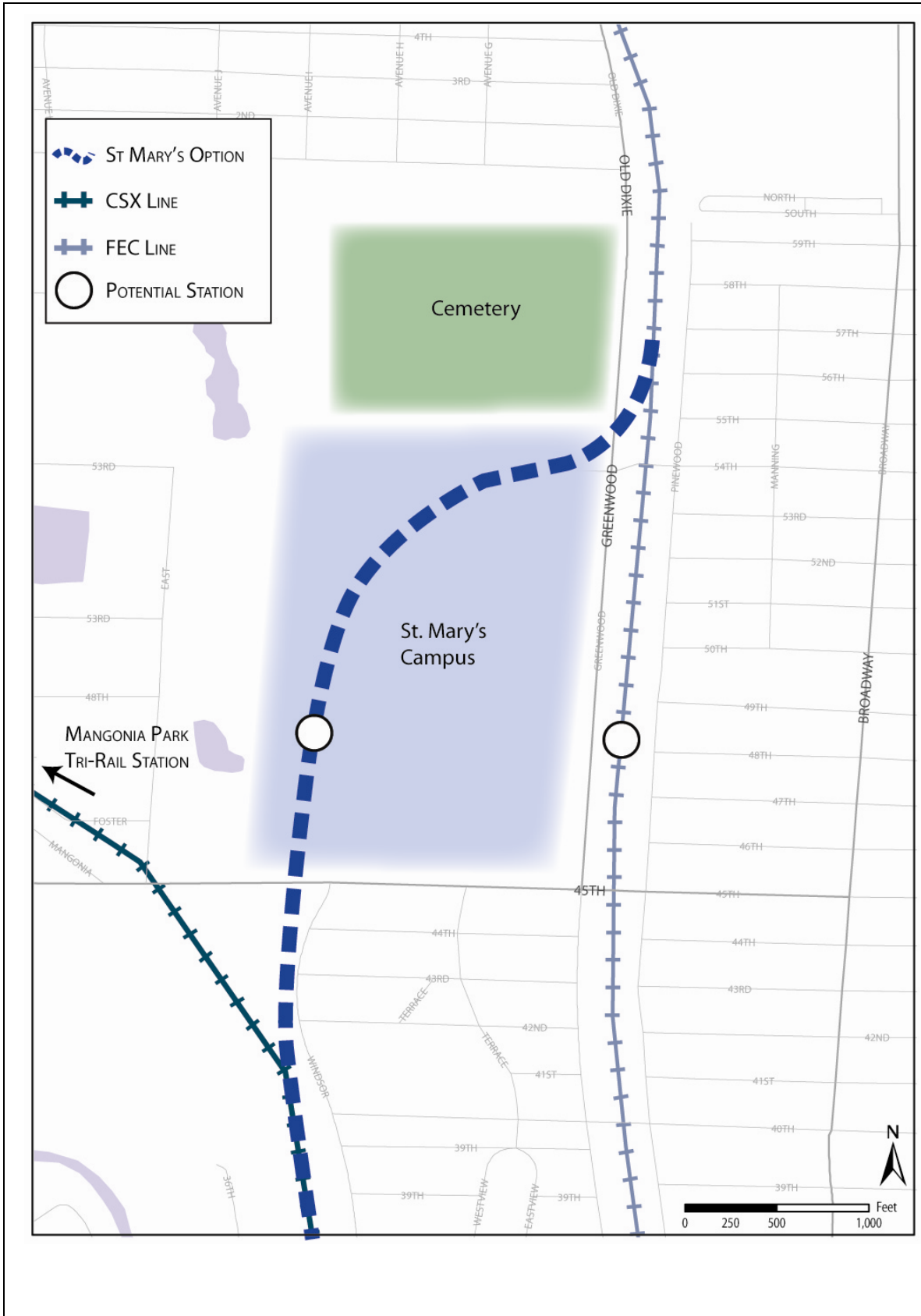
The St. Mary's Hospital Connection would connect the SFRC south of the Tri-Rail Mangonia Park Station to the FEC in the vicinity of 45th Street in West Palm Beach, in a predominately north-south alignment. This new connection would leave the SFRC in the vicinity of 36th Street, traveling north, adjacent to Windsor Avenue. It continues north through the St. Mary's Hospital campus and turns east at approximately 55th Street to connect with the FEC. Various sub-options exist for the exact alignment through the hospital campus. This option is approximately 1¼ miles long.



Location of St. Mary's Connection option related to the SFECC study area (left, at red star) and other north-end connection options.

Operational Characteristics:

North of St. Mary's Hospital, access to the FEC is gained by two reverse curves which will require reduced speeds in this portion of the connection, particularly as it joins the FEC.



Passenger Service Considerations: A station would be expected to be located within the St. Mary's Hospital complex. As St. Mary's Hospital is a major travel generator in the area.	
Engineering Constraints: There are no known engineering impediments to this option.	
Physical Constraints: The hospital campus is situated on the Coastal Ridge which may require a portion of the alignment to be constructed in a depressed open cut section.	
Feasibility: This option appears to be feasible; however, the reaction of St. Mary's Hospital to this option is currently unknown.	
Cost Considerations and Cost-effectiveness: This option is of moderate length and therefore would be expected to have moderate capital cost however, this option will require acquisition of new right-of-way.	
Suitability: This option does fulfill the requirement of connecting the two alignments, though at a reduced rate-of-speed. Depending on the specifics of the alignment chosen, a number of property owners may be adversely affected.	
Additional Considerations: The route north of 36 th Street skirts an area of low income and minority-occupied housing which may raise environmental justice issues. As the alignment is currently configured, the curves for rail may lead to "wheel screech" in a hospital zone. Abatement measures might be necessary. This option creates opportunities for complementary development.	
Advantages of this option: <ul style="list-style-type: none">• Direct access to a major regional trip generator.• Opportunities for complementary development.	Disadvantages of this option: <ul style="list-style-type: none">• Possibly additional costs to depressed open cut section.• Possible Environmental Justice issues.

4. Current Northwood Alignment

Description:

The current Northwood Connector is located in West Palm Beach, north of downtown West Palm Beach.



Location of Current Northwood Connector option related to the SFECC study area (left, at red star) and other north-end connection options.

This option would leave the SFRC in the general vicinity of the existing wye at CSXT Milepost SX 968.3, 1½ miles north of West Palm Beach Station, and join the FEC at Milepost 297.5 (about 750 ft south of the 30th Street grade crossing).

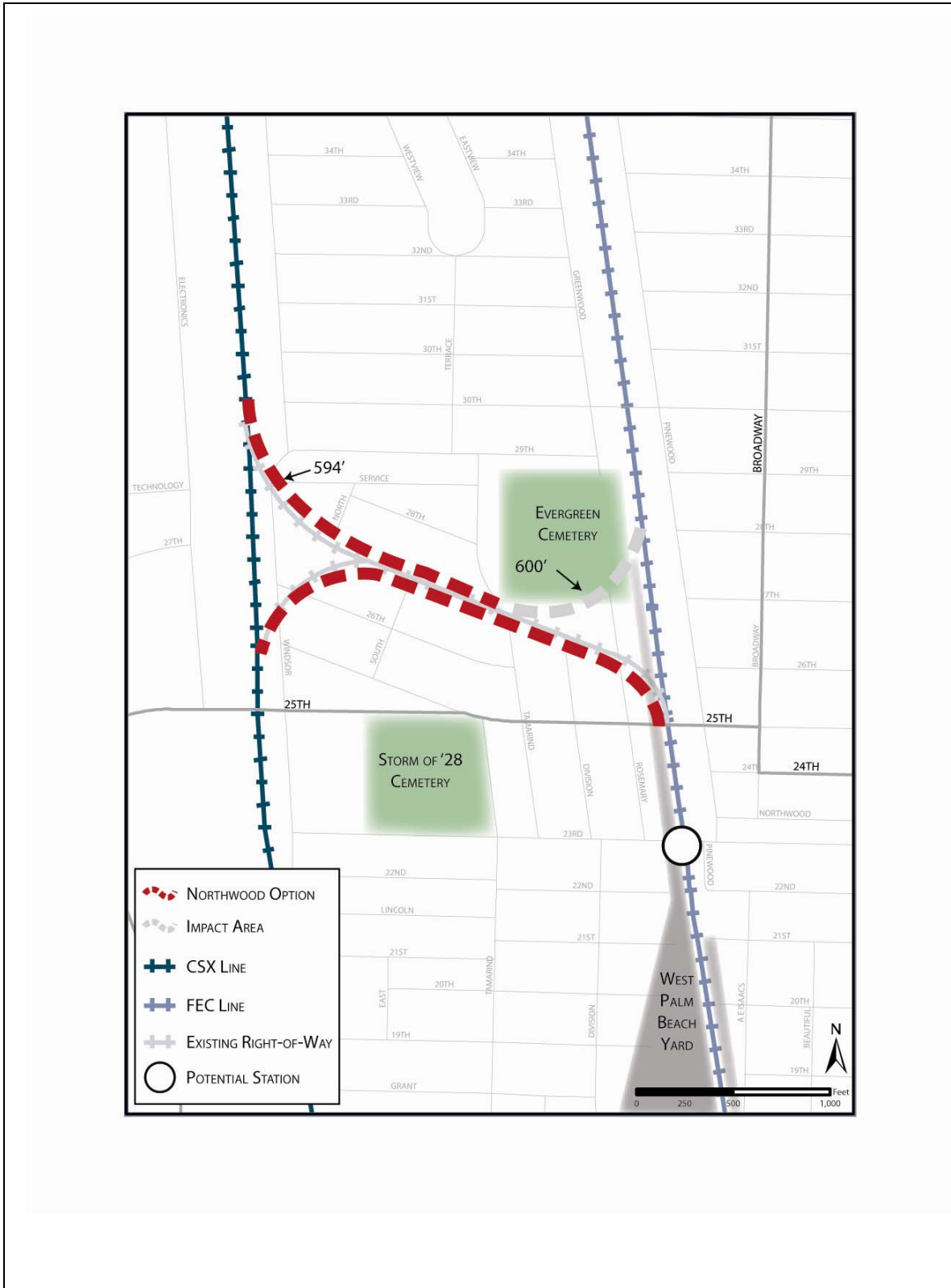
At this point, the two main lines are approximately a half mile apart.

Operational Characteristics:

The Northwood Connector, as currently configured, facilitates north and southward movements on the SFRC to southward movement on FEC. Its orientation and physical configuration do not permit movement to the north on the FEC.

Existing curves have less than 500' radii.

Construction of a new track would impact Evergreen Cemetery.



Analysis in Tier I of the SFEC Study revealed that simply adding a northward movement was impractical, as it would significantly impact an historical, African-American cemetery (Evergreen).

As adding a northward "leg" to the current connection is impractical, trains would have to make the movement from the SFRC to the FEC by means of an operationally disadvantageous reversal of direction, with a severe time penalty.

Passenger Service Considerations:

There are currently no planned potential station locations along this alignment, though a simple station at the eastern end on the FEC might make use of the train standing time, if the change in direction were used.

Engineering Constraints:

This option shares a right-of-way with a freight track.

Physical Constraints:

This option consists of an existing freight railroad industrial track alignment with small-radius, slow-speed curves. The Northwood option does, however, appear to permit larger radius curves to be fitted to the right-of-way in detailed design, which would allow higher maximum speeds through curves, making operation via a new north leg of the FEC wye feasible. This would require substantial right-of-way acquisition and business relocation.

Feasibility:

While operating over an upgraded connection at this location is technically feasible, it would be a significant challenge to add a new north leg to the FEC wye. Without such an improvement, the operationally disadvantageous reverse direction move, if implemented for revenue service, would inflict a time penalty on the schedule. There are operational methods for improving this performance, somewhat, but these will impose operational costs. This may be a fatal flaw for this option.

This option would, however, have the advantage of operating over an existing railroad right-of-way in which much of the infrastructure is already in place, though it is in need of upgrading to a passenger standard.

Cost Considerations and Cost-effectiveness:

In its current configuration, and depending on the frequency of traffic, additional costs of this option may be quite limited, other than rehabilitating the track and track structure. However, there would be significant right-of-way acquisition costs and/or operating costs associated with overcoming the right-of-way issue and making this option viable for long-term revenue operation.

Suitability:

This option does fulfill the requirement of connecting the two alignments, though with a time penalty, unless significant right-of-way acquisition and track realignment are undertaken. Right-of-way acquisition will impact Evergreen Cemetery and is not considered to be feasible.

Additional Considerations: If the reverse direction move were implemented, an operational analysis would be necessary to determine whether a pocket track would be necessary to accommodate trains changing ends at Northwood and the effect of this move with freight operations at West Palm Beach Yard. Additionally, if the reverse direction move were implemented, it would be desirable to build a siding on the FEC, outside the limits of the West Palm Beach Yard for the service to slip into while changing ends. Adding a simple station at this location for this option would incur no time penalties as the train will simply sit while changing ends.	
Advantages of this option: <ul style="list-style-type: none">• Substandard operation could be implemented within existing rail right-of-way.	Disadvantages of this option: <ul style="list-style-type: none">• Time penalties because of the need to reverse train during revenue operation.• Acquisition of sensitive right-of-way (Evergreen Cemetery) and track realignment to achieve viable revenue operations.• Existing horizontal curve radii would have to be increased to meet a minimum speed of 15 MPH.

5. Modified Northwood Alignment

Description:

The modified Northwood Connector would be located in West Palm Beach, north of downtown, immediately south of the current Northwood Connector.



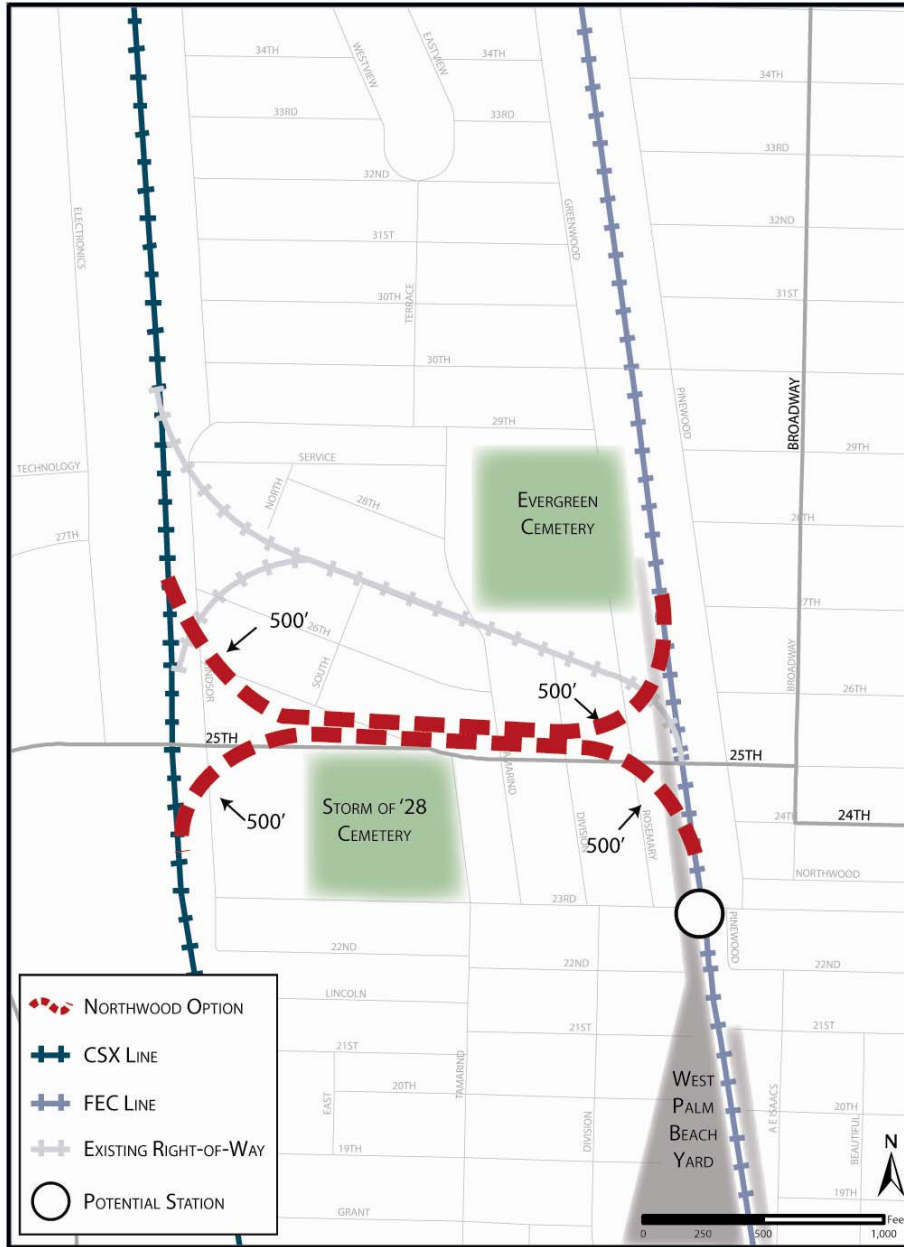
Location of Modified Northwood Connector option related to the SFECC study area (left, at red star) and other north-end connection options.

This option would leave the SFRC south of the existing wye at CSXT Milepost SX 968, just north of the Storm of '28 Historic Cemetery and Mass Grave Site and proceed generally east, just north of 25th Street before turning to meet the FEC.

This alignment is approximately ½ mile long.

Operational Characteristics:

The modified Northwood connector has 500 foot curves on both ends, requiring relatively slow movement but still allowing a direct transition from both north and south on the SFRC to north and south on the FEC.



Passenger Service Considerations:

<p>There are currently no planned potential station locations along this alignment.</p>	
<p>Engineering Constraints:</p> <p>It may be difficult to provide adequate horizontal clearance between the track and 25th Street where the two are parallel.</p> <p>This option is located in an industrial area, which may raise hazardous materials issues that would affect the precise alignment or cost of this option.</p> <p>This option would be shared with freight.</p>	
<p>Physical Constraints:</p> <p>Property acquisition beyond the existing right-of-way would be required for this option</p>	
<p>Feasibility:</p> <p>This option is technically feasible, albeit somewhat slow.</p>	
<p>Cost Considerations and Cost-effectiveness:</p> <p>While this is quite a short alignment option, there will be a need for relocating a substantial number of businesses to create the required new right-of-way.</p>	
<p>Suitability:</p> <p>This option does fulfill the requirement of connecting the two alignments, though using quite slow vehicle movements. There may be a need for a considerable amount of business relocation.</p>	
<p>Additional Considerations:</p> <p>As currently designed, this option makes use of County land immediately adjacent to, and physically undifferentiated from, the Storm of '28 Historic Cemetery. This area of Northwood is zoned industrial and is occupied by economically marginal businesses that may be hard to relocate. The city has limited land zoned for industry and concerns regarding a net loss of industrial land have been raised.</p>	
<p>Advantages of this option:</p> <ul style="list-style-type: none"> • Relatively short length should limit construction costs. 	<p>Disadvantages of this option:</p> <ul style="list-style-type: none"> • Need for a number of potentially disadvantaged business relocations. • Uses property adjacent to and physically undifferentiated from the Storm of '28 Historic cemetery. • No opportunity for a station.

6. Waterworks Connector

Description:

The Waterworks Connector is located in downtown West Palm Beach (WPB).



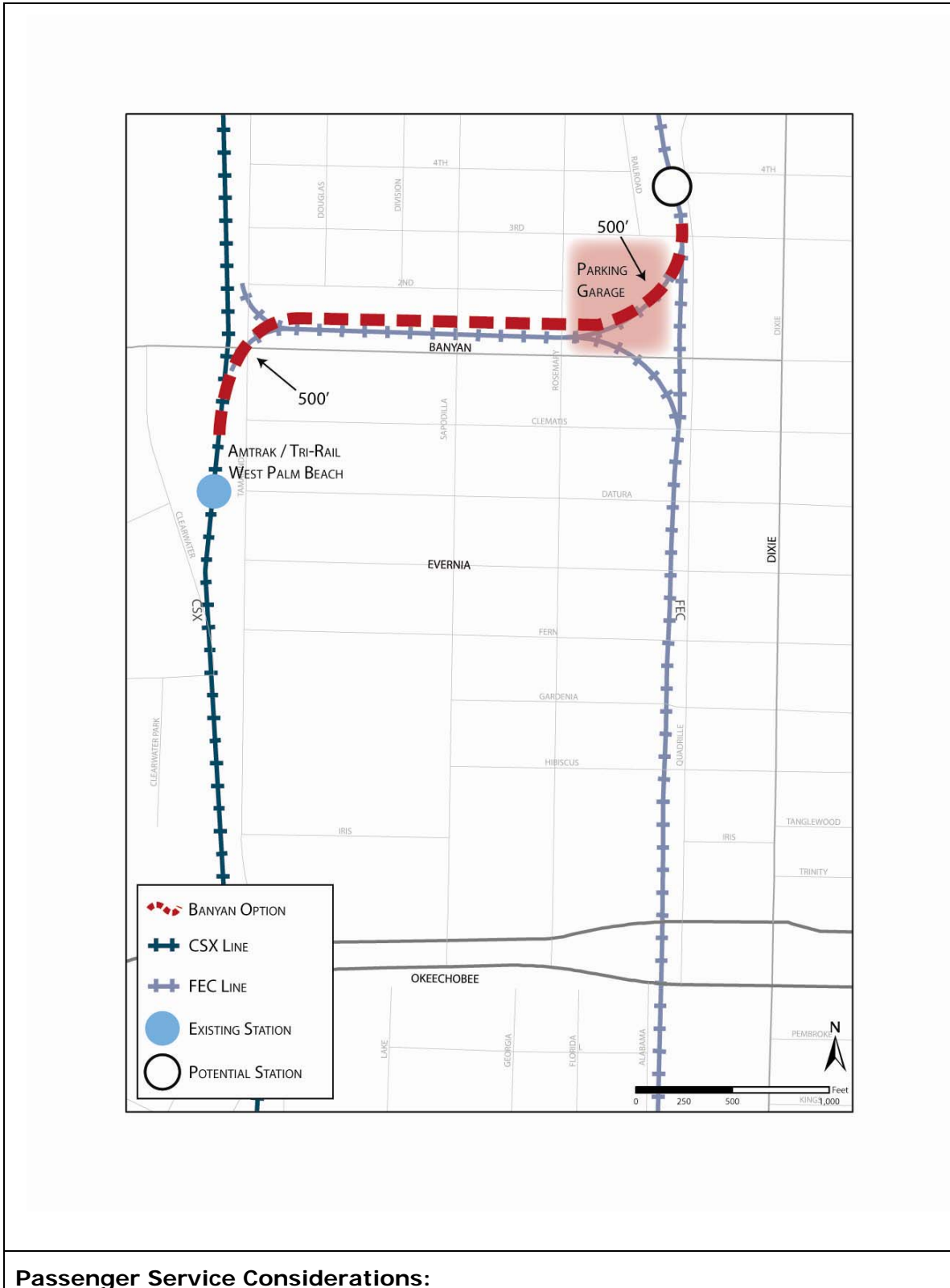
Location of Waterworks Connector option related to the SFECC study area (left, at red star) and other north-end connection options.

The Waterworks Connector would connect the SFRC and the FEC just north of the current Amtrak and Tri-Rail West Palm Beach Station in the vicinity of the former FEC Waterworks Spur on the north side of Banyan Boulevard. The connection runs almost due west-east but originally presumably serviced the nearby water plant rather than connecting with the SFRC as would be the case under this option. On the east side, near the proposed connection with the FEC, the County has recently built a parking garage adjacent to the right-of-way. The Waterworks Connection is conceived of as an at-grade option.

This alignment option is approximately ½ mile long.

Operational Characteristics:

The Waterworks Connector option would have 500 foot curves on both ends.



Passenger Service Considerations:

There are currently no planned potential station locations along this alignment option. Stations would be located just beyond the limits of this alignment option at the existing, historic West Palm Beach Station to the west and at a Government Center Station, probably located north of 4th Street, to the east of this option.

Engineering Constraints:

It will be challenging to identify a satisfactory horizontal alignment that avoids the existing concrete box sewer line which runs along the northern boundary of the right-of-way.

The grade crossing at North Tamarind Avenue and Banyan Boulevard passes diagonally through a busy intersection of two multi-lane roadways, creating significant traffic issues.

Physical Constraints:

It may not be feasible to avoid impacts to the new county parking structure.

Feasibility:

Early engineering analysis indicates that the eastern end of the alignment would severely impact the County's new multi-story parking garage. In addition, this at-grade option exacerbates undesirable traffic issues at Banyan Boulevard and Tamarind Avenue, one of the two major transportation gateways into downtown West Palm Beach from I-95.

Cost-effectiveness:

This option does not require substantial assembling of new right-of-way, a cost-saving. In addition, there is presently very little need to relocate existing businesses in this option but impacts to the County's parking structure could be costly.

A major sewer line in the right-of-way may have to be moved, potentially a costly requirement.

Suitability:

This option does fulfill the requirement of connecting the two alignments, though using quite slow vehicle movements. This option is probably incompatible with planned CRA development of the north side of Banyan Boulevard.

Additional Considerations:

The desire of the City is to provide North-South roadway connections currently closed off at Douglas and Division Streets, creating a feeling of isolation for the historic, disadvantaged, African-American, Northwest neighborhood. Indications are that a through connection would be possible at Douglas but infeasible at Division, except for pedestrians.

Advantages of this option:	Disadvantages of this option:
<ul style="list-style-type: none">• Option makes use of an available railroad right-of-way, although part of it is planned for redevelopment by the CRA.	<ul style="list-style-type: none">• Imposes undesirable traffic impacts• Severely impacts County parking structure• Precludes North-South connections at Division and Douglass Streets.• Incompatible with planned CRA development.• Possible environmental justice issues.

7. Evernia

Description:

The Evernia Connector is located in downtown West Palm Beach.



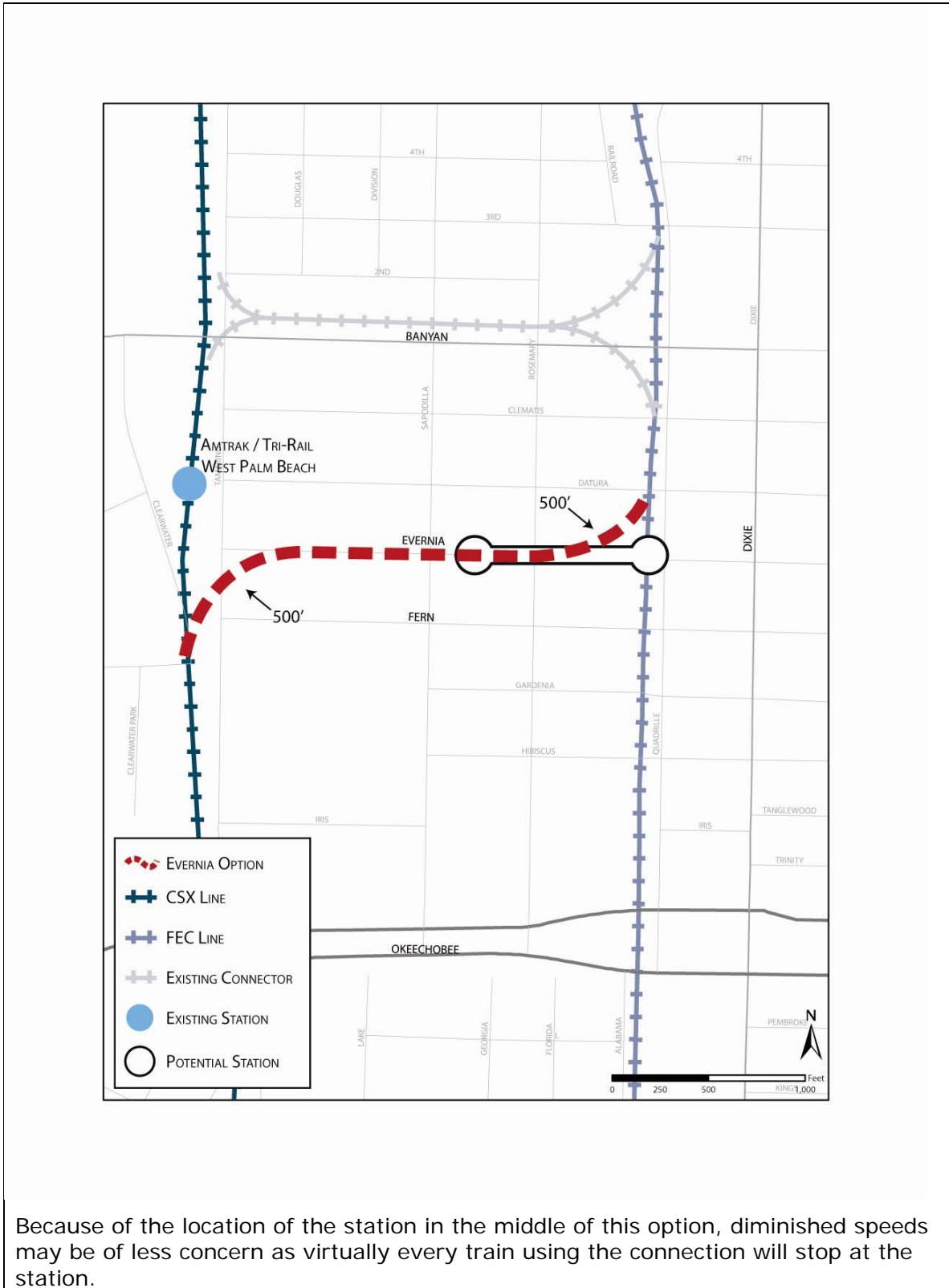
Location of Evernia option related to the SFECC study area (left, at red star) and other north-end connection options.

The Evernia option would connect the SFRC and the FEC south of the current Amtrak and Tri-Rail West Palm Beach Station. The Evernia option follows the alignment of Evernia Street in downtown West Palm Beach, approximately ¼ mile south of the Waterworks Connection. In this option, the line diverts from the FEC at a location where it is possible to create an alignment within the right of way of Evernia Street which has an extra wide cross section. By reducing the width of both Evernia and Fern Street roadways, minimal impacts would result to the footprint of redevelopment parcels between the two streets. The Evernia Connection is conceived of as located in a cut under Sapodilla Street, which would pass over the station.

This alignment option is approximately ½ mile long.

Operational Characteristics:

The Evernia option has 500 foot curves on both ends, requiring relatively slow movement but still allowing a direct transition from north on the SFRC to north on the FEC.



Because of the location of the station in the middle of this option, diminished speeds may be of less concern as virtually every train using the connection will stop at the station.

Passenger Service Considerations:

The design of the Evernia option has always included a center platform with a walking connection to a complementary platform on the FEC. The location of Evernia Station is centrally located in downtown West Palm Beach and was conceived to support new transit-oriented development.

Engineering Constraints:

The at grade crossing of S. Tamarind Ave between Evernia Street and Fern Street will require an acute angle between the tracks and the roadway.

The combination of the existing topography and the maximum allowable grade for the rail line requires that the proposed rail line be located in a depressed open cut section resulting in local street closures and re-profiling of existing streets to allow them to remain open. Construction of a depressed cut may impact the high water table and result in relocation of underground utilities.

Physical Constraints:

There are no known physical constraints for this option.

Feasibility:

This option is technically feasible.

Cost Considerations and Cost-effectiveness:

The length of this option is quite short, compared to others but it does involve a fairly complex station, in a cut, adding to the cost. Most of the required right-of-way is public street right-of-way; however, there will be a need for some private right-of-way acquisition and business relocations, further increasing costs.

Suitability:

This option does fulfill the requirement of connecting the two alignments, slow speeds in the tight curves is of reduced significance because of a new station on the connection. The central location of the station within downtown West Palm Beach was designed to favor passenger accessibility and stimulate desired economic development.

Additional Considerations:

This option may change the street configuration in downtown West Palm Beach, closing some streets to through traffic.

Evernia Station is proximate to several historic structures.

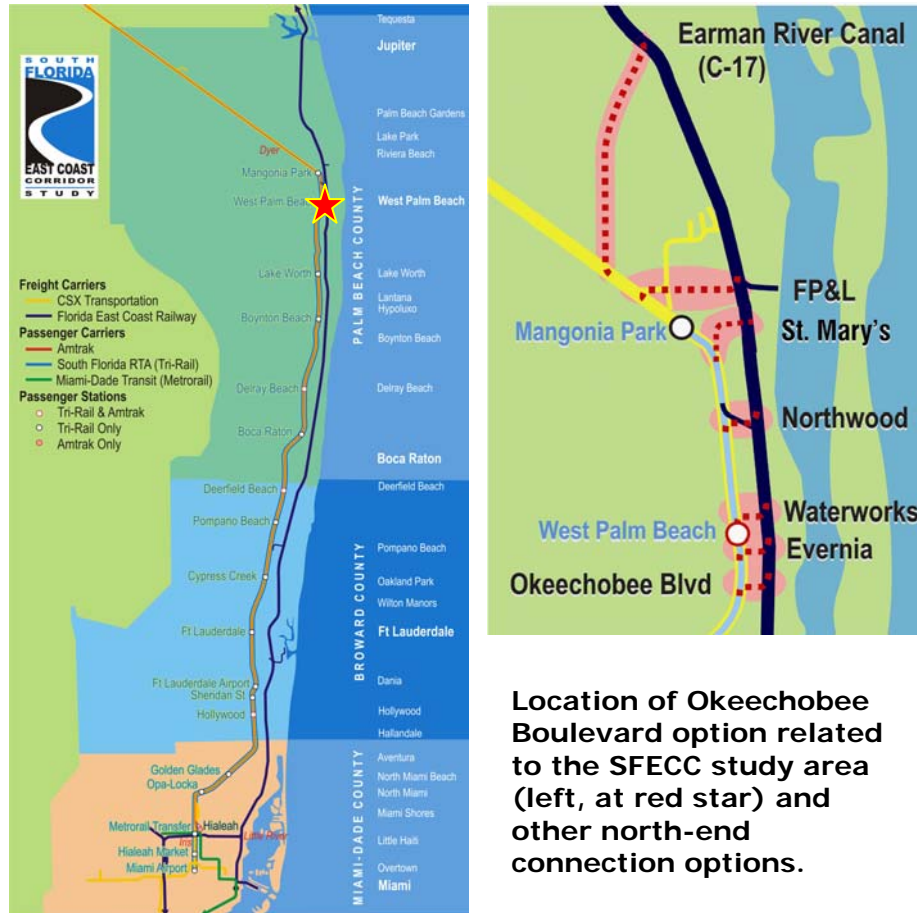
Local developers and land owners have expressed concern about the impacts of a future Evernia Station on their nearer-term planned developments and property sales.

Advantages of this option:	Disadvantages of this option:
<ul style="list-style-type: none">• Speed and time penalties from “tight” turns less significant than most options due to stations located on the connection.• Centrally located Evernia Station is among the best transit-oriented development prospects.• Prospect of relatively easy transfer opportunities between the SFRC and FEC services.	<ul style="list-style-type: none">• Option withdraws Amtrak and Tri-Rail train service from Historic West Palm Beach Station.• Would close Evernia Street as a through street at FEC tracks.• Expensive option to construct because of station in cut.• Station would be proximate to historic structures.• Right-of-way would need to be assembled.

8. Okeechobee

Description:

The Okeechobee connection is located in downtown West Palm Beach.



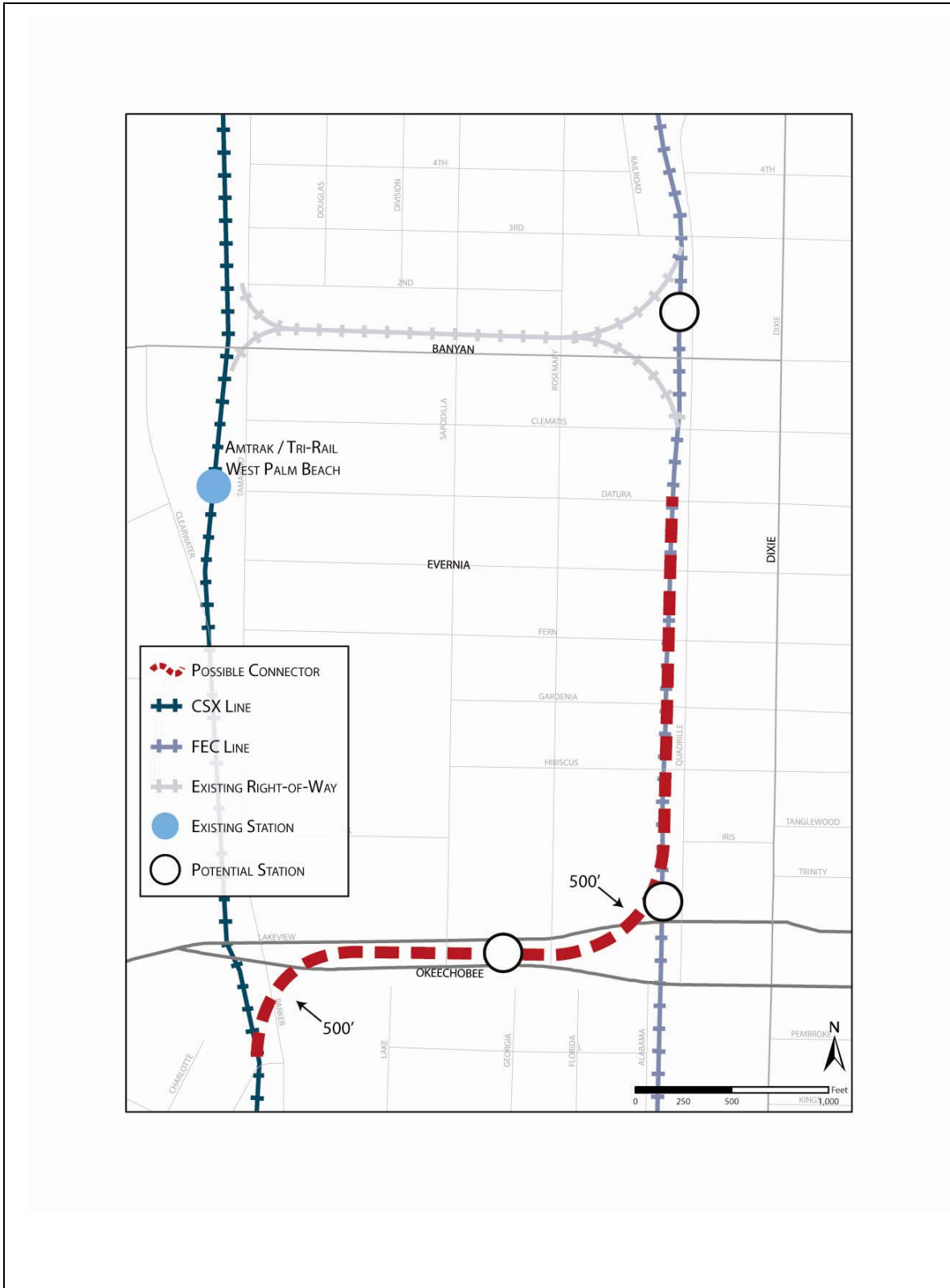
Location of Okeechobee Boulevard option related to the SFEC study area (left, at red star) and other north-end connection options.

The Okeechobee option would connect the SFRC and the FEC south of the current Amtrak and Tri-Rail West Palm Beach Station. This option makes use of the wide expanse of median between the one-way pairs of Okeechobee Boulevard in downtown West Palm Beach, approximately 0.6 miles south of the Waterworks Connection and less than 0.4 miles south of Evernia. As described traveling from south to north, this option diverts from the SFRC south of the current West Palm Beach Rail Station at Okeechobee Boulevard at a location where it is possible to “duck under” the eastbound lanes of Okeechobee Boulevard and travel in a cut in the median. This option then turns north and begins to ascend in the FEC right-of-way, emerging north of Datura Street.

At this point, the two main lines are slightly less than one half mile apart. This alignment option is estimated to be approximately 8/10 of a mile long, much of it in a cut.

Operational Characteristics:

The Okeechobee option has 500 foot curves on both ends, but still allows a direct transition from north on the SFRC to north on the FEC.



As a station is planned along Okeechobee in the median cut, diminished speeds will not be an issue.

Passenger Service Considerations:

The design of the Okeechobee option includes a station in the cut in the median of Okeechobee Boulevard. It is envisioned that a complementary, though physically unconnected station will exist, at grade, on the FEC mainline. As there will be both a grade and distance separation between the two stations, a direct connection would be impractical.

The station on Okeechobee would conveniently serve City Place and cultural attractions in West Palm Beach.

Engineering Constraints:

To enable the proposed rail line to cross under South Tamarind Avenue, this option requires the existing SFRC and the proposed rail line to be depressed in an open cut section at a lower depth than Evernia. This raises issues associated with the water table and underground utilities.

It will be necessary to provide the required vertical clearance envelope where the rail line crosses underneath Okeechobee Blvd., including other cross streets scheduled to remain open within the median.

Some roadways may need to be re-profiled to accommodate grade separation from the rail.

This option poses challenges to the location of station platforms on constant grade and tangent track.

Physical Constraints:

There are no known physical constraints for this option.

Feasibility:

While technically feasible, deep subterranean excavations in South Florida are often challenging and expensive, involving the need for an expensive emergency pumping station. In addition, a new building constructed at Okeechobee and Quadrille Boulevards may increase the costs of this option still further.

Cost Considerations and Cost-effectiveness:

Because of the deep and relatively long subterranean alignment, this option is undoubtedly the most expensive. There are expected to be only limited business relocations required for this option. As this is a new (not an historic) alignment option, all of the right-of-way would need to be assembled, though much of it is already in public ownership.

Suitability:

This option does fulfill the requirement of connecting the two alignments. Slow speed in the "tight" curves is of reduced significance because of a new station on the connection.

Additional Considerations:

This option will necessitate closing Evernia and Fern Streets on the east side of downtown.

Advantages of this option:	Disadvantages of this option:
<ul style="list-style-type: none">• Speed and time penalties from “tight” turns less significant than most options due to new station.• There is only a limited known need for business relocation related to this option.• Much of right-of-way is already publically owned.• Station would conveniently serve City Place and cultural attractions in WPB.	<ul style="list-style-type: none">• Option withdraws local train service from Historic West Palm Beach Station.• Technically difficult to phase and construct.• Most expensive option to construct because of extensive excavation and need to develop shoring plan for new building.• Would close some east-west streets in downtown West Palm Beach.

9. Pompano

Description:

The Pompano connection is located in Pompano Beach in Broward County.



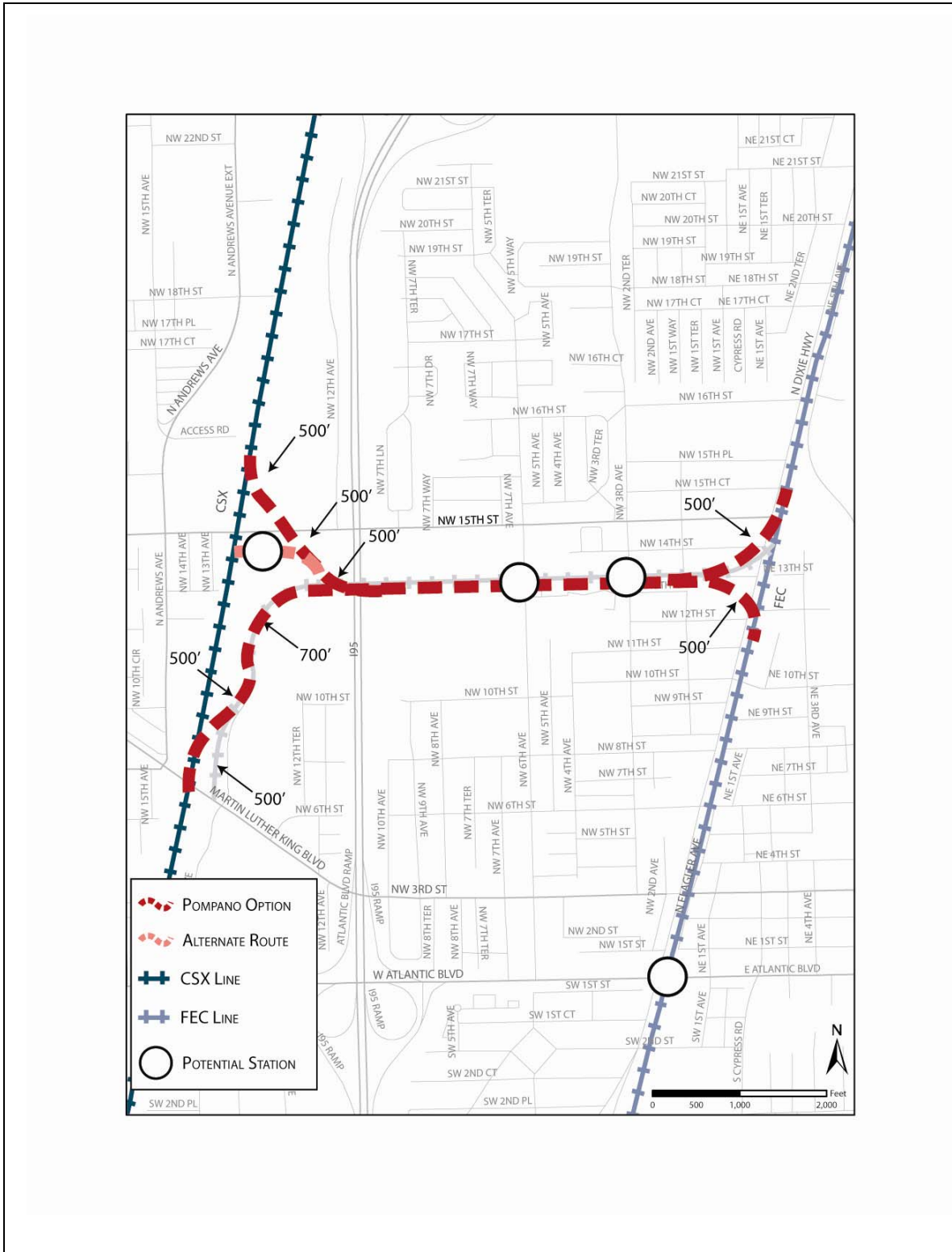
Location of Pompano option related to the SFECC study area (left, at red star)

The Pompano option makes use of an FEC freight industrial spur just south of Northwest 15th Street. As currently configured, this alignment exists for southbound freight trains on the FEC to travel west to customers close to the SFRC. This option makes use a number of existing freight sidings plus short extensions to establish a functional connection to the SFRC to the west.

This alignment option is estimated to be approximately 1¼ miles long.

Operational Characteristics:

The western portion of the Pompano connection option is circuitous and on the east end includes 500 foot curves, requiring relatively slow movement, but it allows a transition from north and south on the SFRC to north and south on the FEC.



Passenger Service Considerations:

The design of the Pompano Connection option includes a number of possible neighborhood station locations (at Northwest 3rd and Northwest 6th Avenues) as well as a possible passenger transfer station between SFRC and FEC services where the Connection meets the SFRC.

Engineering Constraints:

This option is located in an industrial area, with the potential for contamination.

This option requires maintenance of adequate horizontal clearances between the support structures beneath I-95 and the tracks.

The existing alignment at the junction with the SFRC includes a series of reverse curves, requiring slow vehicle movements.

This option shares a right-of-way with a freight track. Increased clearance will be required between the proposed new track alignment and the adjacent, existing industrial tracks.

Physical Constraints:

There are no known physical constraints for this option.

Feasibility:

This option is technically feasible, albeit involving slow vehicle movement.

Cost Considerations and Cost-effectiveness:

This connection is expected to be moderately expensive, given the length of the alignment option and the possibility of stations along its route. On the other hand, as this option makes use of an intact freight line, the need for right-of-way assembly and residential or business relocation related to this option appears to be limited.

Suitability:

This option does fulfill the requirement of connecting the two alignments, though using slow vehicle movements. Because of one or more stations along this option, speed constraints may be less of an issue.

Additional Considerations:

This option is located in an area of heavy industrial and residential uses. Stations in this area may attract riders but transit-oriented development opportunities are likely to be limited.

Advantages of this option:	Disadvantages of this option:
<ul style="list-style-type: none">• Speed and time penalties from “tight” turns less significant than most options due to station located on connection.• The need for right-of-way assembly and residential or business relocation related to this option should be limited.• Could provide mobility to additional transit-dependent populations.	<ul style="list-style-type: none">• Moderately expensive option because of its length and potential stations.• Transit-oriented development opportunities are likely to be limited.

10. North Miami/Little River Connector

Description:

The North Miami/Little River connector is an existing, active wye, which diverges from the FEC mainline at Northeast 73rd Street in north Miami. The section of



Location of North Miami/Little River Connector option related to the SFECC study area (left, at red star)

interest to the SFECC runs from the Iris “diamond” interlocking in Hialeah, just south of Tri-Rail’s Metrorail connection, to the FEC, a distance of approximately 4½ miles.

Operational Characteristics:

The existing wye in North Miami appears to be on a greater than a 1,000 foot radius.



A new transition from the Little River Connector north and south to join the SFRC utilizes 500 foot radius curves. These will dictate relatively slow vehicle movements.

Passenger Service Considerations:

Three areas are considered to be potentially appropriate for the creation of stations as part of this option.

Northwest 14th Avenue, Northwest 22nd Avenue and Northwest 27th Avenue are the centroids of potential future station areas, thus providing service to additional transit-dependent populations.

In addition, options exist on the west to connect with Tri-Rail's Metrorail Transfer Station, slightly to the north and to the Miami Intermodal Center and Miami to the south.

Engineering Constraints:

There are no known engineering constraints for this option.

Physical Constraints:

There are no known physical constraints for this option.

Feasibility:

This option appears to be feasible, though a building currently stands in the way of making the east-to-south turn between the SFRC and the Connector. It is currently unclear whether similar property acquisition and demolition may be required for the turn east-to-north.

Cost Considerations and Cost-effectiveness:

At roughly 4.5 miles in length, this is one of the longest connections. With the inclusion of up to three stations, this option is likely to be among the most expensive to construct. On the other hand, it is expected to require only limited property assembly. Property acquisition will be needed on the SFRC side in order to construct (at a minimum) an appropriate southward turn onto the Connector.

Suitability:

This option does fulfill the requirement of connecting the two alignments. While the building standing in the way of making the turn from the Connector south onto the SFRC is certainly an obstruction, it is not seen as a fatal flaw.

Additional Considerations:

This option would provide the most direct connection between the Miami Intermodal Center (MIC) and downtown Miami or locations farther north along the FEC railway.

Advantages of this option:	Disadvantages of this option:
<ul style="list-style-type: none">• Speed and time penalties from “tight” turns only a concern at the western connection with SFRC• Use of active right-of way should diminish difficulty of assembling required land.• Most direct connection between the Metrorail/Tri-Rail transfer station, MIC and downtown Miami.• Serves additional transit-dependent populations	<ul style="list-style-type: none">• At 4½ miles, with three possible stations, this option is, potentially, moderately to very expensive.• Property acquisition and demolition will be necessary to connect to and from the SFRC.

CONCLUSION

This memorandum described ten possible connections between SFRC and FEC. Of the ten, Pompano is the only feasible middle section connection and North Miami/Little River is the only feasible south section connection. The remaining eight connections described all provide a possible north end connection. These eight connections will be evaluated in more depth as part of Technical Memorandum 3.3.6 North Section Alternative Alignments.