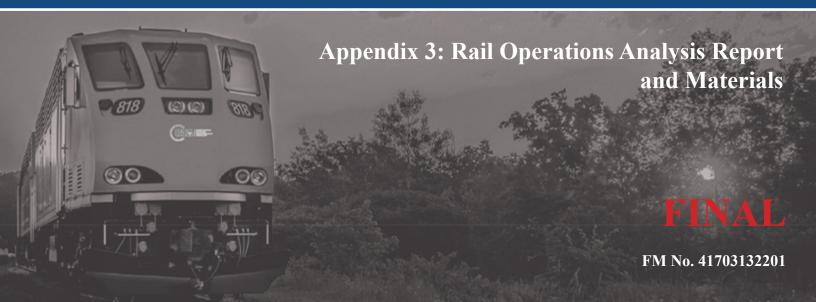
Tri-Rail Coastal Link Study

(formerly known as the South Florida East Coast Corridor Study)



Broward Metropolitan Planning Organization Florida Department of Transportation Miami-Dade Metropolitan Planning Organization Palm Beach Metropolitan Planning Organization Southeast Florida Transportation Council South Florida Regional Planning Council South Florida Regional Transportation Authority Treasure Coast Regional Planning Council

Preliminary Project Development Report April 2014





Appendix 3.0 - Rail Operations Analysis Report and Materials

1.0 Introduction

1.1 Purpose

The purpose of the modeling was to determine the minimum infrastructure necessary to successfully accommodate the proposed train services while providing an acceptable performance level for all trains. The trains included Florida East Coast (FEC) Railway freight trains, proposed All Aboard Florida (AAF) passenger trains, Amtrak trains, and the proposed Tri-Rail Coastal Link commuter rail trains.

1.2 Modeling Theory

Determining capacity becomes complex as this railroad network is not a static system but a physical and dynamic system that depends on the interaction of different types of trains as they operate within the network. There are two predominate methods in determining rail capacity. The first is mathematically determining theoretical capacity of a network, which is a static representation that determines the maximum number of trains that could operate over a given specific during a time based predetermined parameters and ideal headway (spacing). This number is then de-rated to establish a practical capacity. However this approach was not practical for this study given the complexity of the rail network being studied which contains many route combinations with parallel paths. The second, more suitable method, involves the use of rail network modeling software. Many simulation packages are commercially available and Berkeley Software's Rail Traffic Controller (RTC) package was selected. This licensed application allows the assembly of entire complex networks including turnouts and signals as well as various operating parameters. It is widely accepted as the present standard in North America with it being used by all of the North American Class One railways as well as the FEC.

Once the rail network and train characteristics are coded the RTC software attempts to dispatch the trains as efficiently as possible and provide as output, animations, time distance graphs, average train velocity, track occupation and average train delay by type. This information is indispensible in determining if trains are maintaining an acceptable level of performance. By altering inputs and using multiple runs, capacity constraints and possible solutions can be determined.

Basic equipment parameters were used as a base to calculate individual train performance. Well tested algorithms then drive these fundamental equipment parameters for train performance.

The Modified Davis resistance formula and Grade Based Curved Resistance was utilized as this has been shown to accurately represent heavy rail freight and passenger trains.

1.3 Methodology

Modified Davis Basic Resistance Formula

 $R=0.6 + 20/W + 0.01 X V + 0.07 X AV^2/Wn$ Where:

R=Resistance in lbs/ton on level tangent track

W= weight per axle in tons

n = number of axles per car

A = cross section of car in square feet

V = speed in miles per second

Grade Based Curve Resistance

A one degree curve provides a rolling resistance equivalent to that of a 0.04% grade.

To accurately determine the impact of additional trains or the construction of tracks and crossover connections a model which represents real world conditions is required.

The method used for this study involved input of data into dynamic train simulation software. Basic equipment and track structure data was collected



and fed into the model. Parameters were set based on railway algorithms and industry standards.

Next the model was calibrated based on FEC historical data by comparing data of real operations against the model output to ensure the results were comparable.

After this calibration an FEC baseline "No Build" was established using projected 2016 freight volumes to determine the level of train performance based on proposed infrastructure. This became the baseline to determine the impact of new passenger and commuter rail operating scenarios on the FEC.

Finally, the proposed additional commuter train schedules were input into the model and the network performance output was evaluated to determine if the proposed train service(s) could operate over the given infrastructure at an acceptable level for all parties. Where train service was not meeting performance targets. infrastructure such as tracks, turnouts, equipment, etc., was added until execution of service was at an acceptable level. This involved many iterations of simulations.

1.4 Study Area

The study area shown in Figure 1.1 included two railroads, the FEC and a portion of CSXT's Miami Subdivision on which Tri-Rail currently operates a commuter rail service. These two lines run parallel in South Florida and have tracks connecting them in some locations.

1.4.1 FEC

FEC's track was modeled between Jacksonville and Miami, Florida including most yards and industrial connections. Modeling the entire corridor allowed for a better understanding of the downstream effects new traffic patterns may create.

Figure 1.1 - Study Area



1.4.2 South Florida Rail Corridor

The South Florida Rail Corridor ("SFRC") includes a portion of CSXT's Miami subdivision over which Tri-Rail currently operates. The model included the track between milepost (MP) 961, north of Mangonia Park and MP 1037.5, at the Miami International Airport (MIA).



2.0 Calibration

2.1 Methodology

To ensure accurate modeling of the rail lines, initial calibration of the model is necessary. As train performance and train meeting locations will vary from day to day, the goal is not to exactly replicate train moves and delays from any particular time period, but to model similar operating conditions. The FEC line was used to develop calibration factors since the FEC provided time-distance graphs illustrating actual train performance from October 1, 2011 to October 24, 2011. The duration of each model was 36 days and 12 hours, including warm-up and cool-down time, which is a limit imposed by RTC.

2.2 Calibration Data

2.2.1 Working RTC Model

The Phase Two SFECC study team provided the initial RTC model, which had been received directly from FEC. This model was compared to the FEC Track Charts and Time Table to determine its accuracy. Any discrepancies found were corrected and the model was subsequently updated to run on the latest RTC software platform.

2.2.2 FEC Time Table No. 39

A copy of FEC's Employee Time Table Number 39, dated October 1, 2007, was obtained from the Phase Two study team. It was used to verify the accuracy of the RTC model and contained

information regarding maximum speeds, turnout location and configuration, signal locations, crossing locations, and operating instructions.

2.2.3 FEC Track Charts

The FEC Condensed Track Chart, Crossing Guide, and Industry Track Ownership, dated January 1, 2004 was provided by the Phase Two study team. This information aided in confirming that the curvature and grade data for the FEC line in the RTC model was accurate.

2.2.4 FEC Time Distance Graphs

Time Distance (TD) Graphs or string graphs for Oct 1, 2011 to Oct 24, 2011 were provided by the FEC. These graphs depict historical data of trains that used the main track on the FEC line during this time period and were instrumental in understanding how the FEC typically operates. By analyzing these graphs, train time by location and dwell times could be determined.

2.2.5 FEC Typical Train Consist Information (Through Freights)

The FEC provided a spreadsheet titled "FDOT Meeting FEC Railway Trains 4-21-11". This document contained typical train configurations, including the number and type of locomotives, car counts, train length, and tonnage for existing through freights. The information found in this document is summarized in Table 2.1 and Table 2.2



PRELIMINARY PROJECT DEVELOPMENT REPORT APPENDIX 3

	Table 2.1 - Southbound FEC Through Freight									
TRAIN	DEPARTED	ARRIVED	POWER	HPPT	COUNT	I/M	AUTO	MNFT	LENGTH	TON
101-21	BOWDEN	HIALEAH	100-102	8600	62-0-1	63	0	0	10,771	8,421
107-11	BOWDEN	HIALEAH	101-140	8600	54-0-0	46	0	8	10.782	8,480
119-21	BOWDEN	FTPIERCE	413-429	6000	65-0-23	19	0	68	7,227	9,471
121-21	BOWDEN	HIALEAH	720-716-711	9000	87-0-4	42	33	16	11,012	10,358
123-21	BOWDEN	FT LAUD	715-439	6000	16-0-1	15	0	2	2,666	2,506
141-21	BOWDEN	CITY PT	412-425	6000	65-0-0	0	0	65	3,273	8,660
143-21	FTPIERCE	MEDLEY	426	3000	4-0-106	0	0	110	5,331	3,785

	Table 2.2 - Northbound FEC Through Freights									
TRAIN	DEPARTED	ARRIVED	POWER	HPPT	COUNT	I/M	AUTO	MNFT	LENGTH	TON
202-21	HIALEAH	BOWDEN	702-710	6000	26-0-68	26	20	48	9,272	5,178
210-21	HIALEAH	BOWDEN	107-104	8600	53-0-0	53	0	0	8,883	5,103
222-21	HIALEAH	BOWDEN	106-141	8600	28-0-48	28	0	48	6,828	8,320
224-21	FT LAUD	BOWDEN	421-422	6000	36-0-15	36	0	15	6,756	4,778
226-21	HIALEAH	BOWDEN	415-419	6000	46-0-0	46	0	0	8,112	6,233
240-21	CITY PT	BOWDEN	412-507	5850	5-0-42	0	0	47	2,165	1,955
336-21	MEDLEY	CITY PT	103-704	7300	151-0-0	0	0	151	6,664	18,925

Note: HPPT = Horsepower; I/M = Intermodal; MNFT= Manifest

2.2.6 FEC Local Train Plan

In addition to Through Freights, FEC operated local trains or "Way Freights". FEC provided a Local Train schedule shown in Table 2.3.

Actual operating patterns for these trains were confirmed using the TD graphs for the month of October 2011.

Table 2.3 - FEC Local Trains					
TRAIN	FROM	ТО	ORIGIN	DAYS	
ID	MP	MP	TIME	OPERATING	
905	007	067	8:30AM	MO/WE/FR	
910	127	95	6:00AM	MO-FR	
915	154	180	4:30AM	MO-FR	
920	242	180	6:00AM	MO/WE/FR	
920	242	282	6:00AM	TU/TH	
928	242	K15.5	4:00AM	MO-FR	
930	242	K15.5	1:00PM	TU-SA	
932	242	K15.5	4:30PM	MO-FR	
903	242	K15.5	5:45AM	SA	
903	242	K15.5	1:00AM	MO	
937	242	318	9:30AM	MO-FR	
960	343	321	9:00AM	MO-FR	
963	343	351	1:00AM	TU-SA	
965	343	369	8:00AM	MO-FR	
970	343	343	4:00PM	MO-SA	



2.3 Results

A chart of the calibration comparison results (average run time) can be found in Figure 2.1. The average outcome of the RTC model was compared to the real world data contained in the TD graphs and the results varied by approximately 1.0%. This variance is considered acceptable and the parameters developed in calibrating this model were used in subsequent simulations of this rail network.

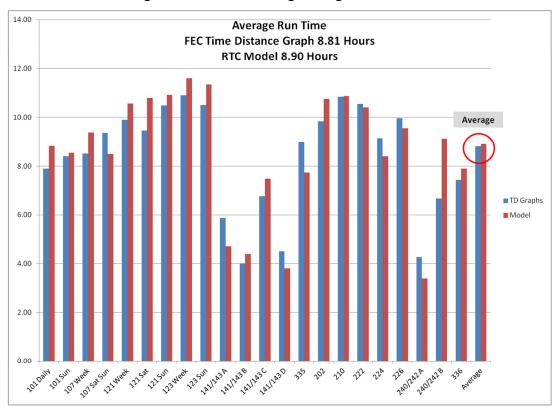


Figure 2.1 - FEC Average Freight Run Time



3.0 Baseline Development

3.1 Baseline Purpose

Baseline FEC 2016 freight network simulations were developed, including future years of growth, to measure the rail network performance prior to the addition of commuter rail traffic. Once developed these future performance values represent a baseline for all model comparisons.

RTC provides many network performance indices and measures. Of these FEC considers two measures vital to their operations: On Time Performance (OTP) and re-crew rate.

3.1.1 OTP

FEC defines a train as being on time when it arrives at its final destination on or before its scheduled arrival time.

3.1.2 Re-Crew Rate

Re-crew rate is measured as the percentage of train crews which are on duty for more than 12 hours before reaching their destination. For the purpose of calculating the simulated re-crew rate, a half hour of on-duty time was allowed for each train crew prior to their scheduled departure at the originating terminal.

3.2 Baseline Input Data

3.2.1 FEC Proposed Trains

FEC provided a proposed train schedule for their 2016 through freight operation. The 2016 schedule included 28 trains, 14 southbound and 14 northbound. Not all of the trains are scheduled to operate daily, or over the entire corridor, and Table 3.1 indicates the proposed through freights by track segment.

Table 3.1 - FEC 2016 Through Trains by Segment					
FROM	TO	MIN	MAX	AVG	
JUPITER	WPB	20	26	24	
WPB	FT LAUD	18	24	22	
FT LAUD	LITTLE RIVER	20	14	18	
LITTLE RIVER	PORT OF MIAMI	0	4	3	

In addition to the proposed through freights the current local trains were retained with one exception. Train #970, will have its activities relocated away from the main track with the implementation of proposed track improvements at Fort Lauderdale and as a result was not modeled.

3.2.2 FEC Proposed Infrastructure Improvements

The planned FEC infrastructure improvements currently include:

- Capacity improvement at Hialeah Yard (allowing trains to simultaneously enter and depart);
- Extension of intermodal tracks at Bowden Yard and improved capacity in the terminal;
- FEC Hypoluxo double track between Hypoluxo and Villa Rica;
- Freight forwarding yard, with an additional siding from North Ojus to South Ojus;
- FEC double track from NW 74 Street (Medley) to NW 121 Street (Hialeah);
- Pineda Causeway grade separation; and,
- FEC Miami freight forwarding yard.

In addition, the maximum freight speed will be raised to 70 miles per hour (mph) from 60 mph (permanent slow orders for curves, crossings, and drawbridges will remain).



3.2.3 Amtrak Proposed Passenger Service

A proposed Amtrak passenger service will contribute to the baseline model. Phase I of the proposed FEC corridor service development plan indicates there will be a daily service of one northbound train (#870) and one southbound train (#877). This plan would have the current 'Silver Star' service being split at Jacksonville with a portion of the train continuing on the FEC corridor to Miami.

3.2.4 Amtrak Proposed Infrastructure Improvements

In order to accommodate passenger train service (up to 90 mph), as well as the existing FEC freight service, Amtrak has proposed the following infrastructure improvements:

- Eight new stations between Jacksonville and Miami;
- New 2,500 foot long sidings for each station;
- Track signal control;
- Surface replacement track work of existing FEC line (29 curve miles);
- New railroad crossings (only at sidings); and,
- Track improvements on the Northwood Connection (from the FEC to the SFRC) in Palm Beach County.

3.3 Baseline Methodology

The RTC model developed in the Calibration step was updated to reflect the track configuration and train schedule in a future year, 2016. FEC's short term proposed track construction and projected trains (2016 FEC schedule) were used to develop a baseline to which future results were compared. The baseline model also included projected Amtrak trains and station tracks.

3.4 Baseline Results

Performance output was measured on FEC's through freight trains only as local freight train operations are non-linear and difficult to measure. Local freights are typically given a lower priority than through freights and will use the main track to move between yards and spurs only when this will not impede other through trains. Based on the

proposed infrastructure as previously stated, the network performance was as follows:

The 2016 baseline model results indicated there were 29 re-crews out of 832 through trains representing a re-crew rate of 3.4%.

Table 3.2 shows the model results for OTP divided into various FEC train types.

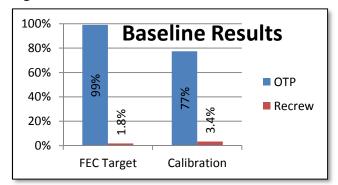
Table 3.2 - FEC OTP				
TRAIN TYPE	TRAIN COUNT BASE	OTP% BASE	TRAIN TYPE	
UPS	91	86	UPS	
INTERMODAL	523	81	INTERMODAL	
AUTO	39	63	AUTO	
EMPTY ROCK	25	100	EMPTY ROCK	
LOADED UNIT	25	100	LOADED UNIT	
MANIFEST	138	35	MANIFEST	
AVERAGE	832	78	AVERAGE	

3.5 Baseline Summary

The baseline modeling results indicate the FEC's projected daily train volume of 28 daily trains with their proposed infrastructure investments would result in 78% of their through freights arriving at their destination on time. In addition, 3.4% of these trains would be on duty in excess of 12 hours and require re-crewing. These values represent the baseline targets and subsequent model results were compared to these figures.

It should be noted that the projected train performance as shown in Figure 3.1 does not meet FEC's current targets of 99% OTP and re-crew of

Figure 3.1 - FEC Baseline Results





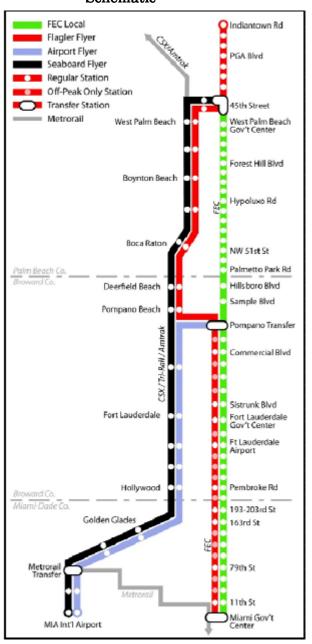
4.0 Phase Two System Master Plan

Extensive modeling was performed by the Phase Two study team using a proposed commuter schedule consisting of a total of 318 daily trains as shown in Table 4.1 and Figure 4.1. These trains were divided between four different routes serving 51 new stations in addition to the existing Tri-Rail stations on the CSXT line.

Table 4.1 - Pl	Table 4.1 - Phase 2 System Master Plan Train Volumes					
SERVICE	SOUTHBOUND	NORTHBOUND				
FEC LOCAL	51	55				
FLAGLER FLYER	49	50				
AIRPORT EXPRESS	46	44				
SEABOARD FLYER	12	11				
ALL SERVICES	158	160				
AVERAGE	832	78				

The Phase Two results indicated that this ambitious volume of trains required significant track construction which included a primarily triple track FEC corridor with sections of double and quadruple track.

Figure 4.1 - Phase 2 System Master Plan Schematic





5.0 Initial Build Alternative

To reduce the capital requirements to support the Tri-Rail Costal Link service, the Phase Two System Master Plan was modified by reducing the number of stations and the frequency of commuter rail trains. Reduction in the number of stations permitted the removal of express commuter trains due to the decreased runtime for local commuter trains.

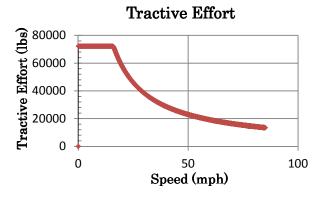
5.1 Equipment

The proposed commuter trains would consist of one locomotive, two bi-level passenger cars and one bi-level cab car.

5.1.1 Locomotives

The South Florida Regional Transportation Authority (SFRTA) provided specifications for their newly purchased four-axle diesel electric Brookville BL36PH locomotives which were incorporated into the model as shown in Figure 5.1. These locomotives feature a 66.2 gear ratio which improves the acceleration characteristics.

Figure 5.1 - BL36PH Tractive Effort Curve



5.1.2 Rail Cars

The model included bi-level cars similar to what Tri-Rail is currently using. AW2 train passenger loading standard was modeled which represents a fully seated with light standing passenger load.

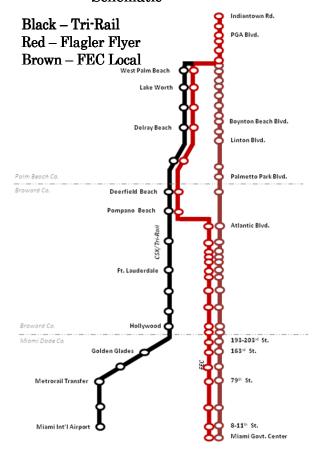
5.2 Commuter Schedules

This scenario included three separate routes with 154 daily trains serving 53 stations on the FEC and SFRC corridors.

5.2.1 Flagler Flyer

The Flagler Flyer as shown in Figure 5.2 would operate on both the FEC and SFRC corridors between Indiantown Road in Jupiter and the Miami Government Center in downtown Miami. Southbound trains would originate at Indiantown Road in Jupiter on a peak 30-minute frequency with hourly service off peak. The trains would proceed south to the Northwood Connection and use a connecting track at Northwood to access the SFRC corridor. After proceeding south on the SFRC corridor to Pompano the trains would then return to the FEC corridor via the Pompano Connection and complete their journey to the Miami Government Center in downtown Miami. This route would have 52 daily trains serving 23 stations on the FEC line and 7 stations on the SFRC line. Northbound trains would operate at the same frequency following the same route.

Figure 5.2 - Initial Build Alternative Schematic





5.2.2 FEC Local Service

The FEC Local service shown in Figure 5.2 would operate entirely on the FEC corridor from 45th Street in West Palm Beach to the Miami Government Center in downtown Miami. This route would have 52 daily trains servicing 31 stations. Frequency would be 30-minute peak with an hourly service off peak.

5.2.3 Modified Tri-Rail Service

The existing Tri-Rail service shown in Figure 6 would be modified by changing the northern terminus from Mangonia Park on the SFRC line to West Palm Beach, 45th Street, on the FEC line. This would create a transfer station with all three services converging at the 45th Street station. In addition, modifications to the current schedule would be required. Tri-Rail currently runs a 20-minute peak service between 6:00 and 7:00 AM. To enable the Flagler Flyer to mesh with, and not conflict with, the Tri-Rail service, standardization of the Tri-Rail headways was required. The Tri-Rail schedule was modified to provide 30-minute peak and hourly off peak frequencies while maintaining 50 daily trains.

5.3 Commuter Rail Layover and Maintenance Facilities

Two new layover facilities were modeled for this scenario.

5.3.1 Little River

This site is located to the south of the FEC main line approximately one mile west of the Little River Junction. A connection would be required in the southwest quadrant at Little River Junction to allow equipment moves between the vehicle maintenance facility and the Miami Government Center station.

5.3.2 West Palm Beach

An underutilized yard currently exists west of the FEC main line just south of the proposed Northwood Connection connecting track. For the purpose of modeling this was used as a staging location for train equipment sets.

5.4 Results

The first modeling attempt indicated additional infrastructure was required to provide acceptable train performance. Infrastructure was incrementally added to determine the minimum track required to provide, both an acceptable level of performance for the proposed commuter trains, and FEC freight performance levels comparable to the baseline simulation results.

5.4.1 Track Requirements

Three tracks were required on the FEC from Jupiter to the Miami Government Center. This included three tracks over the New River Bridge in Fort Lauderdale requiring an expensive expansion of the structure or possibly the construction of a new high level bridge. 30 mph connecting tracks were also required between the FEC and SFRC corridors at the Northwood and Pompano Connections.

5.4.2 Equipment Requirements

Thirty-six train sets were required in addition to any spares. There are 11 for the modified Tri-Rail service, 13 for the Flagler Flyer, and 12 for the FEC Local service.

5.4.3 Train Performance

With this added infrastructure the following performance levels: were achieved:

- FEC OTP 76.3% (Target 78%)
- FEC Re-crew 1.1% (Target 3.4%)
- Tri-Rail Coastal Link OTP 82% (Target 95%).

It should be noted that unlike the FEC which considers a train on time if it arrives at its terminus at or before its scheduled arrival time, Tri-Rail considers a train on time of it arrives less than six minutes after its scheduled arrival time. This current Tri-Rail OTP threshold was used for all Tri-Rail Coastal Link trains.

5.4.4 Observations

Detailed review of the results, which included delay by location statistics and simulation animations revealed the following complications.



5.4.5 Directional Running

To allow the network to accommodate the proposed volume of trains, directional running was required. Tri-Rail Coastal Link southbound trains were routed on the westward track while and northbound operated on the eastward track. This arrangement left the center track open for FEC freight trains with limited availability on the east and west tracks for freight train meets.

5.4.6 Single Track Freight Running

With the Flagler Flyer and the FEC Local commuter rail lines operating between the Pompano Connection and Little River Junction, the east or west tracks were not available for FEC freight trains during the Tri=Rail Coastal Link operating hours of 04:00 to 23:59. In addition, freight trains were restricted to the center track north of the Pompano Connection during the Tri-Rail Coastal Link peak periods. These restrictions hampered the ability of FEC freight trains to meet and pass one another.

5.4.7 Conflicting Routing

The proposed Tri-Rail Coastal Link routing had the Tri-Rail Coastal Link trains crossing over the center freight track at four locations thus limiting the opportunity for a freight train to proceed without impeding a higher priority passenger train at these locations.

5.5 Summary

While this Initial Build Alternative required less additional infrastructure than the Phase Two System Master Plan, the reduction in capital requirements was not proportional to the reduction in service.



6.0 SFRTA Fast Start

SFRTA developed a Fast Start Enhanced Service Integration schedule which was also modeled and tested.

6.1 Schedule

This scenario shown in Figure 6.1 included four services providing access to 47 stations on the FEC and SFRC lines using an integrated schedule which maximized the use of available equipment.

6.1.1 Orange Line

The Orange Line would operate 26 daily trains between Mangonia Park and MIA over the SFRC line.

6.1.2 Blue Line

The Blue Line would operate 24 daily trains between Mangonia Park and the Miami Government Center on the FEC line. This service would use the SFRC line north of Pompano, transfer to the FEC at Pompano using a new connecting track between the SFRC and FEC, and operate on the FEC line south of Pompano.

6.1.3 Green Line

The Green Line would operate 26 daily trains between the Fort Lauderdale Government Center and the Miami Government Center on the FEC line.

6.1.4 Gulf Stream

The Gulf Stream Line would operate 6 trains a day on the FEC line between Indiantown Road in Jupiter and the Miami Government Center.

6.2 Proposed Infrastructure

To support this Fast Start schedule, double track was proposed between MP 337 (North of Fort Lauderdale) and the Miami Government Center. In addition, a connecting track was required at Pompano to allow transfers between the SFRC and FEC rail lines.

6.3 Results

The model results indicate that the infrastructure proposed was insufficient to support the contemplated schedule. FEC freight OTP was at 26% with a re-crew rate of 35%. These results miss

the target of 78% OTP and 3.4% re-crew by a significant margin.

Figure 6.1 - Fast Start Schematic



The commuter train OTP was at 73%. Note this OTP was measured at the termini only as this schedule was developed with less focus on arrival and departure times at intermediate stations.

6.4 Summary

The Fast Start schedule minimizes commuter rail equipment requirements through the use of efficient train cycling but will require additional infrastructure on the FEC line to provide acceptable performance results.



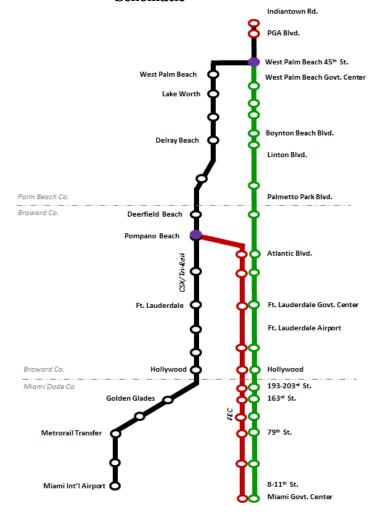
7.0 Interim Build Alternative

In an effort to reduce infrastructure requirements the Initial Build Alternative was modified to create the Interim Build Alternative.

7.1 Schedule (Option 1)

This schedule includes three separate routes as shown in Figure 7.1 with 122 daily trains serving 37 stations on the FEC and SFRC corridors.

Figure 7.1 - Interim Build Alternative Schematic



7.1.1 Red Line

The Red Line would operate 48 daily trains between Pompano Beach on the SFRC line and Miami Government Center in downtown Miami on the FEC line. This route would serve 12 stations with a 30-minute peak service and operate hourly off peak. The scheduled arrival and departure times at Pompano Beach are coordinated with the

Black Line to allow transfers between the two services. This will allow a passenger to access points north of Pompano Beach on the SFRC line from downtown Miami or vice versa.

7.1.2 Black Line

The existing Tri-Rail service would be modified by changing the northern terminus from Mangonia Park on the SFRC line to Toney Penna Drive in Jupiter on the FEC line. In addition, every second train would short turn at the 45th Street Station in West Palm Beach. The Tri-Rail schedule was modified to provide 30-minute peak and hourly off peak frequencies south of West Palm Beach while maintaining 50 daily trains. As every second train would turn at West Palm Beach the frequency of service between West Palm Beach and Jupiter would be hourly during the peak and every two hours off peak. In addition, the arrival and departure times at Pompano Beach were scheduled to allow passengers access to the downtown Miami market via the Red Line.

7.1.3 Green Line

The Green Line would operate entirely on the FEC corridor from 45th Street in West Palm Beach to the Miami Government Center in downtown Miami. This route would have 24 daily trains servicing 18 stations. Frequency would be one hour peak with two hour service off peak.

7.2 Schedule Options

Several options to the originally developed Interim Build Alternative schedule were presented by stakeholders. These alternates were modeled where applicable and would require minimal, if any, infrastructure changes to support them.

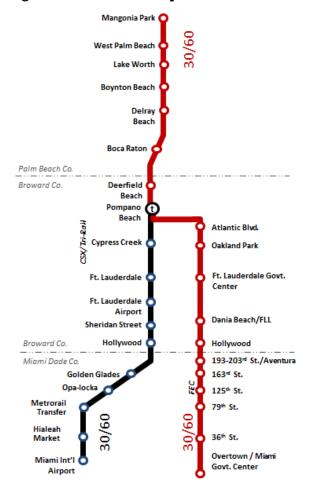
7.2.1 Red Line Option 2

Modification to the Interim Build Alternative would have the Red Line shown in Figure 7.2 extended north to Mangonia Park. This would occur in conjunction with a shortened Black Line which would only service stations between Pompano Beach and MIA. Again the schedule would be such as to allow passengers to transfer between the Red and Black Lines at Pompano Beach. This arrangement would operate the same number of trains over each segment of track and would not



require a change in the proposed infrastructure to support it.

Figure 7.2 - Red Line Option 2 Schematic

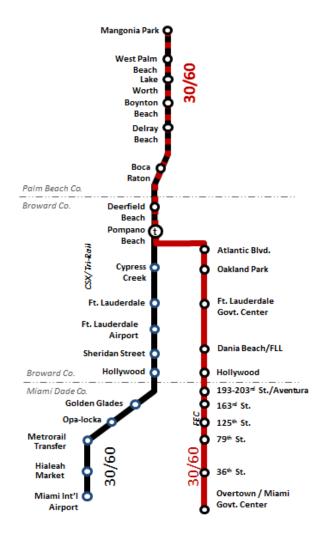


7.2.2 Red Line Option 3

This option, as shown in Figure 7.3, would have trains alternating between Option 1 and Option 2. To clarify, southbound train #1 would operate from Mangonia Park to MIA with a corresponding train originating at Pompano Beach destined for the Miami Government Center. Southbound train #2 would operate from Mangonia Park to the Miami Government Center with a connecting train originating at Pompano Beach destined for MIA. This alternating cycle would continue for each subsequent train with the northbound trains also alternating in the same manner. schedule would be such as to allow passengers to transfer between the Red and Black Lines at Pompano Beach. This arrangement would operate the same number of trains over each segment of track and would not require a change in the proposed infrastructure to support it.



Figure 7.3 - Red Line Option 3 Schematic



7.2.3 Red Line Option 4

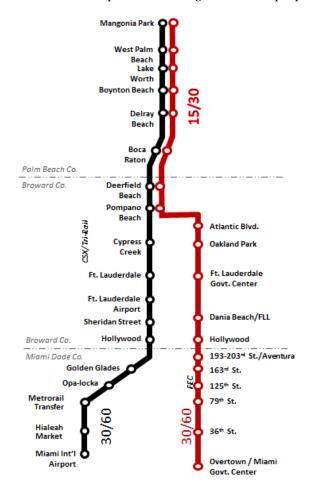
This option, as shown in Figure 7.4, would have both the Red and Black Lines extending northward to Mangonia Park. This removes the need for a transfer at Pompano Beach and doubles the frequency of trains north of Pompano Beach. This scenario was modeled and it was determined that the double track infrastructure currently on the SFRC line was sufficient to accommodate the increased train frequency.

7.2.4 Red Line Option 5

This schedule offered a hybrid of Options 2 and 4 which allowed for one seat rides during peak hours and transfers at Pompano Beach off peak for trips between stations north and south of Pompano Beach on the SFRC corridor. This arrangement would operate fewer trains than Option 4 and

Figure 7.4 - Red Line Option 4 Schematic

would not require a change in the proposed



infrastructure to support it.

7.2.5 Black Line Option 2

The original Black Line was modified to change the terminus of the short turn from 45th Street in West Palm Beach to the existing Tri-Rail station at Mangonia Park. This would have the trains alternating between Mangonia Park and Jupiter and allow a reduction in the number of station tracks at the 45th Street station.

7.2.6 Green Line Option 2

The Green Line Option 2 would move the northern terminus from 45th Street in West Palm Beach to Toney Penna Drive in Jupiter. This option would require an additional 2.75 mile long siding between West Palm Beach and Jupiter.



7.3 Results

Once again the initial results indicated that additional infrastructure was required to provide acceptable train performance. Infrastructure was incrementally added to determine the minimum track required to provide, both an acceptable level of performance for the proposed commuter trains, and FEC freight performance comparable to the baseline simulation results.

7.3.1 Track Requirements

Table 7.1 lists the required infrastructure to support the various Interim Build Alternative schedules as well as the individual segments. This level of investment was required to produce the results illustrated in Figures 7.5 and 7.6.

7.3.2 Equipment Requirements

A total of 19 train sets were required to accommodate the Interim Build Alternative schedule. There are six train sets required for the Red Line, nine for the Black Line and four for the Green Line.

7.3.3 FEC Freight Schedule Adjustments

The schedule provided by FEC resulted in complications when operated in conjunction with the Interim Build Alternative. Four southbound and four northbound FEC through freights were scheduled to operate through the study area during the Tri-Rail Coastal Link peak periods. Of these, northbound Train 208 scheduled to depart Hialeah Yard at 15:00, was able to proceed as scheduled. The other seven trains conflicted with the Tri-Rail Coastal Link peak schedule as follows and as shown in Table 7.2.

Southbound Train 101 was scheduled to depart Bowden at 11:00 destined for Hialeah Yard. This would place the train between Jupiter and Little River Junction at 19:00. Setting this train back one hour to depart at 12:00 would place it in the study area after the afternoon peak period and resolve the conflicts.

Southbound Train 103 was scheduled to depart Bowden at 12:00 and as a result conflicted with the

rescheduled Train 101. Setting this train back by 45 minutes to a 12:45 departure time alleviated this issue.

Southbound Train 121 was scheduled to depart Bowden at 22:00 with a scheduled arrival time at Hialeah Yard of 08:30. This would place the train in the study area during the peak period resulting in numerous conflicts. Advancing this train by one hour, to depart Bowden at 21:00, addressed this issue.

Southbound Train 117 was scheduled to depart Bowden at 21:00 and as a result conflicted with the rescheduled Train 121. Advancing this train by 30 minutes for a 20:30 departure time alleviated this issue.

Northbound Train 210 was scheduled to originate out of the yard in Fort Lauderdale at 17:00. This is during the height of the afternoon rush where the Green and Red lines operate a combined three times per hour in each direction. The model indicated that on most days train 210 was unable to find an opportunity to join the flow of traffic. Setting its departure time back three hours to 20:00 resolved this problem.

Southbound Train 212 which was scheduled to depart West Palm Beach for Bowden at 18:00 demonstrated a similar issue. During the peak period West Palm Beach becomes quite busy with both the Green and Black lines operating in this area. Although station tracks were modeled which removed the Tri-Rail Coastal Link trains from the main track while dwelling, Train 212 was unable to find an opportunity to depart the yard and enter the flow northward.

Northbound Train 216 was scheduled to depart the Port of Miami at 17:30. This placed this 9,000 foot long train in the middle of the afternoon peak period where the Red and Green lines operate a combined three trains per hour in each direction. Setting this train back three hours for a scheduled departure time of 20:30 alleviated the congestion related to this train.





Table 7.1 - I 1	Table 7.1 - Interim Build Alternative Requirements						
INFRASTRUCTURE REQUIREMENTS	INTERIM BUILD	RED 1	RED 2	BLACK 1	BLACK 2	GREEN 1	GREEN 2
STUB STATION TRACK AT TONEY PENNA	√			✓	~		✓
NEW SIDING 285.2 – 288.3 (3.1 MILES)	√			✓	✓		✓
STUB STATION TRACKS AT 45TH ST (+2 THROUGH TRACKS)	2			1		1	
SINGLE TRACK NORTHWOOD CONNECTION (SW-NE)	√			✓	~		
EXTEND EXISTING HYPOLUXO SIDING NORTH TO 306.6 (3.8 MILES)	✓					✓	✓
2 STATION TRACKS AT POMPANO BEACH (+EXISTING TRI-RAIL)	✓	√	✓				
DOUBLE TRACK POMPANO CONNECTION	✓	√	✓				
DOUBLE TRACK POMPANO TO FORT LAUDERDALE	√	✓	√				
DOUBLE TRACK FORT LAUDERDALE TO MIAMI GOV'T CENTER	~	√	~			~	✓
STATION TRACKS AT MIAMI GOV'T CENTER	3	2	2			2	2

Table 7.2 - FEC Through Freight Scheo	lule
Modifications	

Modifications				
TRAIN	ORIGINAL DEPARTURE	ADJUSTMENT	PROPOSED DEPARTURE	
101	11:00	+ 1 HOUR	12:00	
103	12:00	+ 45 MINUTES	12:45	
117	21:00	- 30 MINUTES	20:30	
121	22:00	- 1 HOUR	21:00	
210	17:00	+ 3 HOURS	20:00	
212	18:00	+ 2 HOURS	20:00	
216	17:30	+ 3 HOURS	20:30	

7.3.4 Model Performance

With the infrastructure indicated and modifications to seven FEC through freight departure times, the model indicated acceptable network performance with the Interim Build Alternative. Figures 12 and 13 indicate the OTP and FEC re-crew rates for the complete Interim Build Alternative as well as with options 1 and 2 for each line or segment individually.

Table 7.3 defines the individual segments as presented in the results graphs in Figures 12 and 13.

Table 7.3 - Segments Defined				
LINE	OPTION	SEGMENT		
RED	1	A1		
RED	2	A2		
BLACK	1	B1		
BLACK	2	B2		
GREEN	1	C1		
GREEN	2	C2		



Figure 7.5 - Interim Build Alternative OTP

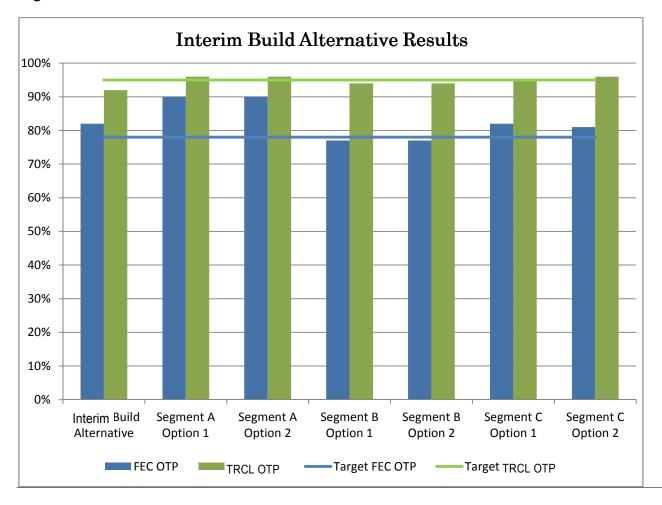
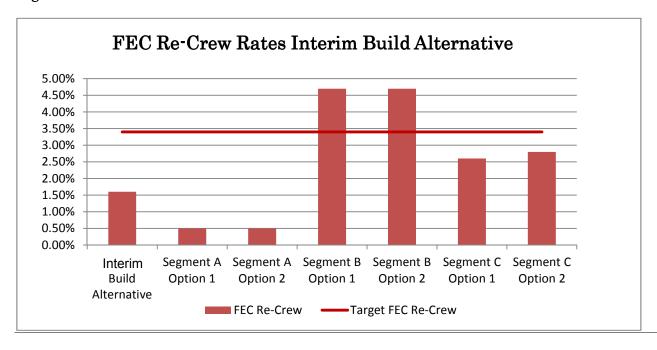


Figure 7.6 - Interim Build Alternative Re-crew Rate





8.0 All Aboard Florida Initial Modeling

In early 2012 Florida East Coast Industries, Inc. (FECI), announced a new passenger service, All Aboard Florida (AAF), which will operate on the FEC rail line through the Tri-Rail Coastal Link study area.

Recognizing that the implementation of this service would have a significant impact on scheduling and infrastructure needs modeling with the addition of AAF trains was initiated immediately. At the time of this modeling there were two primary publicly available sources providing details regarding the proposed service. Each of these scenarios was modeled with and without the proposed Tri-Rail Coastal Link trains to determine impacts on train performance and infrastructure requirements. Both scenarios were modeled to develop a range of infrastructure requirements based on available sources.

8.1 AAF Environmental Assessment

An Environmental Assessment (EA) and Section 4(f) Evaluation for the AAF West Palm Beach to Miami Passenger Rail Project was prepared jointly by All Aboard Florida – Stations LLC and All Aboard Florida – Operations LLC.

This document contained information regarding the proposed passenger service between West Palm Beach and the Miami Government Center. It also included train frequencies and detailed track diagrams showing track configurations and maximum allowable train speeds.

With this scenario both the frequency of trains and the initial track configuration changed since the original baseline performance level was determined. Either of these factors warrants the recalculation of baseline levels.

8.1.1 Infrastructure

Appendix E of the EA document contained detailed track charts for the FEC corridor between MP 295 and MP 366 (Miami Port Lead MP 5). These charts indicate a predominately double track corridor for this entire area. Single track was retained on several river crossings located at mile points 304.05, 311.45, 326.58, 337.90 to 338.52, 353.74.

and 356.53. The proposal also provided single track between the bridges at 337.90 and 338.52. Number 24 turnouts were proposed at the single track locations as well as for crossovers between the two main tracks. Sixty mph was assumed as a maximum speed when taking the diverging route for these turnouts.

Appendix E also indicated maximum allowable speeds which provided for speed increases over the majority of the study area.

8.1.2 FEC Freight Schedule

"Table 1-1.1 FEC Corridor Usage 2006 and Proposed Opening Year of 2015" in the EA document indicated a daily FEC through freight count of ten with an average length of 8,837 feet. Recognizing the fact that the trains presented in the FEC 2016 Freight Schedule do not operate every day or over the entire corridor, 12 of the 28 trains from the 2016 schedule were modeled.

8.1.3 AAF EA Passenger Schedule

Section 1.3.2 of the EA indicated 16-19 roundtrip AAF trains daily which would consist of 2 X 65' long locomotives and 7 X 85' passenger cars with a possibility of two additional coaches for a train length of 900 feet. P42 locomotives and AW1 was assumed for these trains.

Sixteen daily AAF round trips were modeled between West Palm Beach and the Miami Government Center with trains originating hourly from 05:30 until 20:30.

8.1.4 AAF EA Baseline

A baseline level of service as shown in Table 8.1 was first developed with the AAF EA and FEC freight trains on the infrastructure presented in the EA documentation. Once again OTP and re-crew rate were used to measure FEC freight performance. A fully developed schedule for the AAF EA trains was not available so runtime was used to allow comparison of performance levels before and after the addition of the Tri-Rail Coastal Link trains.



Table 8.1 - AAF EA Baseline Values				
MEASURE	VALUE			
FEC THROUGH FREIGHT OTP	100%			
FEC THROUGH FREIGHT RE-CREW RATE	0%			
AAF RUNTIME MINUTES (WPB – MGC)	72			

8.1.5 Additional Baseline Capacity

The baseline results for this scenario indicate 100% FEC OTP and a 0% re-crew rate. This suggests there may be additional capacity available which could be used by additional FEC freights without affecting the performance level. Additional trains were incrementally added to the model using the 2016 FEC Through Freight schedule. Performance metrics were stable when up to 11 trains were added. This would indicate that the proposed baseline schedule and infrastructure has capacity for eight additional FEC through freight trains in addition to the AAF passenger trains as shown in Table 8.2.

Table 8.2 - AAF EA Baseline Trains Added			
SOUTHBOUND	NORTHBOUND		
103	204		
105	210		
109	216		
119	218		
121	220		
	224		

8.1.6 Tri-Rail Coastal Link Schedule

The most recent Tri-Rail Coastal Link schedule, the Interim Build Alternative, which has 122 daily trains serving 37 stations on the FEC and SFRC corridors, was modeled.

8.1.7 Track Requirements

To retain the network performance levels at the baseline values with the addition of the Tri-Rail Coastal Link trains additional infrastructure was required. This infrastructure included completion of the double track between West Palm Beach and Little River Junction as well as a siding between MP 285.2 and 288.3, plus a section of triple track

between Pompano and the New River Bridge in Fort Lauderdale as shown in Table 8.3.

Table 8.3 - AAF EA Infrastructure Summary				
EA ADDITIONAL INFRASTRUCTURE REQUIREMENT				
BRIDGES FROM 1 TO 2 TRACKS 5				
BRIDGES FROM 2 TO 3 TRACKS	1			
SINGLE UPGRADED TO DOUBLE TRACK	3 MILES			
DOUBLE UPGRADED TO TRIPLE TRACK	8 MILES			

8.1.8 Equipment Requirements

Equipment requirements remain the same as the Interim Build Alternative without the AAF for a total of 19 train sets plus spares.

8.1.9 Results

Table 8.4 presents the results for both the baseline and with the Tri-Rail Coastal Link trains. The Tri-Rail Coastal Link results were obtained when the infrastructure noted in the previous section was added.

Table 8.4 - AAF EA Modeling Results				
MEASURE	BASE	WITH TRCL		
FEC OTP (%)	100	100		
FEC RE-CREW RATE (%)	0	0		
AAF RUN TIME (MINUTES)*	72	85		
TRCL OTP (%)		100		

^{*} AAF Run Time represents the average travel time for all northbound and southbound trains between West Palm Beach and the Miami Government Center.



8.2 Surface Transportation Board Filing

A submission filed by All Aboard Florida Operations LLC ("AAF-O") and All Aboard Florida – Stations LLC ("AAF-S") was received by the Transportation Surface Board (STB) on October 9, 2012. This submission contains details on a proposed AAF passenger service which would operate between Orlando, Florida and Miami, Florida. The information contained in this submission was not as extensive as what was available in the EA document so additional assumptions were required as follows.

Similar to the AAF EA scenario recalculation of baseline levels was required.

8.2.1 Infrastructure Assumptions

The STB filing indicates that the AAF trains would join the existing FEC corridor at Cocoa but did not discuss a proposed track layout. A double track connection at MP 169.74, SR 528 in Cocoa was assumed. In addition, the model joined the existing sidings to create double main track between Cocoa and the Miami Government Center. Where the connections were made to existing sidings, a crossover, using high speed, 60 mph turnouts, was modeled. Speed tables were not available so the maximum speeds presented in Appendix E of the EA document were modeled for the section of track between West Palm Beach and the Miami The STB submission Government Center. mentions 110 mph maximum speed north of West Palm Beach. This higher speed was modeled where the current speed was 60 mph or higher maintaining, the current lower speed where applicable.

8.2.2 FEC Freight Schedule

The STB was silent on proposed freight traffic and as a result the full 2016 FEC schedule was modeled.

8.2.3 AAF STB Passenger Schedule

The STB filing mentioned 16-19 passenger train round trips daily between Orlando and the Miami Government Center. The route to Orlando would connect to the existing FEC corridor at SR 528 in Cocoa, approximately Mile 169.7.

The filing also indicated that the AAF trains would be 900 feet long with station stops at Orlando, West Palm Beach, Fort Lauderdale, and Miami Government Center. One P42 locomotive with AW1 loading was modeled and it was assumed that the station platform(s) would be available from both tracks.

Sixteen daily AAF round trips were modeled between Cocoa and the Miami Government Center with trains originating hourly from 05:30 until 20:30.

8.2.4 AAF STB Baseline

A baseline level of service was first developed with the AAF STB and FEC freight trains on the infrastructure summarized in the Infrastructure Assumptions Section 8.2.1. As with the AAF EA modeling, OTP, re-crew rate, and AAF runtime were used as measures as shown in Table 8.5.

Table 8.5 - AAF STB Baseline Values			
MEASURE	VALUE		
FEC THROUGH FREIGHT OTP	99%		
FEC THROUGH FREIGHT RE-CREW RATE	0%		
AAF RUNTIME MINUTES (COCOA – MGC)	200		

8.2.5 Tri-Rail Coastal Link Schedule

The most recent Tri-Rail Coastal Link schedule, the Interim Build Alternative, was modeled which has 122 daily trains serving 37 stations on the FEC and SFRC corridors.

8.2.6 Track Requirements

Additional infrastructure as shown in Table 8.6 was required to return the network performance levels to the baseline values with the addition of the Tri-Rail Coastal Link trains. The assumed infrastructure of double track between Cocoa and Miami Government Center needed to be supplemented with areas of triple track. Triple track was required between Jupiter (MP 284.2) and West Palm Beach (MP 296.6), Pompano (MP 332.4) and the New River Bridge (MP 341.2), and between the New River Bridge (MP 341.4) and Little River Junction (MP 360.2).



Table 8.6 - AAF STB Infrastructure Requirements			
EA ADDITIONAL INFRASTRUCTURE REQUIREMENT			
BRIDGES FROM 1 TO 2 TRACKS	0		
BRIDGES FROM 2 TO 3 TRACKS	8		
SINGLE UPGRADED TO DOUBLE TRACK	0 MILES		
DOUBLE UPGRADED TO TRIPLE TRACK	40 MILES		

8.2.7 Equipment Requirement

Equipment requirements remained the same as the Interim Build without the AAF for a total of 19 train sets plus spares.

8.2.8 Results

Table 8.7 presents the results for the baseline alone and with the Tri-Rail Coastal Link trains. The Tri-Rail Coastal Link results were obtained when the infrastructure noted in the previous section was added.

Table 8.7 - AAF STB Modeling Results					
MEASURE	BASE	WITH TRCL			
FEC OTP (%)	99	95			
FEC RE-CREW RATE (%)	0	0.3			
AAF RUN TIME (MINUTES)*	200	200			
TRCL OTP (%)		100			

^{*} AAF Run Time represents the average travel time for all northbound and southbound trains between Cocoa and Miami Government Center

8.3 AAF Summary

The modeling efforts provided a range of infrastructure requirements with two separate train levels provided by AAF documentation and without AAF trains should the AAF project not come to fruition.



9.0 Other Considerations

In addition to the capacity of the rail network the potential impact on other users of the corridor was explored, in particular to watercraft traversing the New River in Fort Lauderdale and the availability of the moveable bridge as shown in Figure 9.1 for water movements.

A significant increase in train traffic is proposed by FEC freight, AAF, and Tri-Rail Coastal Link. This would limit the time the New River Bridge is available for watercraft.

Figure 9.2 illustrates the average number of daily trains forecasted to traverse the New River based on projected growth in FEC freight traffic and with the addition of AAF and Tri-Rail Coastal Link trains. Subsequent modeling included a new "New River Bridge" which would reduce the impact to watercraft using the New River.

Figure 9.2 - New River Average Daily Trains

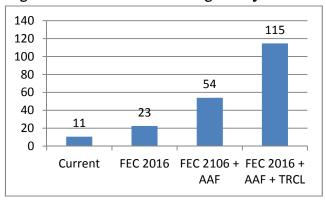
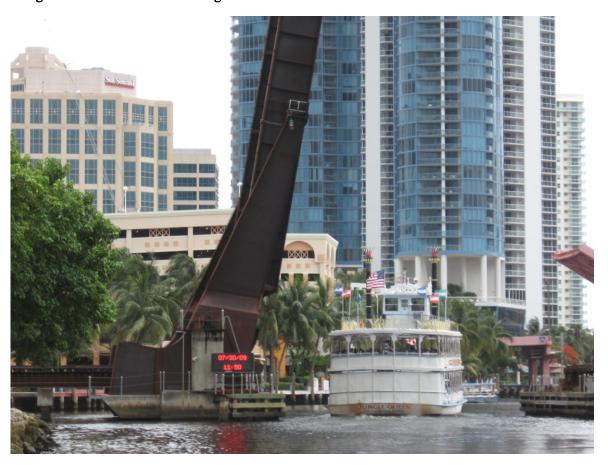


Figure 9.1 - New River Bridge





10.0 AAF Model

On July 18, 2013 AAF provided the study team with an RTC model which included all proposed trains and infrastructure improvements. This was a significant development which negated the modeling previously performed with the AAF trains.

10.1 AAF Proposal from Model

10.1.1 AAF Proposed Infrastructure

The model presented numerous infrastructure improvements proposed by AAF. A brief summary of these improvements follows:

- New track from Orlando to Cocoa 125 mph single and double track;
- Double track MP 166.9 to MP 233.4;
- Triple track MP 233.4 to MP 238.6;
- Double track MP 238.6 to MP 260.5;
- Single track MP 260.5 to MP 261.2;
- Double track MP 261.2 to MP 276.1;
- Triple track MP 276.1 to MP 280.8;
- Double track MP 280.8 to downtown Miami;
- Speed increases to predominately 110 mph from Cocoa to West Palm Beach and 79 mph from West Palm Beach to downtown Miami; and
- Most turnouts upgraded to 60 mph passenger speed.

10.1.2 AAF Proposed Passenger Schedule

AAF proposed to run 32 trains per day, 16 in each direction. Southbound trains were scheduled to depart Orlando every hour on the hour from 05:00 until 20:00 with stops at West Palm Beach 1:55 after departing Orlando, subsequent stop at Fort Lauderdale 2:29 after departing Orlando and arrival at Miami 3:10 after departing Orlando. Northbound trains were scheduled to depart Miami hourly starting at 06:00 until 21:00, stopping at Fort Lauderdale 0:31 after departing Miami, at West Palm Beach 1:07 after leaving Miami, and arriving at Orlando 3:10 after departing Miami.

10.1.3 FEC Freight Schedule

The AAF RTC model provided additional details on FEC's freight operations, in particular the routes and switching locations for the local freights.

10.1.4 Amtrak

The AAF RTC model did not include the two Phase One Amtrak trains proposed to operate on the FEC corridor between Jacksonville and West Palm Beach. Including these trains in the model without additional infrastructure to support them had a significant impact on the performance of all trains in the model. These trains were temporarily removed from the modeling to allow a direct comparison.

10.2 AAF Base Case

With the significant changes found in AAF's RTC model the baseline measures were no longer valid. To determine the impact of additional trains on the performance of both FEC and AAF trains a new base case was developed.

This base case included:

- AAF model joined to the SFRC model;
- Proposed AAF trains;
- Proposed FEC trains (2016);
- Existing Tri-Rail trains; and,
- Existing CSXT trains.

10.2.1 AAF Base Case Results

Table 10.1 shows the results from the AAF Base Case model.

Table 10.1 - AAF Model Base Case Results			
MEASURE	BASE		
AAF OTP	99.1%		
FEC FREIGHT OTP	94.7%		
FEC RE-CREW	4.7%		
FEC FREIGHT AVERAGE RUN TIME	9:22		



10.3 Interim Build Alternative v2

The information provided by AAF indicated that the current working schedule, Interim Build Alternative, would not provide an acceptable level of performance with the addition of the AAF trains. The most significant factor was the occupation of the station tracks in downtown Miami by the AAF trains which would only leave two tracks available for Tri-Rail Coastal Link trains. A revised version of the Interim Build Alternative schedule, referred to here as the Interim Build Alternative v2, which would better compliment the AAF schedule was developed and tested.

The Interim Build Alternative v2, as shown in Figure 10.1, maintained the same level of service but required the Red and Green Line trains to run closer together during the peak periods. In addition, there was a need for two trains to dwell in the same track in the Miami Government Center station, one on top of the other.

10.3.1 Red Line

The Red Line would operate 48 daily trains between Pompano Beach on the CSXT line and Miami Government Center in downtown Miami on the FEC line. This route would serve 12 stations with a 30-minute peak service and operate hourly off peak. The scheduled arrival and departure times at Pompano Beach are coordinated with the Black Line to allow transfers between the two services. This would allow a passenger to access points north of Pompano Beach on the SFRC line from downtown Miami or vice versa.

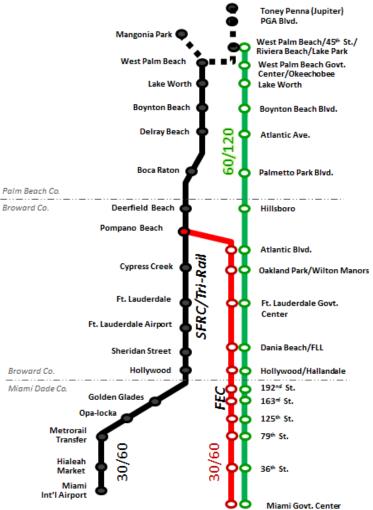
10.3.2 Black Line

The existing Tri-Rail service would be modified by alternating the northern terminus between the existing station at Mangonia Park on the SFRC line and Toney Penna Drive in Jupiter on the FEC line. The Tri-Rail schedule was modified to provide 30-minute peak and hourly off peak frequencies south of West Polm Peach while maintains.

south of West Palm Beach while maintaining 50 daily trains. As every second train would terminate at Mangonia Park with the alternate trains terminating at Toney Penna, the frequency

of service north of West Palm Beach on either route would be hourly during the peak and every two hours off peak. In addition, the arrival and departure times at Pompano Beach were scheduled to allow passengers access to downtown Miami via the Red Line.

Figure 10.1 - Interim Build v2 Schematic





10.3.3 Green Line

The Green Line would operate entirely on the FEC corridor from 45th Street in West Palm Beach to the Miami Government Center in downtown Miami. This route would have 24 daily trains servicing 18 stations. Frequency would be one hour peak with two hour service off peak.

10.4 Interim Build Alternative v2 Results

10.4.1 Train Performance

Table 10.2 shows the model results for Interim Build Alternative v2.

Table 10.2 - Interim Build Alternative v2 Results				
MEASURE	BASE	INTERIM BUILD v2		
AAF OTP	99.1	97.0%		
FEC FREIGHT OTP	94.7%	95.0%		
FEC RE-CREW	4.7%	4.7%		
FEC FREIGHT AVERAGE RUN TIME	9:22	9:39		

10.4.2 Track Requirements

To obtain the results shown in Table 10.2, the infrastructure improvements shown in Table 10.3 are over and above what is being proposed by AAF were required.

Table 10.3 - Interim Build v2 Track Requirements				
FROM	то	# OF TRACK	LENGTH	COMMENTS
284.20	284.65	1	0.45	STATION STUB TRACK
290.87	292.67	1	1.80	TRIPLE TRACK
299.18	301.06	1	1.88	TRIPLE TRACK
311.07	313.70	1	2.63	TRIPLE TRACK
332.45	337.42	1	4.97	TRIPLE TRACK
104.55	105.15	1	0.60	FREIGHT SIDING
323.43	323.64	1	0.21	FREIGHT SIDING
329.52	329.83	1	0.31	FREIGHT SIDING
TOTAL			12.85	

In addition, crossovers were required at MP 236.03, MP 278.40 and MP 970.10 on the SFRC. Finally, to assist trains entering and leaving Port Everglades in Fort Lauderdale, the freight speed was increased on the Port Everglades Lead to 40 mph for one freight train length (9000') from the main track.

10.4.3 Equipment Requirements

This Interim Build v2 schedule requires 20 train sets plus spares as a minimum requirement.

10.4.4 Observations

The Interim Build Alternative v2, in conjunction with the proposed AAF schedule, presented scheduling issues in the Downtown Miami station. AAF's schedule required two tracks and the initial Interim Build v2 schedule required three tracks during the peak period. This could not be accommodated in the planned four-track station. As a result, the schedule and track assignments in the Miami station were modified to restrict the Tri-Rail Coastal Link station occupation to two tracks. This schedule became elaborate with a requirement for trains to perform their station stop then move to the far end of the platform to allow another train to perform their station stop on top of the first train. This produced a schedule which was very susceptible to variations in train performance and may not provide acceptable levels of performance in a real world operation. As a result of this a subsequent schedule, Build Alternative Option A, was developed.



11.0 Build Alternative Option A

The Build Alternative was developed which truncated the Green Line at Fort Lauderdale. This shortened its operation to run between Jupiter and Fort Lauderdale only, which helped to alleviate two concerns noted with the Interim Build Alternative v2. First the congestion in the Downtown Miami Station and second a reduction in the number of trains crossing the New River Bridge in Fort Lauderdale.

11.1 Tri-Rail Coastal Link Build Option A Schedule

11.1.1 Red Line

Figure shows the Build 11.1 Alternative – Option A schematic. The Red Line would operate 50 daily trains between Pompano Beach on the SFRC line and Miami Government Center in downtown Miami on the FEC line. The number of daily trains was increased to 50 from the 48 in previous schedules to provide increased connectivity between the Red and Black Lines. This route would serve 12 stations with a 30minute peak service and operate hourly off peak. The scheduled arrival and departure times at Pompano Beach were coordinated with the Black Line to allow transfers between the two services. This will allow a passenger to access points north of Pompano Beach on the SFRC line from downtown Miami or vice versa.

11.1.2 Black Line

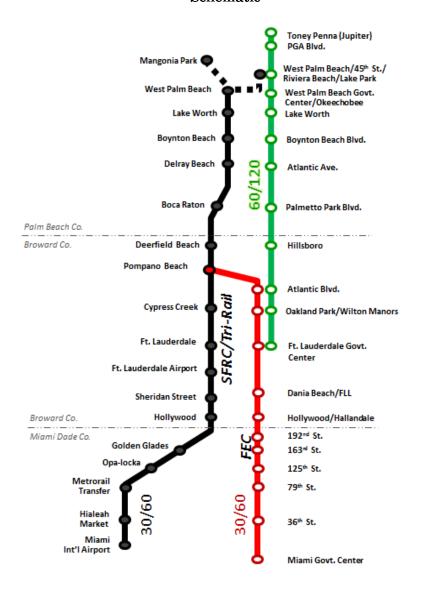
The existing Tri-Rail service would be modified by alternating the northern terminus between the existing station at Mangonia Park on the SFRC line and 45th Street in West Palm Beach on the FEC line. The Tri-Rail schedule was modified to provide 30-minute peak and hourly off peak frequencies south of West Palm Beach while maintaining 50 daily trains. As every second train would terminate at

Mangonia Park with the alternate trains terminating at 45th Street, the frequency of service north of the existing Tri-Rail West Palm Beach station on either route would be hourly during the peak and every two hours off peak. In addition, the arrival and departure times at Pompano Beach were scheduled to allow passengers access to downtown Miami via the Red Line.

11.1.3 Green Line

The Green Line would operate entirely on the FEC corridor from Toney Penna in Jupiter to the Fort Lauderdale downtown station. This route would have 24 daily trains servicing 12 stations.

Figure 11.1 - Build Alternative Option A Schematic





Frequency would be one hour peak with two hour service off peak.

11.2 Build Alternative Option A Results

With this new schedule the benefit of truncating the Green Line was noted. Infrastructure requirements were reduced by 4.5 miles. In addition, reliability of the proposed schedule increased as a result of congestion in the Miami Station being avoided.

11.2.1 Train Performance

The model provided the results shown in Table 11.1.

Table 11.1 - Build Alternative Option A Results				
MEASURE	BASE	OPTION A		
AAF OTP	99.1	97.8%		
FEC FREIGHT OTP	94.7%	96.42%		
FEC RE-CREW	4.7%	8.82%		
TRCL OTP		98.7		

11.2.2 Track Requirement

Table 11.2 - Build Alternative Option A Track Requirements				
FROM	ТО	# OF TRACK	LENGTH	COMMENTS
284.20	284.65	1	0.45	STATION STUB TRACK
290.87	292.67	1	1.80	TRIPLE TRACK
332.45	337.42	1	4.97	TRIPLE TRACK
104.55	105.15	1	0.60	FREIGHT SIDING
323.43	323.64	1	0.21	FREIGHT SIDING
329.52	329.83	1	0.31	FREIGHT SIDING
TOTAL			8.34	

As well as the additional track shown in Table 11.2, the following infrastructure was required:

- New #24 crossover MP 236.05;
- New #24 Crossover MP 278.40;
- New #24 Crossover MP 970.10 (SFRC); and,

- Increased freight speed on Port Everglades Lead to 40 mph for one freight train length (9000 feet) from the main track
- Stub track, points facing northward, at the Fort Lauderdale Station.

11.2.3 Equipment Requirement

Similar to the Interim Build Alternative v2, this Option A schedule requires 20 train sets plus spares to operate.



12.0 Build Alternative Option B Schedule

SFRTA presented a schedule for modeling shown in Figure 12.1 which was quite similar to the Build Alternative Option A with the following differences.

The through route from or to downtown Miami will be the Black Line from Mangonia Park. The Red Line would continue to be a supporting line but would run between Boca Raton and MIA.

The Green Line and Black Line would be synchronized at Atlantic Avenue on the FEC line to allow a timed transfer.

12.1 Tri-Rail Coastal Link Schedule

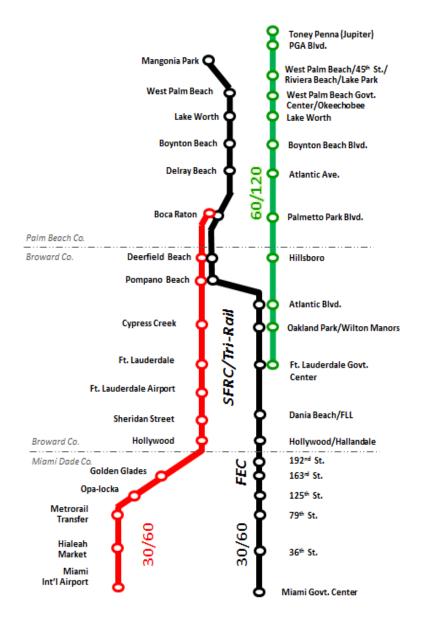
12.1.1 Black Line

This spine of the Tri-Rail Coastal Link would serve the dense travel markets of the coastal corridor between Fort Lauderdale and Miami and link this corridor to the rest of region. It would provide fast direct service to the network of park and ride stations along the northern SFRC, including Boca Raton, which has become Tri-Rail's highest ridership station on weekdays. This line would operate 48 trains per day servicing 19 stations.

12.1.2 Green Line

This leg of the Tri-Rail Coastal Link would serve mobility needs along the northern end of the FEC with direct service linking rapidly growing areas of northern Palm Beach County with the urban downtown cores of West Palm Beach, Lake Worth, Boynton Beach, Delray Beach, Boca Raton and Fort Lauderdale. This schedule offers a timed three-minute connection at Fort Lauderdale to and from Black Line service for Miami Government Center. This line would operate 24 daily trains servicing 12 stations.

Figure 12.1 - Build Alternative Option B Schematic



12.1.3 Red Line

An all day branch linking the southern SFRC and MIA with the Black Line offers a three-minute timed connection at Boca Raton to and from Black Line service for points north of Boca Raton. This line fully serves the growing northbound A.M. market on the existing Tri-Rail service from Miami-Dade and Broward origins to Boca Raton. Forty-eight trains would service 13 stations.



12.2 Build Alternative Option B Results

12.2.1 Train Performance

The model provided the results shown in Table 12.1.

Table 12.1 - Build Alternative Option B Results					
MEASURE BASE OPTION B					
AAF OTP	99.1	98%			
FEC FREIGHT OTP	94.7%	95%			
FEC RE-CREW	4.7%	8.3%			
FEC RUN TIME	9:22	9:29			
TRCL OTP		100%			

12.2.2 Infrastructure Requirements

Tables 12.2 and 12.3 show additions to infrastructure required to support the Build Alternative Option B schedule.

Table 12.2 - Build Alternative Option B Track						
	Requirements					
FROM	ТО	# OF TRACKS	LENGTH	COMMENTS		
284.20	284.65	1	0.45	Station Stub Track		
288.40	292.88	1	4.28	Triple Track		
299.14	300.99	1	1.85	Triple Track		
323.38	323.68	1	0.30	Freight Siding		
327.08	330.58	1	3.50	Triple Track		
329.83	330.24	1	0.41	Freight Siding		
327.08	330.58	1	3.50	Triple Track		
331.80	341.04	1	9.24	Triple Track		
341.04	341.80	2	1.52	Quadruple Track		
341.05	341.16	1	0.11	Storage Track		
341.80	341.96	1	0.16	Triple Track		
342.07	342.59	1	0.52	Freight Siding		
342.97	343.79	1	0.82	Freight Siding		
353.24	360.61	1	7.372	Triple Track		
992.58	992.97	1	0.39	Triple Track		
992.74	993.17	1	0.43	Storage Track		
TOTAL			34.85			

Table 12.3	Table 12.3 - Build Alternative Option B						
Cro	Crossover Requirements						
LOCATION	SIZE	#					
284.45	24	1					
288.64	24	1					
290.70	24	4					
292.80	24	2					
301.10	24	1					
330.50	24	1					
332.48	24	1					
332.80	24	1					
337.45	24	1					
340.20	24	4					
341.05	24	1					
341.60	24	1					
341.76	24	2					
970.12	20	1					
1003.13	20	1					
TOTAL		23					

12.2.3 Equipment Requirements

Twenty-one train sets plus spares are required to support this train schedule.



13.0 Build Alternative Option B

In an effort to reduce infrastructure RTA revised the Build Alternative Option B schedule. In addition to changes in this schedule, AAF also provided specific requirements for network performance which were not available to the project team previously.

13.1 AAF Minimum Network Performance

AAF required a minimum 95% OTP for AAF trains with randomization of FEC freight train departures. Intermodal trains have randomized departure times allowing the trains to depart up to 10 minutes early or 30 minutes late. Other freight trains were allowed to depart up to 10 minutes early or one hour late.

To determine the resilience of the network AAF required eight successful runs with a minimum average AAF OTP of 95% and with less than a 25% model failure rate as shown in Table 13.2. In addition to this requirement, specific track outages and temporary slow orders as shown in Table 13.1 were to be implemented. With the outages and slow orders there was a requirement to have eight successful runs with no more than a 25% model failure rate. The results are shown in Table 13.3.

13.2 Tri-Rail Coastal Link Schedule

The frequency of service remained the same as earlier versions of the alternative with minor changes in departure times to reduce conflicts with other train operations in the corridor.

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	Table 13.1 - Track Outages and Slow Orders							
FROM	ТО	TRACK	BEGIN	ENDING	SPEED	REASON		
180.13	186.2	M2	MON 09:00	MON 14:00	OUTAGE	PLANNED MAINTENANCE		
182	184	M1	MON 09:00	MON 14:00	30 MPH	SLOW ORDER PAST WORK GANG		
241.7	245.43	M2	MON 09:00	MON 14:00	OUTAGE	PLANNED MAINTENANCE		
242	244	M1	MON 09:00	MON 14:00	30 MPH	SLOW ORDER PAST WORK GANG		
276.5	280	M1	TUES 05:00	TUES 11:00	OUTAGE	PLANNED MAINTENANCE		
277	279	M2	TUES 05:00	TUES 11:00	30 MPH	SLOW ORDER PAST WORK GANG		
268	273	M1	TUES 07:00	TUES 09:00	OUTAGE	UNPLANNED OUTAGE		
174	179	ALL	TUES 08:00	TUES 11:00	20 MPH	PTC SIGNAL OUTAGE S0-4		
333	339	ALL	TUES 08:00	TUES 11:00	20 MPH	PTC SIGNAL OUTAGE - DAY TIME SO-2		
174	179	M1	TUES 14:00	TUES 16:00	OUTAGE	UNPLANNED OUTAGE		
174	179	M1	TUES 18:00	TUES 20:00	OUTAGE	UNPLANNED OUTAGE		
343	349	M1	TUES 21:00	TUES 23:00	OUTAGE	UNPLANNED OUTAGE		
174	179	ALL	TUES 22:00	WED 01:00	20 MPH	PTC SIGNAL OUTAGE S0-3		
333	339	ALL	TUES 22:00	WED 01:00	20 MPH	PTC SIGNAL OUTAGE - NIGHT TIME		
333	339	M1	TUES 22:00	WED 04:30	OUTAGE	PLANNED MAINTENANCE		
334	336	M1	TUES 22:00	WED 04:30	30 MPH	SLOW ORDER PAST WORK GANG		
333	339	M1	WED 05:00	WED 11:00	OUTAGE	PLANNED MAINTENANCE		
334	336	M1	WED 05:00	WED 11:00	30 MPH	SLOW ORDER PAST WORK GANG		



13.3 Network Performance

Table 13.2 - Build Alternative Option B Results without Outages

without outages						
RANDOM SEED	FEC EXPEDITED FRT		AAF PASSENGER		TRCL COMMUTER RAIL	
	MPH	ОТР	MPH	ОТР	MPH	ОТР
1	33.2	90.0	76.8	96.4	30.7	97.0
2	33.4	91.9	77.0	98.2	30.7	96.7
3	32.0	89.4	77.1	98.2	30.7	96.6
4	33.0	86.2	76.9	95.5	30.7	97.4
5	33.1	88.1	76.8	97.3	30.7	97.6
6	32.9	86.9	76.2	93.8	30.7	96.6
7	32.9	88.8	76.6	95.5	30.7	97.3
8	33.1	91.2	76.7	96.4	30.7	97.1
AVERAGE	32.9	89.1	76.8	96.4	30.7	97.0
-1	33.1	93.8	76.9	98.2	30.7	97.7

Table 13.3 - Build Alternative Option
B Results with Outages

RANDOM SEED RESULT

1 SOLVED
2 SOLVED
3 FAILED
4 SOLVED

1	SOLVED
2	SOLVED
3	FAILED
4	SOLVED
5	SOLVED
6	FAILED
7	SOLVED
8	SOLVED
9	SOLVED
10	FAILED
11	SOLVED
12	SOLVED
PERCENTAGE	25%
-1	FAILED

For this modeling exercise AAF was tracking OTP and average speed for three types of trains as shown in Table 13.2. With the infrastructure listed in Section 13.3.1 the team was able to meet AAF's network performance requirements. These results satisfy AAF's network performance requirements with a significant reduction in infrastructure when compared to the previous Build Alternative Option B schedule.

13.3.1 Infrastructure Requirements

Tables 13.4 and 13.5 show additions to infrastructure required to support the Build Alternative Option B schedule.

Table 13.4 - Build Alternative Option B Track

Requirements						
FROM	ТО	# OF TRACKS	LENGTH	COMMENTS		
284.20	284.65	1	0.45	Station Stub Track		
288.40	290.77	1	4.37	Triple Track		
299.14	300.99	1	1.85	Triple Track		
323.38	323.68	1	0.30	Freight Siding		
329.83	330.24	1	0.41	Freight Siding		
332.47	341.04	1	8.57	Triple Track		
341.04	341.80	2	1.52	Quadruple Track		
341.05	341.16	1	0.11	Storage Track		
341.80	341.96	1	0.16	Triple Track		
342.07	342.59	1	0.52	Freight Siding		
342.97	343.79	1	0.82	Freight Siding		
358.69	360.61	1	1.92	Triple Track		
992.58	992.97	1	0.39	Triple Track		
992.74	993.17	1	0.43	Storage Track		
TOTAL			21.82			



Table 13.5 - Build Alternative Option B Crossover Requirements						
LOCATION	SIZE	#				
284.65	24	1				
286.46	24	1				
299.16	24	1				
300.96	24	1				
332.53	24	1				
334.16	24	1				
334.24	24	1				
336.66	24	2				
337.45	24	2				
339.44	24	1				
339.66	24	1				
341.40	24	1				
341.76	24	1				
341.84	24	1				
341.92	24	1				
358.71	24	1				
970.12	20	1				
1003.13	20	1				
TOTAL		20				

13.3.2 Equipment Requirements

Twenty-three train sets plus spares are required to support this train schedule.



14.0 Build Alternative Option A with AAF Requirements

To allow a direct comparison between the Option A and Option B schedules, Option A was rerun using the recent AAF minimum network performance requirements.

14.1 Network Performance

Tables 14.1 and 14.2 show the model results for Build Alternative Option A with AAF requirements.

Table 14.1 - Option A Results without Outages						
RANDOM SEED	FEC EXPEDITED FRT		AAF PASSENGER		TRCL COMMUTER RAIL	
	MPH	ОТР	MPH	ОТР	MPH	OTP
1	32.8	86.9	77.1	97.3	32.9	97.2
2	32.9	88.8	77.2	97.3	32.9	96.9
3	FAILED					
4	33.1	91.9	76.7	95.5	32.9	96.5
5	33.1	90.6	77.1	96.4	32.9	97.2
6	33.3	90.0	77.0	96.9	32.9	96.6
7	FAILED					
8	33.0	88.8	76.4	94.2	32.8	95.8
9	32.8	84.4	76.1	91.1	32.9	97.3
10	FAILED					
11	32.8	86.9	76.9	96.4	32.8	96.4
12	33.2	90.0	77.0	96.4	32.8	96.1
AVERAGE	33.0	88.5	76.8	95.6	32.9	96.7
-1	FAILED					

Table 14.2 – Option A Results with Outages					
RANDOM SEED	RESULT				
1	SOLVED				
2	SOLVED				
3	FAILED				
4	SOLVED				
5	FAILED				
6	SOLVED				
7	SOLVED				
8	SOLVED				
9	SOLVED				
10	FAILED				
PERCENTAGE	20%				
-1	SOLVED				



14.1.1 Infrastructure Requirements

Tables 14.3 and 14.4 show the infrastructure requirements to support the Build Alternative Option A schedule with AAF Requirements.

Table 14.3 - Build Alternative Option A Track Requirements #OF **FROM** TO LENGTH **COMMENTS** TRACKS Station Stub 284.20 284.651 0.45Track 288.40 290.771 4.37 Triple Track Station Stub 296.50 296.95 1 0.45Track 299.14300.99 Triple Track 1 1.85 323.38 323.68 1 0.30 Freight Siding 329.83 330.241 0.41Freight Siding 332.47 341.04 1 8.57 Triple Track Quadruple 341.04 341.80 2 1.52 Track 341.05341.16 1 0.11 Storage Track 1 341.80 341.96 0.16 Triple Track 342.07342.59 1 0.52Freight Siding 342.97 343.79 1 0.82 Freight Siding 1001.5 1001.31 1 0.26 Storage Track 7 TOTAL 19.79

14.1.2 Equipment Requirements

Twenty train sets plus spares are required to support this train schedule.

Table 14.4 - Build Alternative Option A Crossover Requirements						
LOCATION	SIZE	#				
284.65	24	1				
286.46	24	1				
299.16	24	1				
300.96	24	1				
332.53	24	1				
334.16	24	1				
334.24	24	1				
336.66	24	2				
337.45	24	2				
339.44	24	1				
339.66	24	1				
341.40	24	1				
341.76	24	1				
341.84	24	1				
341.92	24	1				
358.71	24	1				
1001.61	20	1				
1003.00	20	1				
TOTAL		20				



15.0 Amtrak

With the proposed construction of the Northwood and IRIS Connections the capital investment required to implement Amtrak service between Jacksonville and West Palm Beach on the FEC corridor will potentially decrease.

Modeling was undertaken to determine what schedule and level of performance could be obtained with the addition of Amtrak's proposed Phase One trains to the Southern Florida rail network. The modeling was performed based on information the extracted from "Draft Environmental Assessment and 4(f) statement for the FEC AMTRAK Passenger Rail Study" dated August 2010 and the "Service Development Plan for the Florida East Coast (FEC) Corridor Amtrak Service High Speed Intercity Passenger Rail (HSIPR) Program Jacksonville (Duval County) to Miami (Miami-Dade County), Florida" dated August 2010.

Trains modeled included:

- FEC Proposed 2016 freight trains;
- Existing Tri-Rail;
- Existing Amtrak (91, 97, 98, 92); and,
- Proposed Phase One Amtrak (991, 877, 870, 992).

Of the proposed and existing Amtrak trains only 877 and 870 would operate on the FEC rail line.

Table 15.1 illustrates the Amtrak train schedule which was initially modeled based on the Service

Development Plan and as modified by a memo from FDOT.

Railroad infrastructure included the existing FEC and SFRC track in addition to a new 15 mph NE to SW connection at Northwood between the FEC and SFRC rail lines.

As there are no passenger trains currently operating on the FEC line, maximum allowable passenger train speeds were developed using the following criteria:

- Where the maximum freight speed is currently 60 mph, a maximum passenger speed of 79 mph was used
- Where the maximum freight speed is currently less than 60 mph, the maximum passenger speed was assumed to be the same as the maximum freight speed.

A Train Performance Calculation (TPC) was run for trains 870 and 877 to determine the minimum unimpeded run times on the FEC line.

When the minimum run time was compared to the scheduled run time it was noted that the allowable time in the schedule was slightly longer than the theoretical minimum run time. Southbound 4:48 versus 4:51 and northbound 4:47 versus 5:08. With the maximum passenger speeds assumed this will not allow for a reliable train service.

Using outputs from the model, a new schedule as shown in Table 15.2 was developed for 870 and 877 which provided an improved level of performance with the assumed trains and infrastructure.



Table 15.1 - Proposed Amtrak Phase 1 Schedule								
SOUTHBOUND		STATION	NORTHBOUND					
91	991	97	877		870		992	92
07:15	07:25	09:48	13:08	JACKSONVILLE	15:05	17:10	21:49	22:09
			13:47	ST. AUGUSTINE	14:18			
			14:31	DAYTONA BEACH	13:25			
			15:16	TITUSVILLE	12:39			
			15:35	COCOA	12:20			
OPE	RATE VIA	CSX	15:58	MELBOURNE	11:51	OPER	ATE VIA	CSX
			16:33	VERO BEACH	BEACH 11:20			
			16:49	FT. PIERCE	11:03			
			17:11	STUART	10:40			
			17:50	PALM BEACH	00:57			
			17:59	GARDENS	09:57			
16:13	12:26	16:54	18:19	WEST PALM BEACH	09:39	10:17	16:44	12:59
16:32	12:45	16:52	18:37	DELRAY BEACH	09:21	09:52	16:22	12:37
16:46	12:59	17:27	18:50	DEERFIELD BEACH	09:08	09:38	16:08	12:23
17:03	13:16	17:19	19:04	FT. LAUDERDALE	08:55	09:24	15:54	12:09
_	19:10		19:10	FT. LAUDERDALE	08:48	-	-	-
				AIRPORT 08.46				
17:18	13:31	17:59	19:19	HOLLYWOOD	08:40	09:07	15:37	11:52
-	-	-	19:37	METRORAIL	08:23	-	-	-
17:47	14:00	18:28	19:45	MIAMI AIRPORT	08:18	08:45	15:15	11:30

Table 15.2 - Amtrak Revised Schedule						
STATION	877	870				
JACKSONVILLE	13:08	15:05				
ST. AUGUSTINE	14:10	13:35				
DAYTON BEACH	15:05	12:30				
TITUSVILLE	15:48	11:46				
COCOA	16:08	11:28				
MELBOURNE	16:34	11:07				
VERO BEACH	17:30	10:36				
FT. PIERCE	17:46	10:20				
STUART	18:07	09:41				
WEST PALM	19:05	09:01				
DELAY BEACH	19:25	08:39				
DEERFIELD	19:41	08:25				
FT. LAUDERDALE	20:01	08:10				
FT. LAUDERDALE	20:10	06.00				
AIRPORT	20.10	08:02				
HOLLYWOOD	20:17	07:55				
METRORAIL	20:38	07:37				
MIC	20:47	07:28				



15.1 Immediate Amtrak Implementation

Using various thresholds for Amtrak OTP, the model provided the results shown in Table 15.3.

Table 15.3 - Amtrak Results							
	BASE CASE	W/ PHASE ONE AMTRAK (TABLE 1 SCHEDULE)	W/ PHASE ONE AMTRAK (TABLE 2 SCHEDULE)				
FEC OTP	91.8%	88.0%	91.1%				
TRI-RAIL OTP	98%	90.0%	92.4%				
870/877 (30 MIN OTP)	-	0.0%	78.6%				
870/877 (15 MIN OTP)	-	0.0%	71.4%				
870/877 (6 MIN OTP)	-	0.0%	57.1%				

15.2 Amtrak Implementation with AAF

Infrastructure requirements were also determined should Amtrak expansion to the FEC corridor occur after AAF commences their service with their proposed infrastructure constructed.

Trains modeled included:

- AAF, 32 trains per day;
- FEC Proposed 2016 freight trains;
- Existing Tri-Rail;
- Existing Amtrak (91, 97, 98, 92); and,
- Proposed Phase One Amtrak (991, 877, 870, 992).

Infrastructure added included:

- 2500 foot station tracks added at St. Augustine, Daytona Beach and Titusville
- New service track MP 15.77 to MP 16.93 (move way freight off of main track)
- Extend Dorena siding north by 3400 feet (move way freight off of main track).

The Amtrak schedule was further revised as shown in Table 15.4 and only intermediate stations were adjusted.

Table 15.4 - Amtrak Schedule Revised			
870	STATION	887	
15:05	JACKSONVILLE	13:08	
14:00	ST. AUGUSTINE	13:55	
12:05	DAYTONA BEACH	15:24	
11:23	TITUSVILLE	16:24	
11:05	COCOA	16:43	
10:46	MELBOURNE	17:02	
10:19	VERO BEACH	17:32	
10:05	FT. PIERCE	17:48	
9:44	STUART	18:14	
9:01	WEST PALM BEACH	19:01	
8:39	DELRAY BEACH	19:24	
8:25	DEERFIELD BEACH	19:38	
8:11	FT. LAUDERDALE	19:55	
8:02	FT. LAUDERDALE AIRPORT	20:02	
7:52	HOLLYWOOD	20:10	
7:33	METRORAIL	20:29	
7:26	MIAMI AIRPORT	20:39	

The model results are shown in Table 15.5:

Table 15.5 - Amtrak Results			
MEASURE	RESULT		
AAF OTP	99.1		
FEC FREIGHT OTP	96.6%		
AMTRAK OTP	100%		
TRCL OTP	100%		

FEC average run time increased by approximately 7 ½ minutes. This increase can be attributed to congestion on the single track portion north of Cocoa.



16.0 Summary

Collaboration with AAFhas allowed of a model development which accurately represents the future rail network. Modeling results indicate the two potential schedules, associated with Build Alternative Options A and B have comparable results with similar infrastructure requirements as shown in Table 16.1. The Option A requires less infrastructure and train sets than Option B, while Option B provides improved connections between services.

Table 16.1 - Option A/Option B Comparison				
	Option A	Option B		
ADDITIONAL TRACK (MILES)	19.8	21.8		
TRAINSETS (WITHOUT SPARES)	20	23		
AVERAGE CONNECTION (MINUTES)	10	6		