

ORLANDO INTERNATIONAL AIRPORT (OIA) CONNECTOR REFRESH ALTERNATIVES ANALYSIS Orange & Osceola Counties, Florida FPID Nos. 429215-1-12-01, 429215-1-12-02, 429215-1-12-03, 42925-1-12-04, 429215-1-12-05



ORLANDO INTERNATIONAL AIRPORT (OIA) CONNECTOR REFRESH ALTERNATIVES ANALYSIS

FINAL REPORT

Prepared For: Florida Department of Transportation, District Five

Prepared By: HDR Engineering, Inc.

February 2016

TABLE OF CONTENTS

F .		PAGE
Exe	cutive Sun	nmaryvii
	Project	Background
	Purpose	and Need
	Study A	rea
	Alterna	tives Analysis Process
		Aeetings
	Evaluat	ion of Alternatives
	Potentia	al Capital Funding Sources
	Implem	entation Planxv
1	Introduc	tion1
	1.1 Pro	ject Background1
	1.2 Pur	pose and Need1
	1.2.1	Goals and Objectives2
	1.3 Stu	dy Area3
	1.4 Pre	vious Studies5
	1.4.1	OIA Connector Alternatives Analysis (2005)
	1.4.2	Canadian Court Intermodal Transportation Center Conceptual Master Plan, 20075
	1.4.3	MetroPlan Orlando 2030 Long Range Transportation Plan6
	1.4.4	LYNX Vision 2030 Final Report, 2011
	1.5 Alte	ernatives Analysis Process
	1.5.1	OIA Alternatives Analysis Project Deliverables
2	Existing	Conditions
	2.1 Exis	ting Transportation
	2.1.1	Transit10
	2.1.2	Roadway Characteristics12
	2.1.3	Orlando International Airport15
	2.1.4	Bicycle/Pedestrian Facilities15
	2.1.5	Additional Transportation Improvements15
	2.1.6	Transportation and Mobility Summary16
	2.2 Pop	ulation, Employment and Land Use16



	2.2.1	Existing and Projected Population	. 16
	2.2.2	Existing and Projected Employment	.16
	2.2.3	Existing Land Use	.17
	2.2.4	Future Land Use	. 18
	2.2.5	Developments of Regional Impact (DRI)	. 18
	2.2.6	Population. Employment and Land Use Summary	
	2.3 Envi	ronmental Conditions	.21
	2.3.1	Physical Environment	21
	2.3.2	Natural Environment	.22
	2.3.3	Conservation Areas	.23
3	Agency C	oordination and Public Involvement	
0	3.1 Pub	lic Involvement Plan.	
	3.2 Pub	lic Outreach Activities	
	3.2.1	Scoping Meeting	
	3.2.2	Public Meetings	29
	3.2.3	Project Advisory Group Meetings	. 29
	3.2.4	Project Co-sponsor Meetings	. 30
	3.2.5	Other Stakeholder Meetings	. 30
	3.3 Pub	lic Outreach Methods	. 30
	3.3.1	Project Website	. 30
	3.3.2	Social Media	. 30
	3.3.3	Project Newsletters	. 30
	3.3.4	Other Outreach Methods	. 30
	3.4 Com	ments and Coordination	. 30
4	Definitio	n and Evaluation of Initial Alternatives	.31
	4.1 Eval	uation Process	. 31
	4.2 Scre	ening of Initial Alternatives	. 32
	4.3 Initia	al Alternatives Evaluation Results	. 33
	4.4 Sunl	Rail Connection to OIA	34
5	Definitio	n and Evaluation of Viable Alternatives	. 37
	5.1 Defi	nition of Viable Alternatives	. 37
	5.2 Fore	ecast Years	. 38

Alternatives Analysis Report

	5.3 No-	Build Alternative	38
	5.4 Buil	d Alternatives	39
	5.4.1	Alternative 2	41
	5.4.2	Alternative 3	43
	5.4.3	Alternative 4	46
	5.4.4	Alternative 6	49
	5.5 Ope	erating Plans	52
	5.6 Cap	ital and O&M Costs	53
	5.7 Ride	ership Projections	59
	5.7.1	Regional Travel Demand Model	59
	5.7.2	Travel Demand Forecasting Results – Tier 2 Analysis	59
	5.8 Eva	luation Criteria	62
	5.9 Eva	luation Results	67
6	Refineme	ent and Evaluation of Selected Alternative	69
	6.1 Refi	nement of Alternative 6	69
	6.2 Ope	erating Plans	71
	6.2.1	Running Times	72
	6.2.2	Span of Service	73
	6.2.3	Service Frequency	74
	6.2.4	Cycle and Layover Time	74
	6.2.5	Maintenance Spare Ratio	74
	6.2.6	Peak and Fleet Vehicle Requirements	75
	6.2.7	Operating Requirements Summary	75
	6.3 Con	ceptual Engineering	80
	6.3.1	Guideway and Roadway Improvements	80
	6.3.2	Stations	80
	6.3.3	Transit Signal Priority TSP	83
	6.3.4	Maintenance Facilities	83
	6.4 Trav	el Demand Forecasting Results – Selected Alternative	84
	6.4.1	Travel Markets	84
	6.4.2	Trips by Access Mode	84
	6.5 Con	nparison to No-Build	85

Alternatives Analysis Report

7	Financial	Analysis and Funding Strategies	88
	7.1 Cap	ital and O&M Costs for the Selected Alternative	88
	7.1.1	Capital Costs	
	7.1.2	O&M Costs	
	7.2 BRT	Funding Strategies Across the Nation	
	7.3 Pote	ential Capital Funding Sources	95
	7.3.1	Potential Federal Funding	95
	7.3.2	. Potential State Funding	95
	7.3.3	Potential Local Funding	98
	7.4 Ope	erating Revenue	98
	7.4.1	Farebox Recovery Ratio	98
	7.4.2	Federal and State Formula Grants Programs	98
	7.4.3	Conceptual Operating Funding Strategy	99
8	Impleme	ntation Plan	
	8.1 Ider	ntify Project Champion(s), Project Sponsor and Service Operator	
	8.2 Proj	ject Management Plan	
	8.3 Ado	ption into MetroPlan Orlando Long Range Transportation Plan	
	8.4 Stat	e and Federal Compliance	
	8.5 Con	npatibility with Other Transportation and Development Projects	102
	8.5.1	MAGLEV	
	8.5.2	I-4 / Grand National Drive Overpass	
	8.5.3	SunRail Connection to OIA	
	8.6 Proj	ject Development and Environmental Documentation	
	8.7 Con	nmunity Engagement	105
	8.8 Trai	nsit Funding	105

FIGURES

Figure ES-1.	Study Area	ix
Figure ES-2.	Alternatives Analysis Process Flowchart	х
Figure ES-3.	Viable Alternatives	íi
Figure ES-4.	Selected Alternative Alignment and Station Locationsx	iv
Figure 1-1. S	Study Area	4



Figure 1-2. Alternatives Analysis Process Flowchart	8
Figure 2-1. Existing Roadway Level of Service (LOS)	14
Figure 2-2. Future Land Use	19
Figure 2-3 Study Area DRI's	20
Figure 2-4. Parks and Recreation Facilities	24
Figure 2-5. NWI Wetlands	25
Figure 2-6. FEMA Floodplains	26
Figure 2-7. Conservation Areas	27
Figure 4-1. Initial Alternatives	35
Figure 5-1. Viable Alternatives	
Figure 5-2. Alternative 2 Alignment and Station Locations	42
Figure 5-3. Alternative 3 Alignment and Station Locations	45
Figure 5-4. Alternative 4 Alignment and Station Locations	48
Figure 5-5. Alternative 6 Alignment and Station Locations	51
Figure 6-1. Selected Alternative Alignment and Station Locations	70
Figure 6-2. Station Places and Typologies	82
Figure 8-1. New Starts and Small Starts Project Development Process	

TABLES

Table ES-1. Summary of Evaluation Scores	.xiii
Table 2-1. LYNX FY 2013 Total Ridership	. 10
Table 4-1. Initial Alternatives Evaluation Criteria and Measures	. 33
Table 4-2. Initial Alternatives Evaluation Summary	. 36
Table 5-1. Evaluation of Technologies for Viable Alternatives	. 38
Table 5-2. Alternative 2 Proposed Stations	.43
Table 5-3. Alternative 3 Proposed Stations	.44
Table 5-4. Alternative 4 Proposed Stations	.47
Table 5-5. Alternative 6 Proposed Stations	. 50
Table 5-6. Run Time Summaries	. 52
Table 5-7. BRT & LRT Span of Service	. 52
Table 5-8. Viable Alternative Capital Costs	.54
Table 5-9. BRT and LRT Annual O&M Cost Equations	. 55
Table 5-10. Current Year (2010) LRT and BRT O&M Cost Estimates	.56
Table 5-11. Future Year (2035) LRT and BRT O&M Cost Estimates	. 57
Table 5-12. Current Year (2010) Feeder Bus Operating Cost Estimates	. 58
Table 5-13. Future Year (2035) Feeder Bus Operating Cost Estimates	. 58
Table 5-14. System-Wide Linked Transit Trips by Alternative	.60
Table 5-15. Project-Wide Trips by Alternative	. 60
Table 5-16. Current Year Project Trips by Alternative and Market Segment	.61
Table 5-17. Future Year (2035) Project Trips by Alternative and Market Segment	.61
Table 5-18. OIA AA VMT and VHT Comparison Between Alternatives	. 62
Table 5-19. Project Goals, Objectives and Evaluation Measures	. 63



Table 5-20. Summary of Evaluation Scores	67
Table 6-1. Selected Alternative Proposed Stations	71
Table 6-2. Station-to-Station Run Times (Westbound) – Local BRT	72
Table 6-3. Station-to-Station Run Times (Westbound) – Express BRT	73
Table 6-4. Selected Alternative Span of Service	73
Table 6-5. Service Frequency – Local BRT	74
Table 6-6. Service Frequency – Express BRT	74
Table 6-7. Local BRT Current Year Operating Plan (2010)	76
Table 6-8. Local BRT Future Year Operating Plan (2035)	77
Table 6-9. Express BRT Current Year Operating Plan (2010)	78
Table 6-10. Express BRT Future Year Operating Plan (2035)	79
Table 6-11. Current Year Travel Markets Comparison	84
Table 6-12. Horizon Year (2035) Travel Markets Comparison	84
Table 6-13. System-Wide Linked Transit Trips by Alternative	85
Table 6-14. Project-Wide Trips by Alternative	85
Table 6-15. Comparison of No-Build and Selected Alternative	86
Table 7-1. Selected Alternative Estimated Capital Costs	88
Table 7-4. Current Year (2010) Feeder Bus Operating Cost Estimates	89
Table 7-5. Future Year (2035) Feeder Bus Operating Cost Estimates	89
Table 7-2. Current Year (2010) Selected Alternative O&M Cost Estimates	90
Table 7-3. Future Year (2035) Selected Alternative O&M Cost Estimates	91
Table 7-6. Funding Summary of Current BRT Projects Seeking FTA Funding	92
Table 7-7. Funding Summary of In-Service BRT Projects	93
Table 7-8. Potential Funding Sources for Operations	99



Page TOC-vi

Executive Summary

Project Background

The Florida Department of Transportation (FDOT) is conducting the Orlando International Airport (OIA) Connector Refresh Alternatives Analysis (AA) study in consultation with the City of Orlando, Orange County, Osceola County and the Greater Orlando Aviation Authority (GOAA). The goal of the OIA AA was to identify a recommended premium transit alternative that best addresses the mobility needs of the study area by identifying and evaluating viable alternatives. This study builds on a previous AA study completed in 2005. This "refresh" analysis accounts for changes within the study area since the time of the initial analysis, including, but not limited to, new transit modes and service, amended land uses / new development, roadway improvement projects and changes to the natural and physical environment.

This study also provides the analysis and documentation necessary to identify and advance a recommended project into the Federal Transit Administration's (FTA's) Capital Investment Grant Program process as defined under the Moving Ahead for Progress in the 21st Century (MAP-21) legislation.

Purpose and Need

The Purpose and Need for the OIA AA established the criteria to evaluate alternatives, determine goals and objectives, clearly define the purpose and scope of the project, and identify the need for the proposed improvements.

Central Florida has a long history of planning for high capacity transportation corridors. The SunRail Phase I was completed in May 2014 and will be followed shortly by Phase II in 2017. LYNX is now expanding its highly successful downtown LYMMO Bus Rapid Transit (BRT) system, creating an effective downtown circulation network. All Aboard Florida promises to change the paradigm for intercity travel in Florida. LYNX, Orange County, the City of Orlando and FDOT have studied other fixed guideway corridors including US 441, S.R. 50 / Colonial Drive, International Drive, and US 192. A premium transit project in the OIA AA study area is the key link that connects these premium transit projects and regional activity centers together. Central Florida is now poised to implement not just a single premium transit project, but an integrated transit network.

The Purpose and Need analysis identified the following five study area needs: (1) mitigate traffic congestion on parallel roadways; (2) provide important east-west mobility solutions; (3) establish a critical link in the regional mobility strategy; (4) support the implementation of regional vision and local comprehensive plans; and (5) provide a catalyst for economic development and the creation of new jobs. These benefits make premium transit in the OIA AA study area one of the top priorities in the Metropolitan Planning Organization's Long Range Transportation Plan (MetroPlan Orlando LRTP 2035); if implemented if would provide an important east-west connection to SunRail, consistent with the region's mobility strategy.

Study Area

Figure ES-shows the study area which is bordered by Interstate 4 on the west; Oak Ridge Road and Hoffner Avenue on the north; Narcoossee Road on the east; and Osceola Parkway and Boggy Creek Road on the south. The study area includes a number of regionally significant activity centers such as the Orlando International Airport, Orange County Convention Center, Sea World, Universal Studios, International Drive, Florida Mall and the Lake Nona / Medical City area. In addition, the area offers connections with the SunRail commuter rail system and other public and private transit services. The project traverses the southern portion of unincorporated Orange County, the northern portion of unincorporated Osceola County, and encompasses the cities of Orlando and Belle Isle.

Alternatives Analysis Process

The OIA AA study is comprised of a two-tier process to support the development and evaluation of alternatives (see Figure ES-2). The Tier 1 screening identified and evaluated 12 potential corridors. The screening addressed the following measures: potential mobility benefits, environmental impacts, land use and development patterns, cost effectiveness, public/community acceptance, congestion relief and economic development. In order to present an unbiased evaluation of the 12 corridors, premium transit service was assumed for each corridor but specific transit technologies were not identified. Based on this evaluation, the screening resulted in the selection of the following four potentially Viable Alternatives which were further refined and evaluated in Tier 2. A fifth alternative, the SunRail connection to OIA, was also identified and is being advanced as a separate project.



Page viii



Figure ES-1. Study Area







Upon the more detailed analysis in the Tier 2 evaluation, a Selected Alternative was selected which was found to best fulfill the identified goals and objectives as well as address the transportation needs of the community. Stakeholder, public and community participation was fostered throughout the process through an extensive agency coordination and public involvement effort.

Public Meetings

There were three public meetings for this Alternatives Analysis held at the First Baptist Church of Pine Castle located at 1001 Hoffner Avenue. Public meetings were advertised using social media, newsletters, media press releases and email blasts. Each meeting featured an informal "meet and greet" session where attendees could interact with the project team followed by a formal presentation and question and answer session. These meetings were held at the following stages of the project:

- Project Kick-off March 12, 2013
- Initial Alternatives June 18, 2013
- Viable Alternatives February 20, 2014

As part of the OIA AA PIP, a Project Advisory Group (PAG) was established consisting of key community stakeholders. The PAG met regularly to provide an opportunity for the study team to share project information. The purpose of the PAG was to provide technical and administrative guidance throughout the study. The PAG consisted of representatives from local agencies, jurisdictions and local business. By involving and interacting with the public throughout the study phase, issues and concerns were identified and addressed proactively. The PAG included representatives from the following:



- City of Belle Isle
- City of Kissimmee
- City of Orlando
- Florida Department of Transportation
- Greater Orlando Aviation Authority
- LYNX
- MetroPlan Orlando

- Orange County
- Orlando Utilities Commission
- Orlando-Orange County Expressway Authority
- Osceola County
- Osceola County Expressway Authority
- SunRail

•

Evaluation of Alternatives

Because the OIA AA study area is so large and diverse, with multiple major activity centers and the lack of a single, defined corridor, there were several potential premium transit options evaluated. In order to identify and refine the large number of premium transit options, the AA study process consisted of a two-tier process to support the development and evaluation of alternatives. The Tier 1 screening identified and evaluated a large number of potential corridor alignments that connected various major activity centers. Following the screening of these Initial Alternatives, the following four Viable Alternatives were subsequently selected for further refinement and a rigorous technical evaluation.

- Alternative 2 would use an at-grade, semi-exclusive Bus Rapid Transit (BRT) alignment along Osceola Parkway (i.e., BRT lanes would be shared with right-turning traffic), connecting Orlando International Airport (OIA), Lake Nona/Medical City Development, Buenaventura Lakes, Osceola Parkway and the Gaylord Palms Convention Center.
- Alternative 3 would use a 16.3-mile exclusive, grade-separated aerial Light Rail Transit (LRT) alignment along TG Lee Boulevard, Sand Lake Road and Universal Boulevard connecting the OIA Intermodal Center and the Destination Parkway Transit Center (DPTC).
- Alternative 4 would use a 14-mile exclusive, grade-separated aerial LRT alignment along TG Lee Boulevard, Sand Lake Road and Destination Parkway connecting the OIA South Terminal and DPTC.
- Alternative 6 would use an at-grade, semi-exclusive, BRT alignment connecting the OIA South Terminal and DPTC along a 19-mile corridor via S.R. 528, Sand Lake Road, Winegard Road, Oak Ridge Road, and Universal Boulevard.

Figure ES-3 shows the four Viable Alternatives.

Figure ES-3. Viable Alternatives



Alternatives Analysis Report

Page xii

These Viable Alternatives were analyzed and rated based upon how well each meets the goals and objectives and purpose and need for the project. For each measure, the best performing alternative was accorded a rating of high (3), those that perform less well were accorded a rating of medium (2), and those that perform least well were accorded a rating of low (1). **Table ES-1** shows a score summary for each of the objectives.

Table ES-1. Summary of Evaluation Scores

PROJECT COAL	RANKINGS			
PROJECT GOAL	Alt. 2	Alt. 3	Alt. 4	Alt. 6
Mobility Benefits	1	2	2	3
Environmental Benefits	1	2	2	2
Land Use & Development Patterns	2	3	2	3
Cost Effectiveness	3	1	1	3
Public & Community Acceptance	1	2	2	3
Congestion Relief	1	3	3	2
Economic Development	2	2	2	2
TOTAL SCORE	11	15	14	18
OVERALL RANKING	4	2	3	1

Alternative 6 resulted at best meeting the goals and objectives of the corridor. The evaluation results of all four alternatives were presented to FDOT, the PAG and project sponsors. Based on the consultation and discussions with project sponsors, Alternative 6 was identified as the Selected Alternative for further evaluation and refinement.

Subsequently, the Selected Alternative was refined with both local and express BRT components. The local BRT follows the same routing to the DPTC as Alternative 6, but begins at the Sand Lake Road SunRail station instead of OIA. The express BRT route serves as a connection between OIA and the OCCC/I-Drive area, and operates primarily along Sand Lake Road with stops at Florida Mall and John Young Parkway. The two routes that comprise the Selected Alternative are shown in **Figure ES-3**.

Alternatives Analysis Report

Page xiii









Summary of Selected Alternative

Project Length	12.3 miles (local), 15.3 miles (express)	
Number of Stations	17 total	
Average Station Spacing	0.9 miles (local), 2.2 miles (express)	
Transit Technology	Bus Rapid Transit	
Vertical Alignment	At-grade	
Guideway	Mix of exclusive and shared traffic lanes	
Local BRT Run Time	38:17 (Sand Lake Road SunRail to DPTC)	
Express BRT Run Time	34:00 (OIA to DPTC)	
Opening Year Service Plan	15 minute weekday service on Local and Express BRT routes	
Future Year Service Plan	10 minute weekday service on Local and Express BRT routes	
Opening Year BRT Ridership	5,100 daily boardings	
Future Year BRT Ridership	8,200 daily boardings	
Estimated Capital Cost	\$197.8 million (2013 dollars)	
Estimated Annual O&M Cost	\$5.45 million in Opening Year (2012 dollars)	

Potential Capital Funding Sources

The primary funding source to support implementation of the Selected Alternative will likely be the FTA's Section 5309 Capital Investment Grant Program and flexible FHWA funding programs. FTA's New Starts program funds projects with capital costs exceeding \$250 million and provides federal funding for up to 50 percent of a project's capital cost. The New Starts program requires that "fixed guideway" BRT projects have more than 50 percent of the alignment using exclusive lanes. FTA's Small Starts Program funds transit projects with capital costs less than \$250 million and provides grant funding up to 80 percent of a project's total capital costs, but with an overall limit of \$75 million. "Corridor based" BRT projects under the Small Starts program are not required to have 50 percent of the alignment in exclusive lanes but are required to have short headways, defined stations, transit signal priority or queue jumps lanes, and branded service. The subsequent project development phase will determine which federal program best supports implementation of the Selected Alternative. In addition to the New Starts and Small Starts programs, there are also federal highway programs the project partners could pursue to provide funding for specific elements of the BRT project.

Implementation Plan

Following the completion of the OIA AA study, FDOT, local project sponsors and other stakeholders will consider whether to proceed with implementation of the Selected Alternative, conduct further study and deliberation, or take no action. The next steps for implementation of the Selected Alternative would include identifying and enlisting project champion(s) and sponsor(s), complying with state and federal requirements for major transit initiatives, coordinating the project with other planned and programmed transportation and development projects, completing environmental documentation and



design activities, identifying and committing capital and operational funding sources, and successfully meeting all regulatory and permitting requirements.

To qualify for either New Starts or Small Starts in the FTA Capital Investment Grant Program, the Selected Alternative must include certain elements to qualify as either a fixed guideway BRT project (New Starts) or a corridor-based BRT project (Small Starts). As the Selected Alternative advances into Preliminary Design, these elements will be fully identified and incorporated into the project.



Page xvi

1 Introduction

1.1 Project Background

The Florida Department of Transportation (FDOT) is conducting the Orlando International Airport (OIA) Connector Refresh Alternatives Analysis (AA) study in consultation with the City of Orlando, Orange County, Osceola County and the Greater Orlando Aviation Authority (GOAA). The purpose of this study is to evaluate the potential of a premium transit system to provide system linkage in the Central Florida area and serve as an alternative mode to highway travel. This study provides the analysis and documentation necessary to identify and advance a recommended project into the Federal Transit Administration's (FTA's) Capital Investment Grant Program process as defined under the Moving Ahead for Progress in the 21st Century (MAP-21) legislation.

The goal of the OIA AA was to identify a recommended premium transit alternative that best addresses the mobility needs of the study area by identifying and evaluating viable alternatives. This study builds on a previous AA study completed in 2005. This "refresh" analysis accounts for changes within the study area since the time of the initial analysis, including, but not limited to, new transit modes and service, amended land uses / new development, roadway improvement projects and changes to the natural and physical environment.

1.2 Purpose and Need

The Purpose and Need for the OIA AA established the criteria to evaluate alternatives, determine goals and objectives, clearly define the purpose and scope of the project, and identify the need for the proposed improvements.

Central Florida has a long history of planning for high capacity transportation corridors. The SunRail Phase I was completed in spring 2014, and will be followed shortly by Phase II in 2017. LYNX is now expanding its highly successful downtown LYMMO Bus Rapid Transit (BRT) system, creating an effective downtown circulation network. All Aboard Florida promises to change the paradigm for intercity travel in Florida. LYNX, Orange County, the City of Orlando and FDOT have studied other fixed guideway corridors including US 441, S.R. 50 / Colonial Drive, International Drive, and US 192. A premium transit project in the OIA AA study area is the key link that connects these premium transit projects and regional activity centers together. Central Florida is now poised to implement not just a single premium transit project, but an integrated transit network.

The Purpose and Need analysis identified the following five study area needs: (1) mitigate traffic congestion on parallel roadways; (2) provide important east-west mobility solutions; (3) establish a critical link in the regional mobility strategy; (4) support the implementation of regional vision and local comprehensive plans; and (5) provide a catalyst for economic development and the creation of new jobs. These benefits make premium transit in the OIA AA study area one of the top priorities in the Metropolitan Planning Organization's Long Range Transportation Plan (MetroPlan Orlando LRTP 2035); if implemented if would provide an important east-west connection to SunRail, consistent with the region's mobility strategy.



In order to make the Purpose and Need analysis actionable FDOT, working collaboratively with the Project Advisory Group (PAG) and project co-sponsors, developed the following project specific goals and objectives. The project goals, objectives and evaluation criteria were subsequently used to evaluate the various project alternatives, leading to the selection of a preferred alternative.

1.2.1 Goals and Objectives

As Central Florida continues to experience substantial population growth and diversification of the area's economy, travel demand in the region is also increasing. This growth has resulted in increased congestion, and a lack of mobility on major arterial roadways within the existing transportation network. Public transportation services currently available are unable to meet the growing mobility needs of the corridor workforce, visitors, and transit-dependent populations.

By 2035, population and employment in the study area are expected to increase by 220% and 117%, respectively, over existing conditions. The ability to accommodate the existing and future travel patterns resulting from growth must be provided to sustain the region's economy, maintain an acceptable level of service on the surrounding roadway network, provide residents, workers, tourists and visitors with alternative mobility options, connect major activity centers, and support local comprehensive plans and policies. If no improvements are made to the transportation system, a loss in mobility for the area's residents, visitors, and employees can be expected, resulting in a threat to the continued viability of the economy and the quality of life.

Through various efforts and initiatives, state and local transportation planning and transit officials in Central Florida have been working for years to diversify the regional transportation network to include expanding transit system solutions.

With completion of Phase 1 of the SunRail commuter rail system in May 2014, the OIA AA will be the first opportunity to plan a coordinated, premium transit network within Central Florida that facilitates continued growth of the tourism industry and medical field, and continued expansion of opportunities for residents and employees throughout the Central Florida region.

Specifically, the primary goals of the study are briefly described below:

Mobility Benefits

Introduce a high quality multi-modal transportation system that is combined with the existing highway system to provide a balanced transportation network.

Environmental Benefits

Preserve and sustain the environmental assets of the region to the maximum extent possible, while taking opportunities to improve them.

Land Use and Development Patterns

Develop a transit system that is compatible with local comprehensive plans and supports existing and planned transit oriented land uses.



Cost Effectiveness

Produce a system that is efficient to build, operate and maintain - making the system a smart and sound investment.

Public / Community Acceptance

Actively engage the public and affected stakeholders to assess and incorporate their vision of a regional transit system.

Congestion Relief

Provide viable transit alternatives that will provide expanded mobility options to area residents, workers and visitors and reduce congestion during peak times on area roadways.

Economic Development

Produce a transit system that promotes economic development and the creation of jobs.

1.3 Study Area

Figure 1-1 shows the study area which is bordered by Interstate 4 (I-4) on the west; Oak Ridge Road and Hoffner Avenue on the north; Narcoossee Road on the east; and Osceola Parkway and Boggy Creek Road on the south. The study area includes a number of regionally significant activity centers such as the Orlando International Airport, Orange County Convention Center, Sea World, Universal Studios, International Drive, Florida Mall and the Lake Nona / Medical City area. In addition, the study area offers opportunities to connect with the SunRail commuter rail system and other public and private transit services. The project traverses the southern portion of unincorporated Orange County, the northern portion of unincorporated Osceola County, and encompasses the cities of Orlando and Belle Isle.

The OIA AA study area is several square miles and encompasses diverse land uses, and a wide range of demographics and mobility needs. A key element of the alternatives analysis was the initial scoping of a wide range of alternatives that reflect the diversity of travel markets, alignments and transit technologies. Consideration of and connections with regional mobility services within the study area, such as SunRail and LYNX, are essential to the development and evaluation of alternative options.





Figure 1-1. Study Area



1.4 Previous Studies

This section provides a brief description of prior studies completed with relevance to the transportation alternatives in the OIA AA study area. These studies include the previous alternatives analysis as well as intermodal plans, corridor studies, transportation plans and vision studies. The synthesis of these documents provides a solid foundation for understanding the context within which this OIA AA is being conducted, as well as a summary of the planning efforts that have been completed to date in advance of this analysis.

1.4.1 OIA Connector Alternatives Analysis (2005)

The original 2005 AA, which this study updates, was conducted to evaluate providing a multi-modal transit system that would support system linkages in the Central Florida area and serve as an alternative mode of travel to highways. By integrating the multi-modal system into the overall transportation network within the OIA Corridor, the project was to enhance mobility and access throughout the study area.

The recommendation from the 2005 study was a light rail transit (LRT) alignment extending from an eastern terminus at OIA and generally traveled west along Sand Lake Road. The alignment then traveled southwest to the western terminus at International Drive and the Canadian Court Intermodal Center. At the Intermodal Center the alignment would have connected with the proposed north-south light rail transit system.

This alternative was selected because it was projected to provide the best alternative with potential for future growth and development within the study area. Both the City of Orlando and Orange County supported this alternative. It was projected to have about 9,900 LRT daily boardings (more than the No-Build) and allowed opportunities for investment in the community in and around the proposed LRT stations. The capital costs were estimated at \$617 million (2004 dollars).

1.4.2 Canadian Court Intermodal Transportation Center Conceptual Master Plan, 2007

The 2007 Canadian Court Intermodal Transportation Center (CCITC) Conceptual Master Plan proposed a major intermodal transportation facility which would facilitate efficient transportation connections within the International Drive Resort Area (IDRA). The CCITC was envisioned to be the gateway for passengers arriving from OIA and from other modes of transit throughout the region.

The site identified for the CCITC provided an opportunity for joint development on the remaining property for transit supportive use. The Plan concluded that development potential was greater with transit modes such as rail, whereas development opportunity was more limited when considering bus transit. The overall consensus from the planning effort was that are potential near and long-term opportunities for joint development to spur transit implementation.

In addition, the 2007 CCITC report contained a summary of several other area transportation studies, including:

• LYNX Regional Systems Plan (LYNX, 1994)

- I-4 Multi-Modal Master Plan (FDOT, 1994)
- I-4 Bridge Study (LYNX, 1995)
- Orlando International Airport Connector Major Investment Study (LYNX, 1996)
- Central Florida Light Rail Transit (LRT) North/South Corridor Project (LYNX, 1997-1998)
- Orange County Convention Center/International Drive Resort Area Transportation Master Plan (OCCC, 2002)
- Canadian Court Intermodal Center Concept Development Report (OCCC, 2003)
- Central Florida North/South Commuter Rail Alternatives Analysis (FDOT, 2004)
- Central Florida Light Rail Transit System Project Supplemental Draft Environmental Impact Statement (FDOT, 2004)
- Florida High Speed Rail Tampa to Orlando Final Environmental Impact Statement (FHSRA, 2005)
- LYNX Transit Development Plan Major Update for Fiscal Years 2005-2009 (LYNX, 2005)
- Orlando International Airport Connector Alternatives Analysis (FDOT, 2005)
- I-Drive Local Circulator Alternative/Technology Assessment Study (FDOT, 2005)
- LYNX Comprehensive Operations Analysis (LYNX, 2006)

While these initiatives have focused on planning transportation improvements within the region, a number of them have indirectly or directly resulted in the proposed development of the CCITC.

1.4.3 MetroPlan Orlando 2030 Long Range Transportation Plan

The **MetroPlan Orlando 2030 LRTP** was developed to serve as a guide for the development of the region's transportation system over the next 20 years. The plan is updated every five years to reflect the current and future transportation of the region as well as a prioritization of projects. Projects must be included in the long range plan to receive federal funding. The region is currently guided by the 2030 Long Range Transportation Plan, and work on the long range plan for the year 2040 has begun.

The 2030 Long Range Transportation Plan places more emphasis on transit than any previous plan. The current LRTP has the Central Florida commuter rail project (SunRail) as the number one transit priority followed by an east/west passenger rail line from International Drive to Medical City / Innovation Way (including OIA). The second project is the focus of this study effort. Transit priority projects in the LRTP include:

- SunRail
- Light Rail
- LYNX Bus
- LYNX Premium Bus
- Northwest Corridor Commuter Rail

- Downtown Orlando Bus Rapid Transit
- Additional Bus Rapid Transit

1.4.4 LYNX Vision 2030 Final Report, 2011

The LYNX Vision 2030 study represents a joint effort between LYNX and MetroPlan Orlando to comprehensively look at 22 corridors in Orange, Osceola, and Seminole Counties. The purpose was to determine potential transit modal improvements along these corridors for use in the MetroPlan Orlando 2040 LRTP (ongoing in 2013). In addition to the primary improvements along the corridors studied, improvements to the supporting network that provide connectivity and circulation between these corridors were considered. A series of findings and recommendations was developed as a result of the analysis completed as part of the LYNX Vision 2030 plan. Recommendations for near-term, mid-term and long-term were developed and are listed below:

Near-Term Recommendations

- Work with MetroPlan to ensure that LYNX Vision 2030 is incorporated into 2040 LRTP update and future transit development plan (TDP) updates
- Meet with local jurisdictions and MetroPlan Land Use Subcommittee to discuss how localities can make adopted LRTP land use plan a reality
- Ensure changes do not create disproportionate adverse impacts to under-represented individuals
- Explore options for dedicated/supplementary funding for transit
- Develop and implement bicycle and pedestrian-friendly land use policies
- Continue coordination and discussions with stakeholders

Mid-Term Recommendations

- Update the plan on a regular basis
- Identify additional corridors for inclusion in next update
- Work with counties and municipalities to develop transit-supportive growth plans
- Undertake individual corridor studies to identify better termini, plan operational improvements, and develop specific implementation plans
- Study the possibility of implementing Limited Stop Connector Service
- Secure dedicated funding source for transit
- Identify locations for park-and-ride lots
- Continue coordination and discussions with stakeholders

Long-Term Recommendations

- Monitor changing conditions
- Continue coordination and discussions with stakeholders

1.5 Alternatives Analysis Process

The OIA AA study is comprised of a two-tier process to support the development and evaluation of alternatives. The Tier 1 screening identified and evaluated 12 potential corridors. The screening addressed the following measures: potential mobility benefits, environmental impacts, land use and development patterns, cost effectiveness, public/community acceptance, congestion relief and economic development. In order to present an unbiased evaluation of the 12 corridors, premium transit

service was assumed for each corridor but specific transit technologies were not identified. Based on this evaluation, the screening resulted in the selection of the following four potentially Viable Alternatives which were further refined and evaluated in Tier 2. A fifth alternative, the SunRail connection to OIA, was also identified and is being advanced as a separate project.

The AA process is shown in Figure 1-2.





Upon the more detailed analysis in the Tier 2 evaluation, a Selected Alternative was selected which was found to best fulfill the identified goals and objectives as well as address the transportation needs of the community. Stakeholder, public and community participation was fostered throughout the process through an extensive agency coordination and public involvement effort.

1.5.1 OIA Alternatives Analysis Project Deliverables

This OIA AA Final Report documents the study process, major assumptions and methodologies, and technical results associated with the OIA AA study. In the course of conducting the AA study, several Technical Memoranda were developed that documented specific technical elements of the study. These Technical Memoranda, listed below, are referenced throughout this Final Report for readers who are interested in detailed methods, assumptions and analyses.

- Existing Conditions Report
- Purpose and Need

- Public Involvement Plan
- Comments and Coordination Package
- Transit Technology Assessment
- Transit Operating Plans
- Capital and O&M Cost Methods and Results
- Assessment of Social, Economic and Environmental Impacts
- Evaluation of Viable Alternatives
- Selected Alternative Concept Plans
- Financial Strategies



2 Existing Conditions

2.1 Existing Transportation

This section addresses the existing transportation options available within the OIA AA study area.

2.1.1 Transit

Existing transit services are operated in the OIA AA study area by the Central Florida Regional Transportation Authority (CFRTA, d.b.a. LYNX), the International Drive Resort Area (I-Ride), the SunRail Phase 1 system (DeBary to Sand Lake Road), and a number of private transportation operators.

LYNX

LYNX provides local and express bus services throughout the Orlando metropolitan area. In order to ensure efficient, safe and responsive transit services, LYNX continually reviews and updates service plans to reflect the changing nature of development and travel in the metro area. In addition to these reviews, more comprehensive and broad based transit studies and analyses are undertaken periodically.

LYNX provides local and express bus services throughout the Orlando metropolitan area. LYNX operates a fleet of 265 buses on 77 local bus routes (Links), delivering more than 29.8 million passenger trips and serving area of approximately 2,500 square miles in Orange, Seminole and Osceola counties. Other LYNX services include LYMMO, a free downtown Orlando circulator; a commuter assistance Vanpool program; ACCESS LYNX paratransit service; nine NeighborLink community circulators; and Xpress service from Lake and Volusia counties.

Service	Total Ridership
LYMMO	844,514
Fixed Route	27,832,043
Pick Up Line	145,129
SUBTOTAL - FIXED ROUTE	28,821,686
Special Shuttles	14,591
ACCESS LYNX	773,433
Van Pool	247,420
SUBOTOTAL - OTHER SERVICES	1,035,444
TOTAL ALL SERVICES	29,857,130
Source: LYNX	

Table 2-1. LYNX FY 2013 Total Ridership

LYNX service in the OIA AA study area is provided on weekdays, Saturdays, Sundays and holidays. The span of service varies by route, beginning as early as 4:00 a.m. and ending as late as 3:00 a.m., with service frequencies ranging between every 15 minutes to 60 minutes. A more detailed listing of the LYNX routes and individual route maps are included in the **Existing Conditions Report.**



Within the OIA AA study area, LYNX has constructed three superstops that provide bus bays, passenger shelters, benches, and other passenger amenities. Passengers can transfer among LYNX Links to access other locations in the study area, including the Orlando International Airport and Universal Studios. LYNX' superstops are located at:

- Destination Parkway Transit Center (DPTC)
- Florida Mall
- Orlando International Airport

I-Ride

The International Drive Master Transit and Improvement District sponsors the I-Ride Trolley Service. I-Ride trolleys travel exclusively throughout the International Drive resort area. The Red Line route operates every 20 minutes on International Drive from the Orlando Premium Outlets on Vineland Avenue to the Orlando Premium Outlets on Oak Ridge Road. The Green Line route operates every 30 minutes on International Drive and Universal Boulevard from the Orlando Premium Outlets on Vineland Avenue to the Major Boulevard hotel area. I-Ride Trolleys operate seven days a week, from 8:00 a.m. to 10:30 p.m. The service is available to the general public for a fare of \$1.50. Reduced (\$0.25) and free fares are available to senior citizens and children under 12 years, respectively. Daily, multi-day, weekly, and biweekly passes are also available. The I-Ride Trolley totaled 2.1 million riders in 2012.

SunRail

The Central Florida Commuter Rail Transit (SunRail) is a regional commuter rail system that will ultimately operate along the existing CSXT railroad tracks through four Central Florida counties: Volusia, Seminole, Orange, and Osceola, as was shown in **Figure 1-1**. The project is being constructed in two phases:

- Phase 1 DeBary in Volusia County to Sand Lake Road in unincorporated Orange County, a distance of 32 miles and 12 stations. Operations began in May 2014.
- Phase 2 Sand Lake Road in unincorporated Orange County to Poinciana in Osceola County and from DeBary to DeLand in Volusia County. This phase will include an additional 30 miles and 5 stations and is anticipated to begin service in 2017.

SunRail provides 30-minute peak service from 5:30 a.m. to 8:30 a.m. and from 3:30 p.m. to 6:30 p.m. on weekdays. Midday and early evening service is provided, with trains running every 120 to 150 minutes. Weekend service is not provided for the initial startup.

The Florida Department of Transportation has collaborated with LYNX in the development of a SunRail feeder bus plan that includes modifications of existing LYNX fixed bus routes to directly serve SunRail stations.

Private Operators

In addition to LYNX's and I-Ride's public transit services, a large number of private transportation operators provide a range of transportation services in the OIA AA study area. These services include taxicabs, limousines, shuttle vans and buses that operate between the Orlando International Airport, hotels in downtown Orlando and Central Florida Resorts, theme parks and other attractions.



The operating environment of the OIA AA study area is unique in that the tourist attractions within the Central Florida region make it one of the largest private sector transportation markets in the country. There are several private companies that offer transportation options that include charter bus service, tour bus service, and other for-hire car service (e.g. taxis, limousines). Seven rental car companies are located at Orlando International Airport, with three additional companies located on airport property and several others within close proximity.

2.1.2 Roadway Characteristics

The roadway network within the project study area consists of principal and minor arterials and major and minor collectors. Eleven principal arterials have been identified within the OIA AA study area:

- Beach Line Expressway (S.R. 528);
- Central Florida GreeneWay (S.R. 417);
- Florida's Turnpike (S.R. 91), I-4 (S.R. 400);
- John Young Parkway (S.R. 423/C.R. 423);
- Kirkman Road (S.R. 435);
- Narcoossee Road (S.R. 15/C.R. 15);
- Orange Avenue (C.R. 527);
- Orange Blossom Trail (US 441/17/92/S.R. 500/600);
- Semoran Boulevard (S.R. 436); and

• Osceola Parkway (C.R. 522).

Of these, four are toll roadways within the OIA AA study area: S.R. 528, S.R. 417, Florida's Turnpike, and Osceola Parkway. The principal and minor arterials are connected to commercial and residential areas by collectors and local streets.

Roadway Capacity

Level of Service (LOS) is defined as a qualitative measure that describes traffic in terms of speed, travel time, freedom to maneuver, comfort, convenience, traffic interruptions and safety. Six classifications are used to define LOS, designated by the letters A through F. LOS A represents the best conditions, while LOS F represents heavily congested flow with traffic volume exceeding the roadway capacity.

The 2011 Annual Average Daily Traffic (AADT) and LOS are presented in detail in the **Existing Conditions Report.** The existing LOS for the roadway segments identified within the project study area is shown in **Figure 2-1**.

Roadway Safety

Crash data was obtained from the FDOT Unified Basemap Repository Website – a GIS comprehensive dataset of roadway geometry and attributes accessible over the internet, managed and maintained through documented procedures, standards, partnerships and cooperative agreements. A three-year period, from 2008 to 2010, was evaluated for this study. The crash data for the following state roadways and limits were obtained:

- Beach Line Expressway (S.R. 528) from I-4 (S.R. 400) to Semoran Boulevard (S.R. 436)
- Florida's Turnpike (S.R. 91) from Osceola Parkway (C.R. 522) to I-4 (S.R. 400)
- Central Florida GreeneWay (S.R. 417) from Osceola County line to Narcoossee Road (S.R. 15)
- Narcoossee Road (S.R. 15) from the Beach Line Expressway (S.R. 528) to Semoran Boulevard (S.R. 436)
- Sand Lake Road (S.R. 482) from I-4 (S.R. 400) to the Beach Line Expressway (S.R. 528)
- Semoran Boulevard (S.R. 436) from the Beach Line Expressway (S.R. 528) to Hoffner Avenue (C.R. 15)
- Orange Blossom Trail (US 441/17/92/S.R. 500) from Osceola Parkway (C.R. 522) to Oak Ridge Road

During the three-year period, there were 3,428 crashes involving 7,507 vehicles, resulting in 2,661 injuries and 24 fatalities. Crash rates are based on calculation procedures documented in the Institute of Transportation Engineers (ITE) Traffic Engineering Handbook. It describes a segment crash rate based on accidents per 100 million vehicle miles. The segment along Sand Lake Road (S.R. 482) from I-4 (S.R. 400) to International Drive has a crash rate of 991, the highest one found within the study area.

A detailed analysis of crash data is included in the Existing Conditions Report.





Figure 2-1. Existing Roadway Level of Service (LOS)



2.1.3 Orlando International Airport

Since its opening in 1970, and particularly since becoming an International Airport in 1976, Orlando International Airport has experienced steady growth. Currently, OIA is the third largest US airport in terms of land area, with approximately 13,000 acres. With 67 air carriers (including 45 scheduled, 11 chartered, and 11 cargo) over 3.5 million passengers utilized the airport in 2011. Its four runways and all-weather capability provide OIA with almost unmatched airfield capacity.

The Greater Orlando Aviation Authority (GOAA) is in the process of updating its Master Plan. The plan includes the expansion of the airport facilities to include an intermodal center, rail access, and the OIA Connector project (which is the subject of this study), as well as a new south terminal which will double the current gate capacity. With adequate expressway access, OIA is actively integrating its ground access modes with its air transport system into a well-coordinated transportation system.

2.1.4 Bicycle/Pedestrian Facilities

There are relatively few existing bicycle and pedestrian facilities in the study area. However, several facilities are planned for the future. The existing and proposed bicycle and pedestrian facilities within the study area are shown in the **Existing Conditions Report.**

2.1.5 Additional Transportation Improvements

MetroPlan Orlando's 2015-2019 Transportation Improvement Program (TIP) was reviewed to determine whether any immediate scheduled projects may impact any proposed alternatives developed in this AA. The TIP is a short-term plan which assigns funding to specific projects which were previously identified in the LRTP.

Major projects identified within the study area which may impact proposed alternatives include:

- Interstate 4 Ultimate Improvement Project this project is a major reconstruction of interstate 4 throughout the study area and the Orlando area as a whole. The project includes new express toll lanes and the reconstruction of existing mainline and interchanges to improve congestion. Additionally, an extension of Grand National Drive will include a new overpass over Interstate 4, providing increased connectivity between the International Drive corridor and Universal Studios.
- Sand Lake Road the project includes widening the segment of Sand Lake Road from the Universal Boulevard to John Young Parkway. The project involved widening from four through travel lanes to six through travel lanes.
- Sand Lake Road/John Young Parkway Intersection this project involves the grade separation of the Sand Lake Road/John Young Parkway intersection. A flyover will be constructed to carry John Young Parkway over Sand Lake Road and access ramps for the intersection will also be constructed.



 International Drive Transit Lanes – the project provides dedicated lanes for transit vehicles along International Drive and Universal Boulevard. The project begins at Destination Parkway and runs north along International Drive to Via Mercado. The lanes run east along Via Mercado to Universal Boulevard and north to Sand Lake Road. The lanes will be for exclusive use by transit vehicles and right-turning vehicles. The project will connect existing right-turn lanes at intersections, thereby providing an additional lane along the corridor. The project will also include pedestrian safety improvements.

2.1.6 Transportation and Mobility Summary

The existing conditions transportation analysis describes transit and transportation facilities and existing and projected travel demand for the large and diverse OIA AA study area. In the study area, travel demand is widely dispersed among a number of residential neighborhoods, work sites and major attractions. The existing and planned roadway and transit networks are primarily designed to serve north-south travel markets (e.g., I-4, International Drive, John Young Parkway, Orange Blossom Trail, Orange Avenue and SunRail). The number of roadway and transit facilities that are designed to serve east-west travel markets are limited (Sand Lake Road, S.R. 528 and Central Florida Greeneway), despite considerable travel demand between OIA, residential neighborhoods, and attractions like Universal Studios, Sea World and International Drive. The region's most visible transit investment, Sun Rail, facilitates a premium north-south transit link throughout the OIA AA study area, but the need for a complimentary east-west transit link remains. Only two public transit routes, #111 OIA/SeaWorld and #42 International Drive/OIA, serve east-west travel markets in the study area. Service on these routes is infrequent (e.g., #42 runs every 30 minutes throughout the day; #111 runs every 30 minutes peak periods and every 60 minutes during the day) and travel times are not competitive with autos (e.g., #42 takes 83-84 minutes from OIA to the Destination Parkway Transfer Center; #111 takes 48-49 minutes from OIA to the Destination Parkway Transfer Center).

2.2 Population, Employment and Land Use

2.2.1 Existing and Projected Population

The year 2010 population for the study area is 165,182; by the year 2035 the population is projected to grow by more than 220% to 530,000. This dramatic increase in population will lead to increased tripmaking which, in turn, will directly affect congestion and service quality on local roadways. In addition, the study area has a high percentage of persons below the poverty level (30% in the study area, compared to 14.9% for Orange County and 13.9% for Osceola County). The magnitude of the projected population increases and the number of transportation disadvantaged persons are important indicators of the need for additional transit services in the study area.

2.2.2 Existing and Projected Employment

Current employment within the study area is estimated at 176,205; by the year 2035 employment is expected to grow by 117% to 383,312. Major employment centers include the Orlando International Airport, Orlando Veterans Affairs (VA) Medical Center, Nemours Children's Hospital at Medical City,



Florida Mall, Orange County Convention Center, Universal Studios, SeaWorld, Lockheed-Martin, and numerous hotels and attractions in the International Drive area. Many of the new jobs created are expected to be in the low-wage service industry. Presently, there is limited transit service between residential neighborhoods and job sites; improved transit service will become increasingly important as the local population and employment bases grow.

2.2.3 Existing Land Use

Existing land use information was based on a review of current aerial photography and existing land use maps obtained from Orange County and the City of Orlando. Within such a large study area, the existing land use represents nearly every land use category including office, commercial, public benefit, institutional, industrial, mixed use, residential (single family and multi-family), agricultural, parks and open space, and conservation areas. A brief discussion of the notable existing land uses in terms of size and scale is provided below.

The eastern end of the study area is dominated by Orlando International Airport and the uses associated with the airport. The existing land uses south of the airport include the developing Medical City, home to Nemours Children's Hospital and the Orlando Veteran's Administration medical center, with additional open space or undeveloped land and single family residential development. Some commercial development exists at the Narcoossee Road and S.R. 417 intersection, with agriculture and low density residential uses extending south and east from this interchange.

North of the airport the existing land use is comprised of office and commercial uses along the S.R. 436 corridor, with some vacant land or open space just north of the airport with largely single family or low density residential adjacent to the more intense development along S.R. 436. To the west of airport there is more intense industrial and commercial development in the area immediately to the west of the Airport (Tradeport) as well as surrounding the S.R. 528, US 17-92 and Turnpike intersections, including the Florida Mall.

Continuing west, at the S.R. 528 and I-4 interchange there is significant commercial development including major shopping areas, Sea World and the Orange County Convention Center. Commercial uses exist along much of the I-4 corridor in the study area, including Universal Orlando in the northwest corner of the study area. Between I-4 and US 17-92 the existing land use is largely residential with a large conservation area associated with Shingle Creek just north of Osceola Parkway between I-4 and US 17-92.

The International Drive corridor is predominantly comprised of commercial and a mixture of professional office, and pockets of residential and agricultural areas. This area is characterized by tourist attractions, hotels, resorts, and other tourist-related activities including amusement parks, restaurants, and retail stores. Large commercial shopping centers are located along the I-Drive corridor. The International Drive Resort Area (IDRA) offers a host of hotels and resorts interspersed throughout the corridor. Some of the larger hotels, such as the Peabody Orlando, Rosen Centre Hotel, and Rosen Plaza are directly adjacent to International Drive. The undeveloped parcels within this tourist area are classified as agricultural land uses. The major attractions in this area include Sea World, the Orange County Convention Center, Wet N' Wild, Universal Studios, and Islands of Adventure. There are also

substantial high-density residential developments located south of Central Florida Parkway east of International Drive. Some of the larger communities include Williamsburg, Meadow Woods, Hunter's Creek, and Southchase. These residential areas are surrounded by rapidly developing commercial areas.

2.2.4 Future Land Use

The study area contains properties within the jurisdictions of the City of Orlando, Orange County and Osceola County. Each of these jurisdictions has adopted a Comprehensive Plan and associated Future Land Use Map to guide the development and growth in this area. A map showing the adopted future land uses by jurisdiction is included in **Figure 2-2**. As illustrated on this map, there are several concentrations of land uses around major arterials. Medical City, OIA, Florida Mall, Universal Studios, the Convention Center, and the SeaWorld / I-Drive area east of I-4 are major land use concentrations in the study area. The OIA, Universal Studios and the I-Drive area just east of I-4 have all been designated as major activity centers. Activity center designations typically represent higher intensity or density of uses or mix of uses that have specific policies and requirements for development within those areas. Medical City is designated as an Urban Reserve on the future land use map, but similar to the activity center, a more specific map and set of policies have been developed for this area. Outside of these areas the future land use is largely Low and Low Medium Residential, with Commercial Land Uses located at the intersections of major roadways, or along the frontage of the US 441/17-92 corridor.

2.2.5 Developments of Regional Impact (DRI)

Information on Developments of Regional Impact (DRI) was collected using the East Central Florida's Regional Planning Council's (ECFRPC) Central Florida Geographic Information Systems website. A DRI is defined as any development that would have a substantial impact on the health, safety or welfare of citizens in more than one county, as defined by Chapter 380.06, Florida Statutes. A total of 38 DRIs are located in or adjacent to the study area. These DRI's, shown in **Figure 2-3**, are located within or adjacent to the project study area. The DRI's are also summarized in the **Existing Conditions Report**.

The eastern end of the study area is dominated by Orlando International Airport (OIA) and the uses associated with the airport. The airport controls about 13,000 acres of land making it the single largest landholder in the study area. The airport area once included property within six separate DRIs, but has been consolidated into a single DRI with more than 10,000 acres. Also within the airport's acreage total but not within the OIA DRI is approximately 1,325 acres that the airport controls within its East Airfield property to the east of the 4th Runway, as well as approximately 1,860 acres within its Poitras Planned Development property located immediately south of the Lake Nona DRI and Medical City. At the western side of the study area, the International Drive Resort Area is comprised of a mixture of hotels, shopping centers, and area attractions. Due to the close proximity of IDRA to the Orange County Convention Center, Sea World, Universal Studios, Wet N' Wild, and the Outlet Malls, much of this area is populated and visited by tourists and convention goers.








Orlando International Airport (OIA) Connector Refresh Alternatives Analysis Financial Project ID: 429215-1-12-01

Figure 2-3 Study Area DRI's



2.2.6 Population, Employment and Land Use Summary

The remarkable growth in projected population (an increase of 220% from 2010 to 2035) and employment (an increase of 117% during this same period) will result in increased demand for premium transit in the study area, particularly for travel between local residential neighborhoods and major activity centers. The population and employment growth is supported by projected changes in land use. Many existing and planned major activity centers (residential, commercial and industrial) will necessitate the need for multi-modal transportation infrastructure for the mobility of residents and visitors alike. Premium transit will provide a catalyst for further economic development by increasing mobility and access to jobs, particularly for transit dependent riders and those that desire safe, reliable and convenient transit options.

2.3 Environmental Conditions

2.3.1 Physical Environment

The physical environment consists of historic and cultural resources; public lands/community resources; hazardous materials; air quality; and, noise and vibration. This section describes how these resources may be impacted by the AA project alternatives.

Historic and Cultural Resources

Reviews of the National Register of Historic Places (NRHP) and the digital database of the Florida Master Site File (FMSF) were conducted to determine the presence of archaeological and/or historic resources within the project study area. As a result of this review, no archaeological sites or historic resources which are listed, determined eligible, or considered potentially eligible for listing in the NRHP are located within the project study area.

In general, the search of the FMSF indicated that approximately 40 Cultural Resource Assessment Surveys (CRAS) have been conducted within and proximate to the project corridor. These surveys were performed in association with proposed road, cell tower, gas pipeline, military facility, and commercial and residential development projects. The roadway projects include surveys of segments of the Florida's Turnpike and the Beach Line Expressway (S.R. 528), as located within the project study area.

As a result, a total of 36 prehistoric and historic period archaeological sites, two historic cemeteries, and 134 historic structures have been recorded within the study area. Of these, two historic structures (80R4886 and 80R8115) are located in close proximity to the juncture of Sand Lake Road and the Beach Line Expressway (S.R. 528). However, neither resource is NRHP-listed or eligible. In addition, eight historic structures (80R7443, 80R7452-7458) within the community of Taft are located in close proximity to the CSXT Railroad Corridor; however, none is NRHP-listed or eligible.

In this desktop review, no significant cultural resources, including archaeological sites and historic resources, have been identified in the study area. However, a more detailed analysis would be performed in the next phase of project development.



Public Lands/Community Resources

There are ten parks and/or recreational areas and eight golf courses identified within the OIA Connector study area. These parks and recreational areas are shown in **Figure 2-4**. All ten parks are designated as "community" parks and are designed to serve the needs of the residents who live in the adjacent neighborhoods.

Hazardous Materials

Analysis was performed to evaluate the potential for each of the alternatives to impact known hazardous materials sites within 500 feet of each of the proposed alignments. These sites were determined through a review of the following regulatory databases maintained by the U.S. Environmental Protection Agency (EPA), the Florida Department of Environmental Protection (FDEP), and other various reporting programs.

The full analysis and graphical depiction of all identified sites are located in the Assessment of Social, Economic and Environmental Impacts Technical Memorandum.

2.3.2 Natural Environment

The natural environment includes wetlands, water quality, floodplains, and wildlife and habitat. This section describes the ecosystems within the OIA Connector study area that could potentially be affected by the OIA project alternatives.

Wetlands

Existing wetlands identified within the OIA Connector study area were obtained from the U.S. Fish and Wildlife Service's (USFWS) National Wetland Inventory (NWI) to determine the quality and habitat preference. The approximate locations of wetlands areas are presented in **Figure 2-5**. These wetlands are classified as either open water, riverine, forested or non-forested systems.

In compliance with Executive Order 11990, and the FHWA Technical Advisory T640.8A, Title 23 CFR, Part 777, and Part 2, Chapter 18 of the FDOT's Project Development and Environment (PD&E) Manual, extensive assessments of wetlands and natural resources will be performed as part of the next phase of the project development. Potential impacts to wetlands will be assessed and evaluated further as part of the Preliminary Engineering phase.

Floodplains

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), the OIA Connector study area contains several areas designated as part of the 100-year floodplain, shown on **Figure 2-6**. Potential impacts to floodplains will be assessed further as part of the next phase of project development.

Shingle Creek is a regulated floodway for Orange County as defined in the FEMA National Flood Insurance Program. Orange County acts as the FEMA representative. Shingle Creek is located west of John Young Parkway and east of International Drive.



Page 22

Water Quality

There are no sole source aquifers located within the project study area. The study area is located north of the streamflow and recharge source zones for the Biscayne Aquifer, which has been designated by EPA as a sole source aquifer. The proposed project will be evaluated further as part of the next phase of project development. Potential impacts to surface water and groundwater resources within the study area will be carefully considered in selecting the best alternative.

Wildlife and Habitat

A desktop review of threatened and endangered species within the OIA Connector study area was conducted. The purpose of this effort was to assess the potential for wildlife or rare plant occurrences within the project study area. A literature review of the Florida Natural Areas Inventory (FNAI) was performed to determine the strategic habitat conservation areas established by the Florida Fish and Wildlife Conservation Commission (FFWCC) in the vicinity of the project.

Figure 2-7 provides a graphical illustration of these habitat conservation areas. In addition, seven FNAI active eagle nests were reported by agencies to occur within the study area. The approximate locations of eagle nesting sites are also shown on **Figure 2-7**. Potential impacts to threatened and endangered species will be assessed and evaluated further as part of the next phase of project development.

2.3.3 Conservation Areas

Both the City of Orlando and Orange County have designated and mapped conservation areas. These areas are typically associated with environmentally sensitive features such as lakes, rivers and wetlands, but may also include associated parks and recreation features. Within the study area there is a large conservation area north of S.R. 417 and west of John Young Parkway, and another area south of Boggy Creek Road, just south of the OIA. There are also several bald eagle nesting sites within the study area. These properties and features may require avoidance or additional mitigation or study in terms of potential impacts. The conservation areas are identified in **Figure 2-7**.













Figure 2-5. NWI Wetlands





Figure 2-6. FEMA Floodplains













3 Agency Coordination and Public Involvement

3.1 Public Involvement Plan

Public involvement includes communicating to and receiving information from all interested persons, groups, and government organizations regarding the development of a project. A **Public Involvement Plan (PIP)** was developed which outlines the process to ensure the appropriate level of public involvement is performed for this project in compliance with the Florida Department of Transportation's (FDOT) Project Development and Environment (PD&E) Manual, Part 1, Chapter 11, and Part 2, Chapter 9; the FDOT Public Involvement Handbook; Section 339.155, Florida Statutes; Executive Orders 11990 and 11988; Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA); and 23 Code of Federal Regulations (CFR) 771.

The PIP ensures that the public, local agencies and elected officials, and other interested parties understand the nature of the project and its benefits by providing an open, two-way line of communication, presenting project information in an easy-to-understand format, and by making all project information easily accessible.

The PIP describes the process in which affected parties are engaged in the project including describing public outreach activities, identifying stakeholders and advisory groups and outlining outreach methods.

3.2 Public Outreach Activities

3.2.1 Scoping Meeting

A public scoping meeting was held for members of federal, and local agencies as well as businesses and institutions and other interested parties. The scoping meeting was held on January 31, 2013 at the Greater Orlando Aviation Authority office - One Jeff Fuqua Boulevard, Orlando, Florida in the Carl T. Langford Board Room.

Invitations were sent to over 270 individuals. Invitation letters provided a brief background on the project and explained the purpose of the scoping meeting. The meeting was attended by approximately 50 people. Attendees included project staff and managers, representatives of elected officials and local media.

The meeting began with an introduction of the project team and a presentation overview of the project. The object of the meeting was for the project team to listen to local issues or constraints and other items for consideration during the study. The general agenda presented included the following:

- Project Description, Purpose and Background
- Other Transit Projects
- Potential Transit Technologies
- Schedule and Next Steps

• Other Project Issues

A question and answer session followed the presentation. Questions, concerns and responses were documented as part of the study record. Participants were also encouraged to submit any questions and comments in writing during and after the meeting, as well as contact any of the project staff. Contact information was provided at the meeting. A project website and Facebook page, listed below, were created as additional forums for project communication and input.

3.2.2 Public Meetings

There were three public meetings for this Alternatives Analysis. Each public meeting was held at the First Baptist Church of Pine Castle located at 1001 Hoffner Avenue. Public meetings were advertised using social media, newsletters, media press releases and email blasts. Each meeting featured an informal "meet and greet" session where attendees could interact with the project team followed by a formal presentation and question and answer session. These meetings were held at the following stages of the project:

- Project Kick-off March 12, 2013
- Initial Alternatives June 18, 2013
- Viable Alternatives February 20, 2014

3.2.3 Project Advisory Group Meetings

As part of the OIA AA PIP, a Project Advisory Group (PAG) was established consisting of key community stakeholders. The PAG met regularly to provide an opportunity for the study team to share project information. The purpose of the PAG was to provide technical and administrative guidance throughout the study. The PAG consisted of representatives from local agencies, jurisdictions and local business. By involving and interacting with the public throughout the study phase, issues and concerns were identified and addressed proactively. The PAG included representatives from the following:

•

•

•

Orange County

Osceola County

SunRail

Orlando Utilities Commission

- City of Belle Isle
- City of Kissimmee
- City of Orlando
- Florida Department of Transportation
- Greater Orlando Aviation Authority
- LYNX
- MetroPlan Orlando

PAG meetings were held on the following dates:

- March 6, 2013
- May 8, 2013
- June 18, 2013
- August 14, 2013
- September 4, 2013
- October 2, 2013
 - November 6, 2013
 - January 8, 2014
- February 5, 2014
- August 6, 2014

Orlando-Orange County Expressway Authority

Osceola County Expressway Authority

- October 1 2014
- December 3, 2014

Alternatives Analysis Report

Page 29

3.2.4 Project Co-sponsor Meetings

During the course of the AA, several meetings were held with the primary project co-sponsors: the Greater Orlando Aviation Authority, the City of Orlando, Orange County and Osceola County. These meetings were held to ensure that the co-sponsors were aware of the progress and were involved in the decision making process.

3.2.5 Other Stakeholder Meetings

Other meetings were held upon request with stakeholders as part of the outreach process. These have included meetings with homeowners associations, developers and elected officials. Meetings were held with the Pine Castle, Lake Nona and Meadow Woods developments, the Federal Aviation Administration (FAA), and Congressman Victor Torres from the Florida House of Representatives.

3.3 Public Outreach Methods

3.3.1 **Project Website**

A project website was developed and maintained during the course of the study: <u>www.OIAConnector.com</u>. The website included information pertinent to the study including project schedules, maps and renderings, task updates and deliverables, presentations, and public meeting notices, materials and summaries. The site provided a mechanism to send questions and comments to the study team as well as to request monthly updates. All correspondence was documented along with the appropriate responses.

3.3.2 Social Media

A Facebook page was developed where users could check on project updates and provide comments at <u>www.facebook.com/OIAConnector</u>. All stakeholders were requested to ensure that links to information on this project be available on their websites and social media pages.

3.3.3 **Project Newsletters**

Newsletters provide a clear and informative way of communicating project information, upcoming meetings and current progress. Five volumes were prepared during the course of the Alternatives Analysis, with a total of almost 700 copies distributed to officials, agency representatives, businesses, community groups and other interested persons.

3.3.4 Other Outreach Methods

News releases, public service announcements and other project-related items of interest were provided to local media outlets at appropriate times such as major milestones. Media contacts were coordinated through the FDOT's Public Information Office (PIO). Media outlets included local newspapers, television and radio stations across the Orlando area. A detailed listing of these outlets is included in the PIP.

3.4 Comments and Coordination

Comments received from the public, PAG and other stakeholders were documented in the **Comments** and **Coordination Package.**



4 Definition and Evaluation of Initial Alternatives

4.1 Evaluation Process

Because the OIA AA study area is so large and diverse, with multiple major activity centers and the lack of a single, defined corridor, there were several potential premium transit options evaluated. In order to identify and refine the large number of premium transit options, the OIA AA study process consisted of a two-tier process to support the development and evaluation of alternatives. The Tier 1 screening identified and evaluated a large number of potential corridor alignments that connected various major activity centers. Following the screening of these Initial Alternatives, four Viable Alternatives were subsequently selected for further refinement and a rigorous evaluation. Throughout the evaluation, the No-Build Alternative was carried through the screening process as a baseline to which the Selected Alternative can be compared.

Working in collaboration with the PAG, a May 2013 workshop was held to develop the list of Initial Alternatives. The project team presented the alternatives which were considered during the 2005 AA study and asked the PAG participants to define conceptual alternatives that would: (1) provide the highest benefit to the region, and (2) provide the highest benefit to their constituents. Following the PAG workshop, 15 possible Initial Alternatives were identified. The project team then eliminated redundant alternatives and presented twelve (12) Initial Alternatives and preliminary evaluation measures to the PAG on June 12, 2013. These Initial Alternatives and evaluation measures were subsequently presented at an Initial Alternatives Public Meeting held on June 18, 2013.

In order to present an unbiased comparison of several diverse alternatives, many of which had different origins and destination end points, the following guidelines were defined which were intended to maintain consistency among the alternatives, to the greatest extent possible:

- Initial Alternatives were intended to represent general corridors where high-quality transit could be implemented and operated. The alternatives did not specify the exact horizontal (median, curb) or vertical alignment (at-grade, aerial). Moreover, the alternatives did not specify which segments may be exclusive, semi-exclusive or shared right-of-way. These alignment decisions were made in subsequent analyses for each of the Viable Alternatives.
- 2. Similarly, Initial Alternatives did not specify the mode or technology (enhanced bus, bus rapid transit, light rail transit commuter rail), even though certain alternatives may be better suited for a particular technology. The Initial Alternatives were defined as potential high-quality transit lines, meaning they would provide faster and more frequent service than typical on-street bus service. Unique mode decisions were subsequently made for each of the Viable Alternatives.
- 3. Finally, the Initial Alternatives specified conceptual station locations.

The 12 initial build alternatives are shown in Figure 4-1.



4.2 Screening of Initial Alternatives

To guide the screening process to narrow the 12 Initial Alternatives to 4 Viable Alternatives for further study, a set of goals, objectives and evaluation measures were developed from the **Purpose and Need**. PAG members were given the opportunity to review and comment on the proposed project goals and objectives. The PAG comments were carefully reviewed by the OIA AA project team and the project goals and objectives were subsequently refined. These goals where shown in **Section 1.3** of this report.

Evaluation measures were then defined for both the screening of Initial Alternatives and the evaluation of Viable Alternatives. The Tier 1 screening addressed the following evaluation measures: potential mobility benefits, environmental impacts, land use and development patterns, cost effectiveness, public/community acceptance, congestion relief and economic development. The evaluation measures for the two sets of alternatives differ, reflecting the level of detail considered for each analysis (i.e., the analysis Initial Alternatives relied on high-level measures; the analysis of Viable Alternatives will rely on detailed design plans, operating plans, cost estimates and ridership projections). Some of the Initial Alternatives evaluation measures were quantitative, with numerical values, while others were qualitative, reflecting measures that are harder to distill into a number scale. **Table 4-1** lists the evaluation criteria and measures for the screening of Initial Alternatives.

Following the PAG meeting (June 12, 2013) and Initial Alternatives Public Meeting (June 18, 2013), FDOT reviewed the comments made by the PAG members and the public and subsequently added and refined several evaluation criteria and estimated the evaluation measure for Community and Public Support.



Evaluation Criteria	Measures					
Mobility Benefits						
Ridership Potential	Number of daily 2010 person trips between activity centers					
	 Number of daily 2035 person trips between activity centers 					
Access/Connectivity	Population at or below poverty level					
	Connections to SunRail					
	Connections to OIA					
	 Connections to existing and planned LYNX bus system 					
	Environmental Benefits					
Potential Impacts to	 Environmentally sensitive areas within ¼ mile of alternative 					
Environmentally Sensitive Areas	(wetlands, 100-year floodplains, conservation areas)					
	Land Use and Development Patterns					
Population Served	 Existing (2010) population within ½ mile of each alternative 					
	 Projected (2035) population within ½ mile of each alternative 					
Transit Supportive Land Uses	 Activity centers served by each alternative 					
Cost Effectiveness						
Capital Costs	Order-of-magnitude capital cost for a premium transit improvement					
	(High, Medium, Low)					
Operations and Maintenance	 Order-of-magnitude annual O&M for a premium transit 					
(O&M) Costs	improvement (High, Medium, Low)					
	Public / Community Acceptance					
Public and Community Support	Comments from Project Advisory Group and Initial Alternatives					
	Public Meeting					
Congestion Relief						
Mitigate Traffic Congestion	 Existing LOS (2012) for parallel roadway segments along and/or 					
adjacent to alternative						
Economic Development						
Support or Encourage Economic	 Projected employees (2035) within ½ mile of each alternative 					
Development Initiatives	• Number of Developments of Regional Impact (DRI) within ¼ mile of					
	alternative					

Table 4-1. Initial Alternatives Evaluation Criteria and Measures

4.3 Initial Alternatives Evaluation Results

Evaluation of Initial Alternatives was a high-level process (i.e., precise alignments were not specified, alternatives were technology neutral, station locations were conceptual). Each alternative was evaluated as performing high (3), medium (2), or low (1) for each of the factors. Those alternatives that do not satisfy the project goals and objectives tend to achieve low scores, while alternatives that do achieve the project goals and objectives tend to achieve high scores. **Table 4-2** provides a summary matrix of the Tier 1 evaluation results.



The scores at the bottom of the matrix simply sum the high-medium-low scores for each evaluation measure. A higher score is considered more favorable. As the matrix shows, the five highest ranked alternatives (in order, from highest to lowest) are:

- Alternative 5: OIA South SunRail via the Orlando Utilities Commission (OUC) Stanton Spur Track
- Alternative 6: OIA North DPTC via TG Lee, Sand Lake Rd, Winegard, Lancaster, and Universal Blvd
- Alternative 2: OIA South I-Drive & Osceola Pkwy via Medical City, Boggy Creek, and Osceola Parkway
- Alternative 3: OIA North DPTC via TG Lee and Sand Lake Rd
- Alternative 4: OIA North DPTC via TG Lee, Sand Lake Rd, Florida Mall, and Destination Pkwy

Alternatives 3, 4, and 6 serve the northern portion of the study area and share a common alignment leaving the airport and a common terminal point – the Orange County Convention Center / DPTC. Alternative 2 serves the southern portion of the study area.

4.4 SunRail Connection to OIA

Due to the high interest from regional partners and other stakeholders, FDOT decided to advance Alternative 5, SunRail to OIA, under a separate study. Alternative 5, the SunRail-OIA connection would be along a 5.5 mile long corridor, beginning at a wye turnout on the existing CFRC mainline where the OUC Stanton Spur track begins, approximately 3 miles south of the existing Phase 1 Sand Lake Road station and 1.5 miles north of the proposed Phase 2 South Meadow Woods station. From that point the project corridor would continue east approximately 3.5 miles along the existing OUC Stanton Spur, and then continue approximately 2 miles, on airport property to the proposed Intermodal Terminal at the planned OIA South Terminal.

The proposed SunRail connection to OIA, Alternative 5, would serve OIA air passengers and employees who live in the north and south SunRail corridors (e.g., downtown Orlando, Winter Park, Altamonte Springs, Sanford, Kissimmee). The remaining four Viable Alternatives would serve different travel markets: (1) Central Florida visitors (air passengers) travelling between OIA and resort and convention center destinations in the Universal Studios and I-Drive resort area, and (2) residents in the OIA study area travelling to job sites at OIA, Universal Studios, I-Drive and other major employers in the OIA study area. Because they would serve different travel markets, the SunRail Connection to OIA and the Viable Alternatives would be complementary rather than competing (i.e., the SunRail Connection to OIA project may add riders to the Viable Alternatives since north-south riders would then have a convenient and attractive connection to the Universal Studios and I-Drive resort areas and vice versa).

The four Viable Alternatives advanced in this AA were 2, 3, 4 and 6.

Figure 4-1. Initial Alternatives





Orlando International Airport (OIA) Connector Refresh Alternatives Analysis Financial Project ID: 429215-1-12-01

Table 4-2. Initial Alternatives Evaluation Summary

Evaluation Measures	Alternative											
	1	2	3	4	5	6	7	8	9	10	11	12
Mobility Impacts	2	3	3	3	3	3	2	2	1	2	2	1
Environmental Impacts	3	2	2	3	3	2	2	3	2	1	1	3
Land Use & Development Patterns	1	3	2	2	3	3	2	1	2	3	1	1
Cost Effectiveness	3	1	2	2	3	1	2	3	2	1	3	3
Community Acceptance	2	3	3	3	3	3	1	1	1	1	2	2
Congestion Relief	3	3	2	2	3	1	2	3	1	1	1	1
Economic Development	2	3	3	2	3	3	2	2	2	2	2	2
OVERALL RANKING*	6	3	4	4	1	2	9	8	11	7	11	10

*Ranking based on sum of all evaluation measures and sub-measures shown in Table 4-1.



Orlando International Airport (OIA) Connector Refresh Alternatives Analysis Financial Project ID: 429215-1-12-01

LEGEND
Low
Medium
High

5 Definition and Evaluation of Viable Alternatives

5.1 Definition of Viable Alternatives

The Tier 2 evaluation further refined and evaluated the four potentially Viable Alternatives for the OIA study area. The process is described in greater detail in the **Evaluation of Viable Alternatives Technical Memorandum**. The Viable Alternatives were defined as:

- Alternative 2: OIA South International Drive & Osceola Parkway via Medical City, Boggy Creek, and Osceola Parkway
- Alternative 3: OIA North DPTC via TG Lee Boulevard and Sand Lake Road
- Alternative 4: OIA North DPTC via TG Lee Boulevard, Sand Lake Road, Florida Mall, and Destination Parkway
- Alternative 6: OIA North DPTC via S.R. 528, Sand Lake Road, Winegard Road, Oak Ridge Road, and Universal Boulevard

During the refinement process, potential transit technologies were evaluated for each of the Viable Alternatives. This process provides an analysis of premium transit technologies based on vehicle types, performance, stations, alignments, amenities and costs; identifies those technologies that are most appropriate for urban transit corridors similar to the four Viable Alternatives; then recommends the most appropriate transit technology for each alternative based on the project goals and objectives.

Several technologies were reviewed and evaluated for their ability to effectively and efficiently serve the proposed corridor. The selected technology should have a proven record of successful deployment and operation in similar types of applications in comparison with the four potentially Viable Alternative corridors. This includes urban corridors that range from 10 to 25 miles long. These identified proven technologies were presented at the Scoping Meeting and Public Kickoff Meeting:

- Enhanced Bus
- Bus Rapid Transit
- Light Rail Transit/Streetcar
- Commuter Rail Transit

The technologies were evaluated for each alternative using the following criteria:

- Ability to Accommodate Semi-exclusive or Exclusive Lanes
- Capacity
- Cost to Construct, Operate and Maintain
- Environmental Considerations
- Connectivity with Other Projects

The transit technologies were evaluated high (3-teal blue), medium (2-yellow) or low (1-orange) based on how they satisfied the above criteria. A summation of these rankings provided the basis for selecting the most suitable transit technology for each alternative. The rankings and results of the transit technologies evaluation are shown in **Table 5-1**.

	RANKINGS											
EVALUATION CATEGORY	Alternative 2		Alternative 3		Alternative 4			Alternative 6				
	BRT	LRT	CR	BRT	LRT	CR	BRT	LRT	CR	BRT	LRT	CR
Ability to accommodate semi- exclusive or exclusive lanes	3	2	1	3	3	1	3	3	1	3	1	1
Ridership capacity	1	3	2	1	3	2	1	3	2	1	3	2
Capital costs	3	1	1	2	1	1	2	1	1	3	1	1
Environmental impacts	3	2	1	2	3	1	2	3	1	3	2	1
Connectivity to other premium transit projects	3	2	2	3	2	2	3	2	2	3	2	2
TOTAL SCORE	13	10	7	11	12	7	11	12	7	13	9	7
OVERALL RANKING	1	2	3	2	1	3	2	1	3	1	2	3

Table 5-1. Evaluation of Technologies for Viable Alternatives

NOTES & SOURCES:

1. Ability to accommodate semi-exclusive or exclusive lanes reflects potential corridor R/W.

2. Ridership capacity based on ability to provide at least 2,250 seats per direction, per hour during peak periods.

3. Capital cost based on unit costs shown in Table 6.

4. Environmental impacts reflect potential noise and vibration, air quality and congestion relief,

transit oriented development and economic redevelopment.

5. Connectivity to other projects includes direct connections to SunRail, US 192 and Intl. Drive BRT projects,

and potential extensions to Universal, Disney.

More detailed information about the evaluation process is presented in the **Transit Technology Assessment Technical Memorandum**.

5.2 Forecast Years

The Tier 2 evaluation featured two forecast years, consistent with the Federal Transit Administration's (FTA) Capital Investment Grant Program process. The "Current Year" (2010) is the forecast year that the regional travel demand model was calibrated and validated (refer to section 5.7). The "Future Year" (2035) is the horizon year for MetroPlan Orlando's adopted LRTP.

5.3 No-Build Alternative

The No-Build Alternative served as the baseline for establishing the environmental impacts of the proposed alternatives, the financial condition of implementing and operating agencies, and the cost-effectiveness of the Build Alternatives. In accordance with FTA's Capital Investment Grant Program guidelines, No-Build Alternatives were defined for both the Current Year (2010) and Future Year (2035). The Current Year No-Build Alternative included the roadway and transit projects that were operational



in 2010 and other projects that have since been implemented or are programmed for implementation in the next few years.

The Current Year transit network for the No-Build Alternative included the existing (2010) LYNX bus network. The Current Year No-Build Alternative is also assumed to include the 32-mile Phase 1 SunRail system between DeBary in Volusia County and Sand Lake Road in Orange County, since revenue started revenue service in spring 2014 and the 17-mile Phase 2 South SunRail extension from Sand Lake Road to Poinciana Boulevard in Osceola County, which is scheduled to begin revenue service in 2017. The Current Year No-Build Alternative also included the privately proposed All Aboard Florida intercity rail project, between Miami and OIA, which is expected to be completed in 2016.

The Future Year No-Build Alternative reflects the transit network including those projects within the study area that are described in the transit element of the MetroPlan Orlando 2030 LRTP and the LYNX 2030 Vision TDP. This included the proposed 61-mile SunRail commuter rail system from DeLand to Poinciana Boulevard, All Aboard Florida intercity rail project, and premium transit corridors for future BRT or other transit service, including:

- Kissimmee to Florida Mall along Orange Blossom Trail (US 17/92/441)
- Florida Mall to Downtown Orlando along Orange Blossom Trail
- Medical City/Lake Nona to UCF along Innovation Way/Alafaya Trail
- OIA to Disney along S.R. 528
- Sand Lake Road to Downtown Orlando along Orange Avenue (S.R. 527)
- Apopka to OIA along Semoran Boulevard (S.R. 436)

As discussed in Chapter 4, the No-Build Alternative was carried through the Tier 1 and Tier 2 evaluation process.

5.4 Build Alternatives

The four Viable Alternatives are described below and shown in **Figure 5-1**. The alternatives are also described in greater detail in the **Evaluation of Viable Alternatives Technical Memorandum**.





Orlando International Airport (OIA) Connector Refresh Alternatives Analysis Financial Project ID: 429215-1-12-01

Figure 5-1. Viable Alternatives



5.4.1 Alternative 2

Alternative 2 utilizes an at-grade, semi-exclusive Bus Rapid Transit (BRT) alignment (i.e., BRT lanes would be shared with right-turning traffic) along a 23.4 mile corridor, connecting Orlando International Airport (OIA) and International Drive. Alternative 2 would serve the OIA, Lake Nona/Medical City Development, Buenaventura Lakes residential neighborhood, Osceola Parkway, and the Loop.

The alignment begins at the OIA South Terminal, then proceeds south along South Access Road and joins Boggy Creek Road before turning east onto S.R. 417 for 2.09 miles, and then turns south onto Lake Nona Boulevard. The alignment continues southwest on a new roadway, planned Osceola Parkway extension, that will connect Lake Nona Boulevard to Boggy Creek Road. The alignment turns south on Boggy Creek Road for 1.48 miles, then heads west on a planned extension of Osceola Parkway. The alignment terminates near the Gaylord Palms Convention Center, adjacent to International Drive.

Alternative 2 is summarized below and illustrated in **Figure 5-2.** The proposed stations are shown in **Table 5-2.**

Summary of Alternative 2:

Project Length:	23.4 miles
Number of Stations:	13
Average Station Spacing:	1.8 miles
Transit Technology:	Bus Rapid Transit
Vertical Alignment:	At-grade
Guideway:	Semi-exclusive and shared traffic lanes
Travel Time (min:sec):	52:36
Average Speed (mph):	26.5
2011 Weekday Service Plan:	15 min. peak / 20 min. midday / 30 min. evening
2035 Weekday Service Plan:	10 min. peak / 15 min. midday / 20 min. evening





Figure 5-2. Alternative 2 Alignment and Station Locations



Station Number	Station Name	Preliminary Station Type
2A	International Drive	Major Urban Center
2B	Poinciana Boulevard	Suburban Center
2C	Flora Boulevard	Suburban Center
2D	Thacker Avenue	Suburban Center
2E	Centerview Boulevard	Urban Center
2F	SunRail Osceola Parkway Station	Transit Hub
2G	FL Turnpike	Urban Center
2H	Florida Parkway	Local
21	Buenaventura Boulevard	Suburban Center/Regional Commuter
2J	Osceola Parkway & Boggy Creek Road	Suburban Center/Regional Commuter
2К	Medical Center Drive	Urban Center
2L	Tavistock Lakes Boulevard	Urban Center
2M	OIA South Terminal	Transit Hub

Table 5-2. Alternative 2 Proposed Stations

The station typologies are described in **Section 6.3.2.**

5.4.2 Alternative 3

Alternative 3 uses an exclusive, grade-separated aerial Light Rail Transit (LRT) alignment along TG Lee Boulevard and Sand Lake Road connecting the OIA South Terminal and DPTC.

The alignment begins at the OIA South Terminal, then proceeds north in the right-of-way adjacent to the South Access Road, crosses over S.R. 528/Beachline Expressway, continues along TG Lee Boulevard before joining North Frontage Road/McCoy Road, then turns south along Conway Road, west on S.R. 528/Beachline Expressway, then west along Sand Lake Road. Alternative 3 then turns south at Universal Boulevard, then turns onto Tradeshow Road to terminate at the DPTC. Alternative alignments along Lee Vista Boulevard and International Drive would be evaluated in subsequent phases of the project.

Alternative 3 would be constructed as an aerial fixed guideway LRT line, with limited locations of atgrade alignment where the LRT would have limited or no interference with vehicular traffic. Segments that would likely be constructed on at-grade LRT alignment include the segment on OIA property from the proposed South Terminal to the employee parking lot near S.R. 528, and along Universal Boulevard and Tradeshow Road between Destination Parkway and Sand Lake Road. Alternative 3 is summarized below and illustrated in **Figure 5-3.** The proposed stations are shown in **Table 5-3.**

Summary of Alternative 3:	
Project Length:	16.3 miles
Number of Stations:	15
Average Station Spacing:	1.1 miles
Transit Technology:	Light Rail Transit
Vertical Alignment:	Mostly aerial
Guideway:	Exclusive guideway
Travel Time (min:sec):	34:20
Average Speed (mph):	29.0
2011 Weekday Service Plan:	15 min. peak / 20 min. midday / 30 min. evening
2035 Weekday Service Plan:	10 min. peak / 15 min. midday / 20 min. evening

Table 5-3. Alternative 3 Proposed Stations

Station Number	Station Name	Preliminary Station Type
3A	Destination Parkway	Transit Hub
3B	OCCC	Major Urban Center
3C	Austrian Row & Universal Boulevard	Urban Center
3D	Jamaican Court & Universal Boulevard	Urban Center
3E	Tangelo Park	Local
3F	John Young Parkway	Suburban Center
3G	Chancellor Drive	Urban Center
3H	Florida Mall	Major Urban Center
31	Sand Lake Road & Winegard Road	Urban Center
3J	SunRail Sand Lake Road Station	Transit Hub
ЗК	McCoy Road + S.R. 528	Urban Center
3L	Daetwyler Drive	Urban Center
3M	Gateway Village	Urban Center
3N	TG Lee Boulevard	Urban Center
30	OIA South Terminal	Transit Hub

The station typologies are described in Section 6.3.2.





Orlando International Airport (OIA) Connector Refresh Alternatives Analysis Financial Project ID: 429215-1-12-01

Figure 5-3. Alternative 3 Alignment and Station Locations







5.4.3 Alternative 4

Alternative 4 uses an exclusive, grade-separated aerial Light Rail Transit (LRT) alignment along TG Lee Boulevard, Sand Lake Road and Destination Parkway connecting the OIA South Terminal and DPTC.

The alignment begins at the OIA South Terminal, then proceeds north adjacent to South Access Road, crosses over S.R. 528/Beachline Expressway, continues along TG Lee Boulevard before joining North Frontage Road/McCoy Road, then turns south along Conway Road, west on S.R. 528/Beachline Expressway, then west along Sand Lake Road. The alignment turns south to connect with Florida Mall Avenue, August Lane, President Drive, and then turns south to follow Exchange Drive before crossing over Florida's Turnpike. Alignment 4 then continues along Destination Parkway, terminating at the DPTC. Alternative alignments along Lee Vista Boulevard and International Drive would be evaluated in subsequent phases of the project.

Alternative 4 would be constructed as an aerial fixed guideway LRT line, with limited locations of atgrade alignment where the LRT would have limited or no interference with vehicular traffic. Segments that would likely be constructed on at-grade LRT alignment include the segment on OIA property from the proposed South Terminal to the employee parking lot near S.R. 528, and along Destination Parkway between the transit center and John Young Parkway.

Alternative 4 is summarized below and illustrated in **Figure 5-4.** The proposed stations are shown in **Table 5-4.**

Summary of Alternative 4:	
Project Length:	14.0 miles
Number of Stations:	11
Average Station Spacing:	1.3 – 1.4 miles
Transit Technology:	Light Rail Transit
Vertical Alignment:	Mostly aerial
Guideway:	Exclusive guideway
Travel Time (min:sec):	26:43
Average Speed (mph):	32.0
2011 Weekday Service Plan:	15 min. peak / 20 min. midday / 30 min. evening
2035 Weekday Service Plan:	10 min. peak / 15 min. midday / 20 min. evening

Station Number	Station Name	Preliminary Station Type
4A	Destination Parkway	Transit Hub
4B	Futures Drive	Suburban Center
4C	John Young Parkway	Suburban Center
4D	Florida Mall	Major Urban Center
4E	Sand Lake Road & Winegard Road	Urban Center
4F	SunRail Sand Lake Road Station	Transit Hub
4G	McCoy Road	Urban Center
4H	Daetwyler Drive	Regional Commuter
41	Gateway Village	Urban Center
4J	TG Lee Boulevard	Urban Center
4К	OIA South Terminal	Transit Hub

Table 5-4. Alternative 4 Proposed Stations

The station typologies are described in **Section 6.3.2.**



Page 47



Figure 5-4. Alternative 4 Alignment and Station Locations





5.4.4 Alternative 6

Alternative 6 uses an at-grade, semi-exclusive, Bus Rapid Transit (BRT) alignment connecting the OIA South Terminal and DPTC.

The alignment begins at the OIA South Terminal, then proceeds north along South Access Road, west on S.R. 528/Beachline Expressway, then continues west on Sand Lake Road. The alignment turns north on Winegard Road, west on West Oak Ridge Road, and northwest on a future extension of Grand National Drive to Major Boulevard near Universal Studios. Alternative 6 then turns south on Universal Boulevard and Tradeshow Road, and then terminates at the DPTC. An alternative alignment along International Drive would be evaluated in subsequent phases of the project.

The BRT route will utilize general travel lanes in mixed traffic as well as exclusive BRT lanes in several locations. The need for these lanes is due to traffic congestion on Sand Lake Road, McCoy Road, Oak Ridge Road and Universal Boulevard. The potential for exclusive or Business and Transit (BAT) lanes will need to be evaluated on Sand Lake Road/McCoy Road between Winegard Road and S.R. 528, on Universal Boulevard between Carrier Drive and Tradeshow Road. (BAT lanes refer to curb lanes designated specifically for use by buses and vehicles entering and exiting adjacent businesses.) These evaluations will require coordination with the FDOT Traffic Operations department to determine the feasibility and impact these options would have on traffic operations along the corridor(s). Additionally, left turn lanes would be added on Winegard Road between Sand Lake Road and Oak Ridge Road to allow for reduced travel times of the BRT vehicles. BRT or BAT lanes may also be an option along Oak Ridge Road between International Drive and Winegard Road; however, the proximity to adjacent residential and retail structures would make right-of-way acquisition very costly. The BRT on all other roadways would likely not encounter significant congestion, so exclusive lanes would not be necessary.

Alternative 6 is summarized below and illustrated in **Figure 5-5.** The proposed stations are shown in **Table 5-5.**

Summary of Alternative 6:

Project Length:	19.0 miles
Number of Stations:	15
Average Station Spacing:	1.2 – 1.3 miles
Transit Technology:	Bus Rapid Transit
Vertical Alignment:	At-grade
Guideway:	Exclusive and shared traffic lanes
Travel Time (min:sec):	46:33
Average Speed (mph):	25.0
2011 Weekday Service Plan:	15 min. peak / 20 min. midday / 30 min. evening
2035 Weekday Service Plan:	10 min. peak / 15 min. midday / 20 min. evening

Station Number	Station Name	Preliminary Station
		Туре
6A	Destination Parkway	Transit Hub
6B	OCCC	Major Urban Center
6C	Austrian Row & Universal Boulevard	Urban Center
6D	Jamaican Court & Universal Boulevard	Urban Center
6E	Carrier Drive	Urban Center
6F	Universal Studios	Major Urban Center
6G	Festival Bay/Belz	Major Urban Center
6H	Millenia Boulevard	Local
61	Kingsgate Drive	Local
6J	Texas Avenue	Local
6K	Orange Blossom Trail	Urban Center
6L	Lancaster Road	Local
6M	Sand Lake Road & Winegard Road	Urban Center
6N	SunRail Sand Lake Road Station	Transit Hub
60	OIA South Terminal	Transit Hub

Table 5-5. Alternative 6 Proposed Stations

The station typologies are described in Section 6.3.2.



Page 50



Orlando International Airport (OIA) Connector Refresh Alternatives Analysis Financial Project ID: 429215-1-12-01

Figure 5-5. Alternative 6 Alignment and Station Locations



5.5 **Operating Plans**

Operating plans were developed for the four Viable Alternatives and their respective transit technology modes. Transit operating plans were developed for two analysis years: the "Current Year" which describes existing transit operations and is the baseline for the regional travel demand model (2010), and a "Future Year" (2035) which features projects included in the region's adopted Long-Range Transportation Plan (LRTP).

Preliminary estimates of run times were based on vehicle performance characteristics for typical BRT buses and LRT vehicles, alignments and station locations, civil speed restrictions, station dwell times and estimated signalized intersection delays. A detailed description of the assumptions made in the run time analysis is provided in the **Transit Operating Plans Technical Memorandum**. The estimated run times for each alternative are shown below in **Table 5-6**.

Run Time (min:sec)	Distance (miles)	Avg. Speed (mph)					
Alternative 2 (Bus Rapid Transit)							
52:36	23.4	26.5					
Alternative 3 (Light Rail Transit)							
34:20	16.3	29.0					
Alternative 4 (Light Rail Transit)							
26.43	14.0	32.0					
Alternative 6 (Bus Rapid Transit)							
46:33	19.0	25.0					

Table 5-6. Run Time Summaries

Span of service is assumed to operate from 5:00 am to 11:00 pm on weekdays, and 6:00 am to 12:00 am during weekends and holidays, shown in **Table 5-7**.

Table 5-7. BRT & LRT Span of Service

Day of Week	Time Period	Hours			
	AM Peak	5:00am - 9:00am	4.0		
	Midday Peak	9:00am - 3:00pm	6.0		
Monday-Friday	PM Peak	3:00pm - 7:00pm	4.0		
	Evening	7:00pm - 11:00pm	4.0		
		18.0			
Caturday, Curday 9	Daytime	6:00am - 9:00pm	15.0		
Saturday, Sunday & Holidays	Evening 9:00pm - 12:00am		3.0		
		Weekend Total	18.0		



5.6 Capital and O&M Costs

Capital and O&M cost estimates were developed for the four Viable Alternatives. The capital cost estimates were developed using the Federal Transit Administration's (FTA) Standard Cost Categories (SCC). Any project pursuing (or potentially pursuing) federal funding through FTA must organize project costs according to the following SCC categories:

<u>SCC Category 10 – Guideway:</u> includes all transit improvements associated with the roadway including bus lanes, queue jump lanes and pedestrian crossings.

<u>SCC Category 20 – Stations/Stops</u>: includes all costs associated with at-grade stations, such as grading, structures, finishes, equipment, mechanical and electrical components, and safety systems.

<u>SCC Category 30 – Support Facilities:</u> Yards, Shops, Administration Buildings – includes construction costs associated with all support facilities, such as bus garages, maintenance facilities, and administration buildings. Cost elements include grading, structures, finishes, equipment, mechanical and electrical components, and safety systems.

<u>SCC Category 40 – Sitework and Special Conditions</u>: includes site civil elements associated with the project, including clearing and demolition, utility relocation, environmental mitigation, sidewalks, landscaping, fencing, public art, paving, and temporary construction facilities.

<u>SCC Category 50 – Systems:</u> includes all systems-related elements, such as traffic signal control, and communications systems.

<u>SCC Category 60 – Right of Way, Land, Existing Improvements:</u> includes the purchase or lease of real estate, relocation of existing households and businesses, and professional services associated with the real estate component of the project.

<u>SCC Category 70 – Vehicles:</u> includes the costs for limited stop bus, BRT and LRT vehicles.

<u>SCC Category 80 – Professional Services</u>: includes all professional, technical and management services related to the design and construction of fixed infrastructure during the preliminary engineering, final design, and construction phases of the project.

<u>SCC Category 90 – Unallocated Contingency:</u> includes a standard unallocated contingency to account for undefined project items in early stages of project planning and design. This contingency is in addition to specific allocated contingencies for individual line items.

The specific methodologies and assumptions are detailed in the **Capital and O&M Cost Methods and Results Technical Memorandum.**

The capital costs are presented in **Table 5-8**.

Standard Cost Category (SCC)	Alt. 2 (BRT) \$(x000)	Alt. 3 (LRT) \$(x000)	Alt. 4 (LRT) \$(x000)	Alt. 6 (BRT) \$(x000)	
10 Guideway	\$32,320	\$362,132	\$362,132 \$307,213		
20 Stations	\$4,800	\$88,800 \$72,400		\$5,600	
30 Support Facilities	\$0	\$12,750	\$12,750	\$0	
40 Sitework	\$37,543	\$77,827	\$67,048	\$55,617	
50 Systems	\$13,045	\$66,630	\$57,443	\$13,719	
CONSTRUCTION SUBTOTAL	\$87,708	\$608,139	\$516,853	\$122,816	
60 Right-of-Way	\$1,800	\$1,370	\$35,124	\$4,652	
70 Vehicles	\$18,750	\$80,000	\$80,000	\$17,500	
80 Professional Services	\$38,153	\$264,541	\$224,831	\$53,425	
90 Contingency	\$29,282	\$190,810	\$171,362	\$39,679	
TOTAL PROJECT COST	\$175,693	\$1,144,860	\$1,028,170	\$238,072	

Table 5-8. Viable Alternative Capital Costs

Note: All costs are based on 2013 dollars (x000). No escalations of costs are reflected in the above estimates.

As shown above, the capital costs vary significantly. The BRT alternative (2 and 6) capital costs range from \$176 million to \$238 million. The LRT alternative (3 and 4) capital costs are in excess of \$1 billion.

Construction costs vary by alternative due to alignment length, the number of stations, the number of vehicles needed, the amount of right-of-way required, the number of elevated versus at-grade structures needed, and other factors. In general, the LRT alternatives are typically more costly than the BRT alternatives since LRT requires significant track, signalization, and electrification components, whereas the BRT alternatives are each completely at-grade, with major cost components that include roadway widening, vehicles, systems, and right-of-way. The BRT alternatives were assumed to use the existing LYNX vehicle maintenance and storage facilities, resulting in no additional cost for the support facilities category for those alternatives.

The O&M model and cost estimation methods are consistent with the FTA guidelines by developing fully allocated cost models utilizing multiple supply variables. O&M models were developed for both the BRT and LRT alternatives. The BRT O&M unit costs and cost estimates were prepared utilizing LYNX's FY 2011 National Transit Database (NTD) operating and financial data for fixed route bus service. LRT O&M estimates were developed using FY 2011 NTD operating and financial data from other LRT systems currently in operation.

The following equations, shown in **Table 5-9**, summarize the fully-allocated cost model used to estimate annual O&M costs for BRT and LRT operations.

BRT										
Estimated Annual O&M Cost	=	Stations Unit Cost X Projected BRT Stations	+	Garage Unit Cost X Projected Garages	+	Bus-Hour Unit Cost X Projected Bus-Hours	+	Bus-Miles Unit Cost X Projected Bus-Miles	+	Peak Vehicles Unit Cost X Projected Peak Vehicles
LRT										
		Route-Mile Unit Cost		Yard		Train-Hour		Car-Mile		Peak Vehicles

Unit Cost

Х

Projected

Train-Hours

+

Unit Cost

Х

Projected

Car-Miles

+

Unit Cost

Х

Projected

Peak Vehicles

Unit Cost

Х

Projected

Yards

Table 5-9. BRT and LRT Annual O&M Cost Equations

Х

Projected

Route-

Miles

+

Estimated

Annual

O&M Cost

=

O&M costs were calculated by applying unit costs derived from the fully allocated model to the projected operating statistics. Costs were estimated and summarized using 2011 dollars for both the Current Year (2010) and Future Year (2035) scenarios, shown in **Tables 5-10 and 5-11**.

+




Table 5-10. Current Year (2010) LRT and BRT O&M Cost Estimates

	BRT Stations	Garages	Bus-Hrs	Bus-Miles	Peak Buses	Total Annual
Current Year / Alternative	\$9,787	\$2,339,973	\$40.42	\$1.86	\$44,379	O&M Cost
Alternative 2 - Medical City, Boggy Creek,						
and Osceola Parkway	13.0	0.10	40,780	953,500	8	
Cost by Variable	\$127,000	\$225,000	\$1,648,000	\$1,775,000	\$355,000	<u>\$4,130,000</u>
			т	otal Annual O&M C	Cost (2011 Dollars)	\$4,130,000
			Average Annual O	&M Cost per Bus-H	our (2011 Dollars)	\$101
	Pt Miles	Varde	Train Ure	Cor Milos	Dook Vobielos	
Current Veer / Alternative	¢07 EOE	taius	ГГАПТ-ПГ5 ¢120.04	car-ivilles	conc ooo	
	Ş97,595	\$3,590,414	\$139.94	\$3.81	\$206,920	U&IVI COSt
Alternative 3 - TG Lee Boulevard and Sand Lake Road	16.3	1.0	57,990	1,332,700	12	
Cost by Variable	\$1,595,000	\$3,596,000	\$8,115,000	\$5,084,000	\$2,483,000	<u>\$20,873,000</u>
			т	otal Annual O&M C	Cost (2011 Dollars)	\$20,873,000
			Average Annual O&	M Cost per Train-H	our (2011 Dollars)	\$360
	Rt-Miles	Yards	Train-Hrs	Car-Miles	Peak Vehicles	Total Annual
Current Year / Alternative	\$97,595	\$3,596,414	\$139.94	\$3.81	\$206,920	O&M Cost
Alternative 4 - TG Lee Boulevard, Sand Lake Road,						
Florida Mall, and Destination Parkway	14.0	1.0	53,930	1,143,700	10	
Cost by Variable	\$1,366,000	\$3,596,000	\$7,547,000	\$4,363,000	\$2,069,000	<u>\$18,941,000</u>
			т	otal Annual O&M C	Cost (2011 Dollars)	\$18,941,000
			Average Annual O&	M Cost per Train-H	our (2011 Dollars)	\$351
	RPT Stations	Carages	Rue Hre	Ruc Miles	Dook Ruses	Total Annual
Current Vear / Alternative		¢2 220 072	Sucretaria Sucretaria	Sus-ivilles	SAN 270	
Alternative 6 - Medical City, Boggy Creek		÷2,559,975	940.4Z		۲۰ ,375 -	Oawredst
and Osceola Parkway	15.0	0.08	38,740	774,500	7	
Cost by Variable	\$147,000	\$197,000	\$1,566,000	\$1,442,000	\$311,000	<u>\$3,663,000</u>
			т	otal Annual O&M C	Cost (2011 Dollars)	\$3,663,000
			Average Annual O	&M Cost per Bus-H	our (2011 Dollars)	\$95





Table 5-11. Future Year (2035) LRT and BRT O&M Cost Estimates

Future Year / Alternative	BRT Stations \$9.787	Garages \$2.339.973	Bus-Hrs \$40.42	Bus-Miles \$1.86	Peak Buses \$44.379	Total Annual O&M Cost
Alternative 2 - Medical City, Boggy Creek, and Osceola Parkway	13.0	0.14	57,990	1,355,600	12	
Cost by Variable	\$127,000	\$337,000	\$2,344,000	\$2,524,000	\$533,000	<u>\$5,865,000</u>
			Т	otal Annual O&M Co	st (2011 Dollars)	\$5,865,000
			Average Annual O	&M Cost per Bus-Ho	ur (2011 Dollars)	\$101

Future Year / Alternative	Rt-Miles \$97,595	Yards \$3,596,414	Train-Hrs \$139.94	Car-Miles \$3.81	Peak Vehicles \$206,920	Total Annual O&M Cost
Alternative 3 - TG Lee Boulevard and Sand Lake Road	16.3	1.0	81,590	1,895,000	16	
Cost by Variable	\$1,595,000	\$3,596,000	\$11,417,000	\$7,229,000	\$3,311,000	<u>\$27,148,000</u>
			т	otal Annual O&M C	ost (2011 Dollars)	\$27,148,000
			Average Annual O&	M Cost per Train-H	our (2011 Dollars)	\$333

	Rt-Miles	Yards	Train-Hrs	Car-Miles	Peak Vehicles	Total Annual
Future Year / Alternative	\$97,595	\$3,596,414	\$139.94	\$3.81	\$206,920	O&M Cost
Alternative 4 - TG Lee Boulevard, Sand Lake Road,						
Florida Mall, and Destination Parkway	14.0	1.0	75,210	1,626,100	16	
Cost by Variable	\$1,366,000	\$3,596,000	\$10,525,000	\$6,203,000	\$3,311,000	<u>\$25,001,000</u>
				Total Annual O&M C	ost (2011 Dollars)	\$25,001,000
			Average Annual O8	&M Cost per Train-H	our (2011 Dollars)	\$332

	BRT Stations	Garages	Bus-Hrs	Bus-Miles	Peak Buses	Total Annual
Future Year / Alternative	\$9,787	\$2,339,973	\$40.42	\$1.86	\$44,379	O&M Cost
Alternative 6 - Medical City, Boggy Creek,						
and Osceola Parkway	15.0	0.13	52,790	1,101,200	11	
Cost by Variable	\$147,000	\$309,000	\$2,134,000	\$2,050,000	\$488,000	<u>\$5,128,000</u>
				Total Annual O&M Co	st (2011 Dollars)	\$5,128,000
			Average Annual	D&M Cost per Bus-Ho	ur (2011 Dollars)	\$97



Using the bus operating statistics from the 2011 and 2035 regional travel demand model networks, the following feeder bus O&M cost estimates were developed for each of the Viable Alternatives. This information is shown in **Table 5-12** and **Table 5-13** and is based on the No-Build scenarios for FY 2011 and 2035, respectively. To determine the incremental costs for providing feeder service to the Viable Alternatives, LYNX's 2011 National Transit Database (NTD) operating cost of \$81.77 per an hour was utilized for the annual feeder bus O&M cost column.

Alternative	Routes	Peak Buses	Annual Rev Bus-Miles	Annual Rev Bus-Hours	Annual O&M Cost (\$2011)
No-Build	LYNX	77	7,242,428	470,661	\$38,486,000
Alternative 2	OIA Feeder Service	78.5	7,451,882	481,428	\$39,366,000
Alternative 2	Increment Over No-Build	1.5	209,454	10,767	\$880,000
Altomative 2/2a	OIA Feeder Service	75.5	7,148,903	464,847	\$38,011,000
Allemative 5/5a	Increment Over No-Build	-1.5	-93,525	-5,814	(\$475,000)
Altomative 4/4a	OIA Feeder Service	75.5	7,143,171	464,407	\$37,975,000
Allemative 4/4a	Increment Over No-Build	-1.5	-99,257	-6,254	(\$511,000)
Alternative 6/6a	OIA Feeder Service	76.5	7,196,332	467,004	\$38,187,000
Alternative 0/0a	Increment Over No-Build	-0.5	-46,097	-3,656	(\$299,000)

Table 5-12. Current Year (2010) Feeder Bus Operating Cost Estimates

Table 5-13. Future Year (2035) Feeder Bus Operating Cost Estimates

			Annual	Annual	Annual
Alternative	Routes	Peak Buses	Rev Bus-Miles	Rev Bus-Hours	O&M Cost (\$2011)
No-Build	LYNX	125.5	11,273,000	639,842	\$52,320,000
Alternative 2	OIA Feeder Service	126	11,227,271	641,290	\$52,438,000
Alternative 2	Increment Over No-Build	0.5	-45, 729	1,447	\$118,000
Altomative 2/2a	OIA Feeder Service	114	10,069,976	580,135	\$47,069,000
Allemative 5/5a	Increment Over No-Build	-11.5	-1,203,024	-59,707	(\$5,251,000)
Altomativa 4/4a	OIA Feeder Service	113	9,981,466	575,621	\$47,069,000
Allemative 4/4a	Increment Over No-Build	-12.5	-1,291,534	-64,221	(\$5,251,000)
	OIA Feeder Service	127	11,430,643	647,416	\$52,939,000
Alternative 0/0a	Increment Over No-Build	1.5	157,642	7,574	\$619,000



5.7 Ridership Projections

This section summarizes the travel demand forecasting methodology and results for the four Viable Alternatives. The process included ridership forecasting of the Current Year (2010) and Future Year (2035) No-build alternatives, two light rail transit (LRT) alternatives (3 and 4) and two bus rapid transit (BRT) alternatives (2 and 6). The ridership forecasting process utilized the recently-developed CFRPM v5.6, a time-of-day model that underwent significant revisions to better meet FTA Capital Investment Grant Program criteria. CFRPM v5.6 uses a 2010 base and 2035 horizon year.

5.7.1 Regional Travel Demand Model

The Central Florida Regional Planning Model, version 5.6 (CFRPM v5.6) was utilized to develop and analyze the alternatives for the OIA AA study. CFRPM v5.6 is the latest travel demand model covering the Florida Department of Transportation District 5 area. The CFRPM v5.6 utilizes Cube Voyager, developed by Citilabs, as its forecasting engine. This planning software well addresses contemporary planning issues and advances in travel demand forecasting. CFRPM v5.6 utilizes Public Transport (PT) module that allows preparing public transport data and evaluating public transport systems.

The study team has performed several comparisons to verify that the model represented existing conditions. This included the comparison of model outputs against available INRIX data, theme parks reported attendance, airport enplanement information provided by the Greater Orlando Aviation Authority (GOAA) and the attendance at the Orange County Convention Center (OCCC).

Updating the socio-economic data helped to reflect the fast pace population and employment growth around Medical City area and updating the special purpose productions helped to reflect the most recent tourism data collected from the above mentioned sources. The speeds comparison showed that model produced congested speeds in acceptable range in comparison to INRIX data for all major highway segments within and around the study area. In addition, the project team reviewed the onboard survey results for all routes that serve corridor market trips and developed a series of comparisons between CFRPM v5.6 and the 2010 collected transit surveys. These comparisons provided route-level flows of the major travel markets by transit mode, time of day, origin/destination, access mode and number of transfers.

5.7.2 Travel Demand Forecasting Results – Tier 2 Analysis

Impacts to Overall Transit Ridership and Project Trips

It is expected that transit usage in the study area will grow significantly between 2010 and 2035 due to increases in regional population and overall transit service. The average weekday transit ridership across the LYNX service area is projected to double from approximately 114,400 current trips to 251,400 trips in 2035 without introducing the OIA AA service. The existing congestion problems that have been identified in the OIA AA study area will continue to worsen under the No-Build alternative. The Viable Alternatives would provide enhanced services in addition to the local bus services operated in the area. The Viable Alternatives would provide faster service than the local buses. Corridor ridership within the project area will likely continue to be substantial and the alternatives will generate additional riders who may shift from personal automobiles to transit when traveling from OIA to the attractions area. When



any one of the evaluated alternatives is introduced, system-wide ridership consistently increases. In the horizon year, system-wide trips increase in Alternatives 2 and 6, slightly increase in Alternative 4 and decrease in Alternative 3.

Tables 5-14 and **5-15** summarize system-wide and project trips by alternative. System-wide trips pertain to the total transit trips taken on an average weekday within the LYNX service area. Project-wide trips are those trips taken on the proposed premium transit facility for an average weekday.

Alternative	Current Year Trips	Increase over No-Build	Future Year (2035) Trips	Increase over No-Build
No-build	114,400	-	251,400	-
Alternative 2	117,600	3,200	253,400	2,000
Alternative 3	118,100	3,700	250,200	(1,200)
Alternative 4	118,600	4,200	251,600	200
Alternative 6	116,800	2,400	254,400	3,000

Table 5-14. System-Wide Linked Transit Trips by Alternative

Source: CFRPM v5.6

Table 5-15. Project-Wide Trips by Alternative

Alternative	Current Year Trips	Increase over No-Build	Future Year (2035) Trips	Increase over No-Build
No-build	0	-	0	-
Alternative 2	1,400	1,400	3,200	3,200
Alternative 3	4,400	4,400	7,800	7,800
Alternative 4	4,400	4,400	7,100	7,100
Alternative 6	4,600	4,600	6,500	6,500

Source: CFRPM v5.6

Project Trips by Market Segments

Transit demand forecasts presented in **Tables 5-16** and **5-17** show the demand for travel in each of the key markets served by each alternative in the Current and Future years. Alternatives 3, 4 and 6 show greater ridership increases with regard to work, non-work and special purpose trips in comparison to Alternative 2. This can be explained by the fact that Alternative 2 runs through the newly developing area of Lake Nona – Medical City with possible constraints accessing transit facilities, while Alternatives 3, 4 and 6 go through an area which is transit oriented with most of the needed transit facilities already in place.



	Alternative 2	Alternative 3	Alternative 4	Alternative 6
Work Trips*	700	2,600	2,500	2,600
Non-Work Trips*	400	1,100	1,200	1,400
OIA/OCCC/Attractions*	300	700	700	600
Total Weekday*	1,400	4,400	4,400	4,600
% Transit Dependent	12%	13%	12%	26%

Table 5-16. Current Year Project Trips by Alternative and Market Segment

* Rounded to the nearest hundred

Source: CFRPM v5.6

Table 5-17. Future Year (2035) Project Trips by Alternative and Market Segment

	Alternative 2	Alternative 3	Alternative 4	Alternative 6
Work Trips*	1,700	4,600	4,200	3,300
Non-Work Trips*	700	2,400	2,100	2,100
OIA/OCCC/Attractions*	800	700	700	1,200
Total Weekday*	3,200	7,800	7,100	6,500
% Transit Dependent	12%	18%	18%	25%

* Rounded to the nearest hundred

Source: CFRPM v5.6

Trips by Trip Purpose and Access Mode

The model forecasts that in each of the alternatives the riders will travel mostly for work purposes. In Alternative 2 the riders are primarily the workers traveling from the western corridor to employment centers in northern Osceola County and the OIA; Alternatives 3 and 4 connect workers to jobs at OIA, Florida Mall and International Drive areas; and Alternative 6 connects workers to jobs at OIA, Universal Studios, International Drive and jobs in the northern part of the corridor.

There is also a high volume of personal and shopping trips on all the alternatives, especially on Alternatives 3, 4, and 6. Alternatives 3 and 4 attract high volume of shopping trips since they go through Florida Mall and International Drive retail area.

Alternative 6 attracts personal trips from outside of the study area due to its high connectivity with other LYNX local bus services. In addition, Alternative 6 has the highest number of transit dependents in comparison to other alternatives, which can be also explained by the fact that this alternative goes through denser population and denser transit service areas.

Changes in VHT and VMT

Table 5-18 presents the forecasted change in auto vehicle-miles of travel (VMT) and auto vehicle-hours of travel (VHT) with the implementation of each of the alternatives. CFRPM v5.6 forecasts a reduction in



VMT and VHT for each of the alternatives in both Current and Future years. In the Current Year the greatest reduction in VMT and VHT is in Alternative 6 due to the higher number of project trips on this alternative in comparison to other alternatives. However, in the Future Year, Alternatives 3 and 4 perform better in reducing both VMT and VHT due to their higher growth of linked transit trips in comparison to Alternatives 2 and 6.

	Year	No Build (x1,000)	Alt. 2 (x1,000)	Alt. 3 (x1,000)	Alt. 4 (x1,000)	Alt. 6 (x1,000)
	2010	125,630	125,517	125,477	125,440	125,346
VMT	2035	203,225	203,170	202,776	202,760	203,100
	Growth from 2010 to 2035	77,595	77,653	77,299	77,320	77,754
	2010	3,246	3,243	3,242	3,241	3,239
VHT	2035	10,222	10,220	10,209	10,209	10,218
	Growth from 2010 to 2035	6,976	6,977	6,967	6,968	6,979

Table 5-18. OIA AA VMT and VHT Comparison Between Alternatives

Source: CFRPM v5.6

5.8 Evaluation Criteria

The Purpose and Need, goals and objectives that were established for this project formed the basis for identifying the evaluation measures used during the Tier 1 screening process and the Tier 2 evaluation of Viable Alternatives. These evaluation measures were used as a basis for rating each of the alternatives relative to their ability to address and support the project goals and objectives. They were then used to compare which alternatives provide higher benefits compared to the financial investment required. The comparison of costs, benefits, and impacts were then used to recommend a solution appropriate to this study area.

The goals, objectives and evaluation measures are shown in **Table 5-19**.

Table 5-19. Project Goals, Objectives and Evaluation Measures

Objective	Evaluation Measure(s)	Evaluation Rating Method		
Mobility Benefits: Introduce a high quality multi-modal transportation system that is combined with the existing highway system to provide a balanced transportation network.				
Maximize transit opportunities/ridership for	 Current and Future Year population within ½-mile of stations 	For each measure the higher the number, the better the alternative		
Central Florida residents and employees	• Current and Future Year projected employment within ½-mile of stations	will rank.		
	 Current and Future Year projected daily transit trips on project 			
	Current and Future Year projected daily transit work trips on project			
Maximize transit opportunities/ridership for Central Florida visitors	 Current and Future Year hotel / motel population within ½-mile of stations Attendance at tourist attractions and convention centers within ½-mile of stations 	For each measure the higher the number, the better the alternative will rank.		
Maximize reliability of transit service	 Percent of alternative alignment in mixed flow Percent of alternative alignment in 	If there is an exclusive lane, the alternative will be less subject to congestion and more reliable to		
Minimize travel time through major corridors	 Current and Future Year transit travel time-savings between major activity centers in minutes compared to the No Build Alternative 	The alternative with the highest travel time-savings will rank the best.		
Provide stations near major employment centers, activity centers, and residential or hotel centers	 Employment and activity centers within ½-mile of stations Current and Future Year employment within ½-mile of stations Current and Future Year employment 	For each measure the higher the number, the better the alternative will rank.		
	 Current and Future Year projected households within ½-mile of stations 			
	Current and Future Year hotel/motel population within ½-mile of stations			
Provide improved mobility opportunities to transit- dependent populations	 Low-income households within ½-mile of proposed stations Current and Future Year projected transit-dependent ridership on project 	For each measure the higher the number, the better the alternative will rank.		

Alternatives Analysis Report

Page 63

Objective	Evaluation Measure(s)	Evaluation Rating Method	
Provide connections to other transit and transportation modes	 Number of connections to Phase 1 and 2 SunRail Number of connections to OIA Number of connections to existing LYNX bus system 	For each measure the higher the number, the better the alternative will rank.	
Environmental Benefits: Preserve possible, while taking opportunit	e and sustain the environmental assets of th ies to improve them.	e region to the maximum extent	
Sustain the natural, social, and historic environment	 Number of noise-sensitive receptors within 500 feet of proposed alignments and stations Number of historic resources within 500 feet of proposed alignments and stations Number of any known potential hazardous waste sites within 500 feet of proposed alignments and stations Environmental justice (minority and low-income) populations within ½-mile of stations Current and Future Year projected number of transit dependent trips on project 	For noise, historic resources, residential and non-residential structures, and hazardous waste sites, the higher the number, the lower the alternative will rank. For low-income, minority, and transit dependent populations, the greater the number served, the higher the alternative will rank.	
Minimize energy consumption	 Current and Future Year change in auto vehicle miles traveled (VMT) compared to the No Build Alternative 	The alternative that would result in the greatest reduction in VMT would rank the highest.	
Minimize pollutant emissions / improve air quality	 Current and Future Year change in auto vehicle miles traveled (VMT) compared to the No Build Alternative 	The alternative that would result in the greatest reduction in VMT would rank the highest.	
Improve safety for all modes of travel	 Number of potentially affected intersections (number where reductions in level of service (LOS) would occur) Linear feet of existing and proposed bicycle facilities within ½-mile of stations 	The alternatives with the most intersections that would see reductions in LOS would rank higher. The alternatives with the most linear feet of existing bicycle facilities near the proposed stations would rank higher.	



Page 64

Objective	Evaluation Measure(s)	Evaluation Rating Method
Minimize impacts to existing natural features (wetlands/floodplains/parks)	 Acres of wetlands within 500 feet of proposed alignments and stations Acres of floodplains within 500 feet of proposed alignments and stations Number of Section 4(f) properties within 500 feet of proposed alignments and stations Acres of conservation within 500 feet of proposed alignments and stations Acres of conservation within 500 feet of proposed alignments and stations Number of river and/or stream crossings 	For each measure, the higher the value, the lower the alternative will rank.
Land use and Development Patter plans and supports existing and p	rns: Develop a transit system that is compa lanned transit-oriented land uses	tible with local comprehensive
Develop alternatives that conform to local government comprehensive plans and transit policies	 Consistency with local land use plans and transit policies 	The alternatives that are the most consistent with local land use plans and transit policies would rank the highest.
Promote joint development at locations of high transit accessibility	 Acres of land with economic and zoning development incentives within ½-mile of stations Acres of vacant or underutilized land within ½-mile of transit stations Number of Developments of Regional Impact (DRI) within ½-mile of stations 	The higher the number, the higher the alternative will rank.
Develop alternatives that encourage transit-oriented land uses	 Current and Future Year employment density within ½-mile of the stations Current and Future Year residential density within ½-mile of the stations 	The higher the number, the higher the alternative will rank.
Cost Effectiveness: Produce a system smart, sound investment	tem that is efficient to build, operate, and m	naintain - making the system a
Minimize the annual capital cost per passenger trip	Order of magnitude capital costAnnual capital cost per passenger trip	For each measure, the lower the cost the higher the alternative will rank.
Minimize the operating cost per passenger mile	 Order of magnitude annual operating cost Operating cost per passenger mile 	For each measure, the lower the cost the higher the alternative will rank.



Objective	Evaluation Measure(s)	Evaluation Rating Method			
Public and Community Acceptance: Actively engage the public and affected stakeholders to assess and incorporate their vision of a regional transit system					
Increase the level of satisfaction with the overall quality of life in the community	 Level of support (number of supportive comments received) 	The alternative that received the most supportive comments will be rated higher.			
Increase transit ridership	 Current and Future Year projected number of trips on project 	The higher the number, the higher the alternative will rank.			
Serve low-income households	 Low-income households within ½-mile of stations 	The higher the number, the higher the alternative will rank.			
Minimize impacts to existing natural features (wetlands/floodplains/parks)	 Acres of wetlands within 500 feet of proposed alignments and stations Acres of floodplains within 500 feet of proposed alignments and stations Number of Section 4(f) properties within 500 feet of proposed alignments and stations Acres of conservation within 500 feet of proposed alignments and stations Acres of conservation within 500 feet of proposed alignments and stations Number of river and/or stream crossings 	The higher the value, the lower the alternative will rank.			
Congestion Relief: Provide viable residents, workers, and visitors a	transit alternatives that will provide expan nd reduce congestion during peak times on a	ded mobility options to area area roadways			
Offer additional modes of transportation that provide additional capacity	 Current and Future Year throughput capacity (passengers per peak hour per peak direction) Current and Future Year total transit trips on project per mile 	The higher the number, the better the alternative will rank.			
Reduce congestion during peak periods	Current and Future Year auto vehicle hours of travel (VHT)	The higher the value, the lower the alternative will rank.			
Economic Development: Produce jobs.	a transit system that promotes economic d	evelopment and the creation of			
Support or complement economic development plans or policies	 Consistency with local economic development plans and policies 	The alternatives that are most consistent with local economic development plans and policies would rank the highest.			
Support the creation of new jobs	 Current and Future Year employment within ½-mile of proposed stations Number of Developments of Regional Impact (DRI) within ½-mile of stations 	The higher the number, the better the alternative will rank.			
Maintain or increase the share of affordable housing	 Low-income households within ½ mile of stations 	The higher the number, the higher the alternative will rank.			



The alternatives were analyzed and rated based upon how well each meets the goals and objectives and purpose and need for the project. For each measure, the best performing alternative was accorded a rating of high, those that perform less well were accorded a rating of moderate, and those that perform least well were accorded a rating of low. Since there are often several measures for each objective and several objectives for each goal, the results for the individual measures were combined to determine the best performing alternative for each project objective and overall goal. The following scale was used to determine the numerical score for each alternative:

<u>Rating</u>	<u>Score (points)</u>
High	3 Points
Medium	2 Points
Low	1 Point

The resulting scores for each of the measures were then averaged resulting in a composite score for each alternative, for each goal. The evaluation measures and scoring process is presented in detail in the **Evaluation of Viable Alternatives Technical Memorandum**.

5.9 Evaluation Results

The four Viable Alternatives were evaluated as performing high (3-teal blue), medium (2-yellow) or low (1-orange) for each of the evaluation measures. Those alternatives that do not satisfy the project goals and objectives tend to achieve low ranking, while alternatives that do achieve the project goals and objectives tend to achieve high ranking. The total score is shown at the bottom of the matrix and provides a sum for each of the objectives and evaluation measures. **Table 5-20** shows a score summary for each of the objectives.

Table 5-20. Summary of Evaluation Scores

ORIECTIVE	RANKINGS			
OBJECTIVE	Alt. 2	Alt. 3	Alt. 4	Alt. 6
Mobility Benefits	1	2	2	3
Environmental Benefits	1	2	2	2
Land Use & Development Patterns	2	3	2	3
Cost Effectiveness	3	1	1	3
Public & Community Acceptance	1	2	2	3
Congestion Relief	1	3	3	2
Economic Development	2	2	2	2
TOTAL SCORE	11	15	14	18
OVERALL RANKING	4	2	3	1

As shown in the ratings in the above table, Alternative 6 resulted at best meeting the goals and objectives of the corridor. The evaluation results of all four alternatives were presented to FDOT, the





PAG and project sponsors. Based on the consultation and discussions with project sponsors, Alternative 6 was advanced for further evaluation and refinement.



Page 68

6 Refinement and Evaluation of Selected Alternative

Following the identification of Alternative 6 as the Selected Alternative, further refinement of the Selected Alternative was conducted based on comments and other feedback from the third public meeting, subsequent feedback from the PAG and project co-sponsors, along with a rigorous evaluation of the costs and ridership of the Viable Alternatives.

6.1 Refinement of Alternative 6

The feedback from the public and other project stakeholders and technical analyses indicated two possible modifications to Alternative 6 were warranted:

- Several project stakeholders noted that the Alternative 6 BRT line would result in long travel times for visitors, residents and workers travelling between OIA and the I-Drive area. The diversion of the BRT through Winegard and Oak Ridge Roads and Universal Studios added about 12 minutes to run times between OIA and DPTC. A review of the Alternative 6 ridership projections confirmed that ridership between OIA and the I-Drive area was low. As a result, two separate BRT services were identified – an "Express BRT" that would operate directly between OIA and the I-Drive area with limited stops and a "Local BRT" that would connect the Oak Ridge neighborhood to the Sand Lake Road station and Universal Studios and I-Drive activity centers.
- 2. Discussions with FDOT and Orange County traffic engineers indicated that with the planned widening of Sand Lake Road between McCoy Road and Universal Boulevard, this roadway segment could not also support an exclusive BRT lane. It was subsequently determined that the Express BRT buses would operate in shared traffic lanes along Sand Lake Road.

Subsequently, the Selected Alternative was refined with both local and express BRT components. The local BRT follows the same routing to the DPTC as Alternative 6, but begins at the Sand Lake Road SunRail station instead of OIA. The express BRT route serves as a connection between OIA and the OCCC/I-Drive area, and operates primarily along Sand Lake Road with stops at Florida Mall and John Young Parkway. The two routes that comprise the Selected Alternative are shown in **Figure 6-1**. The proposed stations are shown in **Table 6-1**.

Summary of Selected Alternative

Project Length:	12.3 miles (local), 15.3 miles (express)
Number of Stations:	17 total; 9 Local, 3 Express, 5 shared (serve local and express routes)
Average Station Spacing:	0.9 miles (local), 2.2 miles (express)
Transit Technology:	Bus Rapid Transit
Vertical Alignment:	At-grade
Guideway	Semi-exclusive and shared traffic lanes





Orlando International Airport (OIA) Connector Refresh Alternatives Analysis Financial Project ID: 429215-1-12-01





Station Number	Station Name	Preliminary Station Type
6A	Destination Parkway	Transit Hub – Shared
6B	OCCC	Major Urban Center – Shared
6C	Austrian Row & Universal Boulevard	Urban Center – Shared
6D	Jamaican Court & Universal Boulevard	Urban Center – Shared
6E	Carrier Drive	Urban Center – Local
6F	Universal Studios	Major Urban Center – Local
6G	Festival Bay/Belz	Major Urban Center – Local
6H	Millenia Boulevard	Local
61	Kingsgate Drive	Local
6J	Texas Avenue	Local
6К	Orange Blossom Trail	Urban Center – Local
6L	Lancaster Road	Local
6M	Sand Lake Road & Winegard Road	Urban Center – Local
6N	SunRail Sand Lake Road Station	Transit Hub – Shared
60	OIA South Terminal	Transit Hub – Express
6P	Florida Mall	Major Urban Center – Express
6Q	John Young Parkway	Suburban Center – Express

Table 6-1. Selected Alternative Proposed Stations

The station typologies are described in Section 6.3.2.

6.2 **Operating Plans**

Operating plans were also developed for both the Current Year (2010) and Future Year (2035), consistent with the travel demand forecasting scenarios. Run time estimates were refined for the Selected Alternative based on the vehicle characteristics described in the **Transit Operating Plans Technical Memorandum.** For BRT, it is assumed that maximum speeds not exceed the corresponding civil speed limit for general traffic, generally 35 to 55 mph, for each roadway section of the alignment. For some sections of the Selected Alternative alignment, particularly in the I-Drive/OCCC vicinity, the maximum speeds are assumed to be 30 mph.

BRT vehicles are assumed to have a normal service maximum acceleration rate of about 2.0 miles per hour per second (mphps) from zero to 30 miles per hour (mph), with an average acceleration rate of 0.75 mphps from zero to 65 mph. Normal service braking is assumed to be a constant 2.0 mphps from 65 mph to 0 mph. Modern LRT vehicles are assumed to have a normal service maximum acceleration rate of about 2.5 miles per hour per second (mphps) from zero to 30 miles per hour (mph), with an average acceleration rate of 1.0 mphps from zero to 65 mph. Normal service braking is assumed to be a constant 2.5 mphps from zero to 65 mph.



Dwell times of 20 seconds per station and a delay of 10 seconds per signalized intersection were assumed. It is anticipated that Transit Signal Priority (TSP) will be used to minimize signal delay.

6.2.1 Running Times

Based on these assumptions, the estimated running times are presented below in **Table 6-2** and **Table 6-3** for the local and express BRT alignments, respectively.

Table 6-2. Station-to-Station Run Times (Westbound) – Local BRT

		Detailed Station-to-Station Run Time Estimates
Stations	Run Time (hr:min:sec)	Distance (miles) Total
SunRail SLR	00:00:00	0.00
Winegard	00:03:08	0.99
Lancaster	00:06:04	2.05
OBT	00:09:06	3.00
Texas	00:11:45	4.06
Kingsgate	00:14:21	5.09
Millenia Blvd	00:16:52	6.06
Festival Bay Belz	00:18:33	6.57
Universal Studios	00:23:39	8.07
Carrier Drive	00:27:48	9.52
Jamaican Court	00:30:11	10.26
Austrian Row	00:32:15	10.75
occc	00:34:37	11.39
Destination Parkway	00:38:17	12.28
Total	00:38:17	12.28
Avg. Speed = 20.0 mph Avg. Station Spacing = 0.9	miles	



Stations	Run Time (hr:min:sec)	Distance (miles) Total
OIA South Terminal	00:00:00	0.00
	Ī	
SunRail SLR	00:11:38	6.75
	Ι	
Sand Lake Road / Florida Mall 📢	00:16:53	8.87
	I	
John Young Parkway 📢	00:20:30	10.53
	Ι	
Jamaican Court 📢	00:25:54	13.22
	Ι	
Austrian Row 🤇	00:27:58	13.72
	Ι	
0000	00:30:20	14.36
	Ι	
Destination Parkway	00:34:00	15.25
Tabul	00:24:00	15.05
ΙΟΤΟΙ	00:34:00	15.25
Avg. Speed = 27.0 mph		
Avg. Station Spacing = 2.2 miles		

Table 6-3. Station-to-Station Run Times (Westbound) – Express BRT

6.2.2 Span of Service

The span of service for the Selected Alternative is assumed to operate from 5:00 am to 11:00 pm on weekdays, and 6:00 am to 11:00 pm during weekends and holidays for both the local and express BRT services. The span of service is shown in **Table 6-4**.

Table 6-4 Sel	lected A	lternative	Snan o	f Service
1 abie 0-4. Je	icticu A		Span u	I SEI VILE

Day of Week	Time Period	Time	Hours
	AM Peak	5:00am - 9:00am	4.0
	Midday Peak	9:00am - 3:00pm	6.0
Monday-Friday	PM Peak	3:00pm - 7:00pm	4.0
	Evening	7:00pm - 11:00pm	4.0
		Weekday Total	18.0
Coturdou Cundou P	Daytime	6:00am - 7:00pm	13.0
Saturday, Sunday &	Evening	7:00pm - 11:00pm	4.0
nonudys		Weekend Total	17.0



6.2.3 Service Frequency

The Selected Alternative is anticipated to operate on various headways, based on the time of day and local or express service. The frequencies are assumed to increase from Current Year (2010) to Future Year (2035). The service frequencies are shown for the Local BRT service in **Table 6-5** and for the Express BRT service in **Table 6-6**.

Table 6-5. Service Frequency – Local BRT

Day of Week	Time Period	Current Year Frequency (2010)	Future Year Frequency (2035)
	AM Peak	15 min	10 min
Manday Friday	Daytime Peak	15 min	10 min
wonday-Friday	PM Peak	15 min	10 min
	Evening	30 min	20 min
Saturday, Sunday &	Daytime	20 min	15 min
Holidays	Evening	30 min	20 min

Table 6-6. Service Frequency – Express BRT

Day of Week	Time Period	Current Year Frequency (2010)	Future Year Frequency (2035)
	AM Peak	15 min	10 min
Mandau Fridau	Daytime Peak	15 min	10 min
wonday-Friday	PM Peak	15 min	10 min
	Evening	30 min	20 min
Saturday, Sunday &	Daytime	30 min	20 min
Holidays	Evening	30 min	20 min

6.2.4 Cycle and Layover Time

The cycle time consists of round-trip run time and layover. Operations plans include time for end-of-line layovers to provide sufficient time for operators to switch between tracks and vehicle cabs, take breaks as required by union agreement, as well as provide for schedule recovery (i.e., a late bus or train can "catch up" to its schedule).

6.2.5 Maintenance Spare Ratio

The maintenance spare ratio (MSR) is the percentage of extra vehicles in a fleet, over and above the number actually required to provide scheduled peak period service. Bus and rail transit systems typically maintain a MSR of 10% to 30%, depending on the age and condition of the vehicles, the vehicle fleet size, and the effectiveness of the maintenance program. A 20% MSR is assumed for the BRT vehicle fleet, which is a commonly accepted standard in the transit industry.



6.2.6 Peak and Fleet Vehicle Requirements

The peak vehicle requirements were calculated for each premium transit service incorporating operating requirements based on service frequency and cycle times. The MSR will be applied to the peak vehicle requirement to determine the total fleet requirement in order to estimate associated capital costs with procurement of new bus vehicles.

6.2.7 Operating Requirements Summary

Tables 6-7 and 6-8 show the operating requirements for the local BRT services for Current (2010) and Future (2035) years. **Tables 6-9 and 6-10** show the operating requirements for the express BRT services for Current (2010) and Future (2035) years.





Table 6-7. Local BRT Current Year Operating Plan (2010)

		С	perating Service L	.evels		Ope	erating	Plans	Ope	rating Requ	irements
Day of Week	Annual Days	Time Period	Span of Service	Hours	Headway	Layover Time	Cycle Time	One-Way Trips	Annual Revenue Miles	Annual Revenue Hours	Vehicle Requirement
		AM Peak	5:00am - 9:00am	4	15	13.4	90.0	32	99,800	6,100	6
Monday Friday	254	Midday	9:00am - 3:00pm	6	15	13.4	90.0	48	149,700	9,140	6
Monady-mady	204	PM Peak	3:00pm - 7:00pm	4	15	13.4	90.0	32	99,800	6,100	6
		Evening	7:00pm -11:00pm	4	30	13.4	90.0	16	49,900	3,050	3
Saturday	50	Daytime	6:00am - 7:00pm	13	20	23.4	100.0	78	49,800	3,380	5
Scholddy 52	JZ	Evening	7:00pm - 11:00pm	4	30	13.4	90.0	16	10,200	620	3
Sunday & Holidays	59	Daytime	6:00am - 7:00pm	13	20	23.4	100.0	78	56,500	3,840	5
	57	Evening	7:00pm - 11:00pm	4	30	13.4	90.0	16	11,600	710	3

Total 527,300 32,940 6

Maintenance Spares 2

Total Vehicle Fleet 8

NOTES:

1. Annual revenue bus-miles and bus-hours include layover time, but do not include report and deadhead time.

2. Minimum layover time assumed for breaks/scheduled recovery = 15%

3. Maintenance spare ratio = 20%



Table 6-8. Local BRT Future Year Operating Plan (2035)

		Operating Service Levels			Operating Plans			Operating Requirements			
Day of Week	Annual Days	Time Period	Span of Service	Hours	Headway	Layover Time	Cycle Time	One-Way Trips	Annual Revenue Miles	Annual Revenue Hours	Vehicle Requirement
		AM Peak	5:00am - 9:00am	4	10	13.4	90.0	48	149,700	9,140	9
Monday Friday	254	Midday	9:00am - 3:00pm	6	10	13.4	90.0	72	224,600	13,720	9
Monady-mady	204	PM Peak	3:00pm - 7:00pm	4	10	13.4	90.0	48	149,700	9,140	9
		Evening	7:00pm -11:00pm	4	20	23.4	100.0	24	74,900	5,080	5
Saturday	50	Daytime	6:00am - 7:00pm	13	15	13.4	90.0	104	66,400	4,060	6
Saturady 52	52	Evening	7:00pm - 11:00pm	4	20	23.4	100.0	24	15,300	1,040	5
Sunday & Holidays	59	Daytime	6:00am - 7:00pm	13	15	13.4	90.0	104	75,400	4,600	6
	57	Evening	7:00pm - 11:00pm	4	20	23.4	100.0	24	17,400	1,180	5

Total 773,400 47,960 9

Maintenance Spares 2

Total Vehicle Fleet 11

NOTES:

1. Annual revenue bus-miles and bus-hours include layover time, but do not include report and deadhead time.

2. Minimum layover time assumed for breaks/scheduled recovery = 15%

3. Maintenance spare ratio = 20%



Table 6-9. Express BRT Current Year Operating Plan (2010)

		С	Operating Service Levels			Ope	erating	Plans	Operating Requirements		
Day of Week	Annual Days	Time Period	Span of Service	Hours	Headway	Layover Time	Cycle Time	One-Way Trips	Annual Revenue Miles	Annual Revenue Hours	Vehicle Requirement
		AM Peak	5:00am - 9:00am	4	15	22.0	90.0	32	124,000	6,100	6
Monday Friday	254	Midday	9:00am - 3:00pm	6	15	22.0	90.0	48	185,900	9,140	6
Monady-mady	234	PM Peak	3:00pm - 7:00pm	4	15	22.0	90.0	32	124,000	6,100	6
		Evening	7:00pm -11:00pm	4	30	22.0	90.0	16	62,000	3,050	3
Saturday	50	Daytime	6:00am - 7:00pm	13	30	22.0	90.0	52	41,200	2,030	3
Scholddy 52	JZ	Evening	7:00pm - 11:00pm	4	30	22.0	90.0	16	12,700	620	3
Sunday & Holidays	59	Daytime	6:00am - 7:00pm	13	30	22.0	90.0	52	46,800	2,300	3
	57	Evening	7:00pm - 11:00pm	4	30	22.0	90.0	16	14,400	710	3

Total 611,000 30,050 6

Maintenance Spares 2

Total Vehicle Fleet 8

NOTES:

1. Annual revenue bus-miles and bus-hours include layover time, but do not include report and deadhead time.

2. Minimum layover time assumed for breaks/scheduled recovery = 15%

3. Maintenance spare ratio = 20%



Table 6-10. Express BRT Future Year Operating Plan (2035)

		Operating Service Levels			Operating Plans			Operating Requirements		irements	
Day of Week	Annual Days	Time Period	Span of Service	Hours	Headway	Layover Time	Cycle Time	One-Way Trips	Annual Revenue Miles	Annual Revenue Hours	Vehicle Requirement
		AM Peak	5:00am - 9:00am	4	10	12.0	80.0	48	185,900	8,130	8
Monday Friday	254	Midday	9:00am - 3:00pm	6	10	12.0	80.0	72	278,900	12,190	8
Monady-mady	204	PM Peak	3:00pm - 7:00pm	4	10	12.0	80.0	48	185,900	8,130	8
		Evening	7:00pm -11:00pm	4	20	12.0	80.0	24	93,000	4,060	4
Saturday	50	Daytime	6:00am - 7:00pm	13	20	12.0	80.0	78	61,900	2,700	4
Saturday 52	52	Evening	7:00pm - 11:00pm	4	20	12.0	80.0	24	19,000	830	4
Sunday & Holidays	50	Daytime	6:00am - 7:00pm	13	20	12.0	80.0	78	70,200	3,070	4
	57	Evening	7:00pm - 11:00pm	4	20	12.0	80.0	24	21,600	940	4

Total 916,400 40,050 8

Maintenance Spares 2

Total Vehicle Fleet 10

NOTES:

1. Annual revenue bus-miles and bus-hours include layover time, but do not include report and deadhead time.

2. Minimum layover time assumed for breaks/scheduled recovery = 15%

3. Maintenance spare ratio = 20%

6.3 Conceptual Engineering

This section summarizes the efforts undertaken to develop the conceptual engineering plan for the Selected Alternative. Concept plans and typical sections were developed to illustrate the proposed alignment and station locations. Additionally, a set of concept station types was developed for the proposed stations. Additional engineering assumptions, including maintenance facilities, signal systems and vehicle type are also detailed in this section.

6.3.1 Guideway and Roadway Improvements

For the Selected Alternative, buses will operate in both exclusive lanes and mixed traffic depending on specific locations within the corridor. The existing general purpose lanes will be maintained, but specific roadway segments will be widened to provide a dedicated bus lane in each direction. These lanes will run along the outside of the roadway and will also be used for all right-turning vehicles at intersections and driveways. Proposed roadway improvements are shown in the **Selected Alternative Concept Plans.**

The most significant roadway modifications will be made along Universal Boulevard and Oak Ridge Road. Along Universal Boulevard, the existing median will be narrowed to maintain existing lanes and provide the bus lanes from south of Pointe Plaza Avenue to Via Mercado. The new lanes will continue from Via Mercado to Sand Lake Road under a separate project. The widening along Universal Boulevard is anticipated to take place within existing right-of-way.

Oak Ridge Road will be widened from Millenia Boulevard to Winegard Road to maintain existing travel lanes and provide new bus lanes. The widening will remove the existing two-way left turn lane and replace it with a raised median, and maintain existing left turn lanes. Right-turning vehicles will use the bus lane. It is assumed that right-of-way takings will be required along the majority of Oak Ridge Road to facilitate these proposed improvements.

More modest improvements are planned along Winegard Road. Currently, the majority of this road is two lanes, with turning lanes at major intersections. The proposed improvements will include widening to provide a two-way left turn lane to ease congestion associated with turning vehicles. The two-way left turn lane will transition to allow for intersection turning lanes as well as bus bays at proposed stops. The widening associated with these improvements along Winegard Road is assumed to take place within the existing right-of-way.

The remaining segments of the Selected Alternative, including along S.R. 528 and Sand Lake Road, are anticipated to operate within mixed traffic.

6.3.2 Stations

The stations identified for the Selected Alternative range from a local stop to a major transit hub, depending on location. Potential right-of way impacts are illustrated in the **Selected Alternative Concept Plans.**

Station Places and Types

The study area contains four broad kinds of places – destinations, districts, neighborhoods, and corridors. Each of these places has characteristics that affect its transit service needs:

- **Destinations** are focused on a specific building or facility and can generally be served by single station. Examples in the study area include the Orange County Convention Center, SunRail Sand Lake Road, the OIA South Terminal, and Universal Studios.
- **Districts** are broader areas containing several nodes of activity that are typically served with multiple stations focused on cross-street access to a wider area. Examples include North and South International Drive.
- **Corridors** are linear concentrations of multi/mixed-uses that require multiple stations at even spacing to maximize coverage. Study area corridors include Oak Ridge Road and Sand Lake Road.
- **Neighborhoods** are areas of mainly residential use which may include a central location of higher intensity and/or a mix of uses that can be served by a single station. In the study area, neighborhood locations include Sky Lake, along Winegard Road.

Station Typologies

In order to analyze stations consistently, a typology of stations was developed to describe typical characteristics and elements necessary to serve the destinations, districts, neighborhoods, and corridors in the study area. This typology outlines four types of stations found in the Selected Alternative:

- Local stations (L) are intended to serve neighborhoods or districts with priority to walkup/bike/local transit access. These stations have a small footprint containing limited or in some cases no parking, and bus and taxi transfers occur on the street.
- **Urban Center** stations (UC) are closely-spaced stations to serve a corridor or district. These stations have small footprints and give priority to walk-up access and have limited amounts of parking. They may be linked with area transit circulators, with bus and taxi transfers occurring on-street rather than in off-street locations.
- **Major Urban Center** stations (MU) serve regional destinations through primarily pedestrian connections. Their footprints are limited as they provide no parking, however they may be located adjacent to private parking lots. They are often associated with local bus connections and taxi transfers.
- **Transit Hub Stations** (TH) serve as the interface of multiple transit modes and corridors. They provide frequent service and connections to other modes of transit. These types of stations have other large footprints and contain a significant level of parking and may have a large number of bus and taxi transfers occurring in a centralized location.

The relationship between the station typologies and the places they serve is located in Figure 6-2.



Figure 6-2. Station Places and Typologies

Design Considerations

Local

Local stations are intended to serve neighborhoods or districts with priority for walk-up, bike and local transit access. These stations have a small footprint containing limited or in some cases no parking, and bus and taxi transfers occur on or nearby the street. The design of a local station should include:

- Connected sidewalks (both along the street frontage as well as to adjacent uses.)
- Appropriate lighting
- Enhanced pedestrian crosswalks
- Wider sidewalks adjacent to the shelter to allow for better pedestrian circulation. (8' recommended)
- Enhanced landscape adjacent to the station to provide shade comfort for pedestrians and to create aesthetic value for the station and surrounding area.

Urban Center

Urban center stations are closely-spaced stations to serve a corridor or district. These stations usually have small footprints and give priority to walk-up access and may have limited amounts of parking. They may be linked with district-wide transit circulators, but bus and taxi transfers occur on-street rather than in off-street locations. The design of an Urban Center should include:

- Connected sidewalks (both along the street frontage as well as to adjacent uses.)
- Appropriate lighting
- Enhanced pedestrian crosswalks

- Wider sidewalks adjacent to the shelter to allow for better pedestrian circulation. (8' recommended)
- Enhanced landscape adjacent to the station to provide shade.

Major Urban Center

Major urban center stations serve regional destinations through primarily pedestrian connections. Their footprints are limited as they provide no parking (but may be located adjacent to private parking lots). The design of a Major Urban Center should include:

- Connected sidewalks (both along the street frontage as well as to adjacent uses)
- Connections and access to the 'regional destination'.
- Appropriate lighting
- Enhanced pedestrian crosswalks
- Wider sidewalks adjacent to the shelter to allow for better pedestrian circulation. (8' recommended as a minimum, 15' is preferred)
- Enhanced landscape adjacent to the station to provide shade comfort for pedestrians and to create aesthetic value for the station and surrounding area.
- Clearly defined circulation route for buses.

Transit Hub

Transit hub stations serve as the interface of multiple transit modes and corridors. They provide frequent service and connections to other modes of transit. These types of stations may have large footprints and contain a significant level of parking and have a large number of bus and taxi transfers occurring in a centralized location. The design enhancements of Transit Hub station should include:

- Connected sidewalks (both along the street frontage as well as to adjacent uses)
- Accessible connections to the adjacent parking lot.
- Appropriate lighting
- Enhanced pedestrian crosswalks
- Enhanced landscape adjacent to the station to provide shade comfort for pedestrians and to create aesthetic value for the station and surrounding area.
- Clearly defined circulation route for buses. (Signage and Wayfinding).

The station types for each station in the Selected Alternative are listed in **Table 6-1**.

6.3.3 Transit Signal Priority TSP

To mitigate congestion during peak hours, it is anticipated that transit signal priority (TSP) systems will be installed at signalized intersections along the corridor. TSP provides additional green time at a signal when a bus is approaching to enable more efficient bus operations and time savings for riders. For this analysis, it is assumed that 33 signals will require upgraded controllers for TSP equipment while an additional 10 traffic signals will require full reconstruction.

With TSP in place, the run time analysis assumed an average delay of 10 seconds at every signal along the corridor.

6.3.4 Maintenance Facilities

The additional vehicles required for the Selected Alternative are assumed to use the existing LYNX vehicle maintenance and storage facilities. During the subsequent Project Development phase, LYNX



and its partners will need to verify that its existing and programmed maintenance and storage facilities can accommodate the additional BRT buses or identify necessary modifications or expansion of those facilities.

6.4 Travel Demand Forecasting Results – Selected Alternative

6.4.1 Travel Markets

The transit demand forecasts presented below in **Tables 6-11** and **6-12** show the comparison between the Alternative 6 and the Selected Alternative. These tables highlight the demand for travel in each of the key markets served by the Selected Alternative in the Current and Future years. In the Current Year the Selected Alternative attracts 7 percent more total weekday daily linked transit trips in comparison to Alternative 6. Most of the increase is from work related trips from households reliant on transit. In the Future Year, there is an increase in both work and non-work trips in comparison to Alternative 6.

Table 6-11. Current Year Travel Markets Comparison

	Alternative 6	Selected Alternative
Work Trips	2,600	2,900
Non-Work Trips	1,400	1,700
OIA/OCCC/Attractions	600	500
Total Weekday	4,600	5,100
% Transit Dependent	26%	27%

Source: CFRPM v5.6

Table 6-12. Horizon Year (2035) Travel Markets Comparison

	Alternative 6	Selected Alternative
Work Trips	3,300	4,100
Non-Work Trips	2,100	2,500
OIA/OCCC/Attractions	1,200	1,600
Total Weekday	6,500	8,200
% Transit Dependent	25%	27%

Source: CFRPM v5.6

6.4.2 Trips by Access Mode

The model predicts that 70% of riders in the existing year will access transit service by walking and approximately 60% of total linked transit trips will have a work related trip purpose. In the horizon year, 70% of riders will walk to transit service and approximately 50% of riders will travel for business. Nearly 25% of all linked transit trips would come from transit dependent riders. The Selected Alternative also attracts higher number of special purpose trips in comparison to other alternatives.



6.5 Comparison to No-Build

The Tier 1 screening of Initial Alternatives, Tier 2 evaluation of Viable Alternatives and subsequent refinement of the Selected Alternative were designed to identify the most effective premium transit solution in the OIA study area based on the Purpose and Need, goals, objectives and evaluation measures. As detailed in Chapter 5, four Viable Alternatives were analyzed and Alternative 6 was found to show the greatest increase in ridership. **Tables 6-13** and **6-14** summarize these ridership results.

Table 6-13. System-Wide Linked Transit Trips by Alternative

Alternative	Current Year Trips	Increase over No-Build	Future Year (2035) Trips	Increase over No-Build
No-build	114,400	-	251,400	-
Alternative 2	117,600	3,200	253,400	2,000
Alternative 3	118,100	3,700	250,200	(1,200)
Alternative 4	118,600	4,200	251,600	200
Alternative 6	116,800	2,400	254,400	3,000
Selected Alternative	117,000	2,600	254,700	3,300

Source: CFRPM v5.6

Table 6-14. Project-Wide Trips by Alternative

Alternative	Current Year Trips	Increase over No-Build	Future Year (2035) Trips	Increase over No-Build
No-build	0	-	0	-
Alternative 2	1,400	1,400	3,200	3,200
Alternative 3	4,400	4,400	7,800	7,800
Alternative 4	4,400	4,400	7,100	7,100
Alternative 6	4,600	4,600	6,500	6,500
Selected Alternative	5,100	5,100	8,200	8,200

Source: CFRPM v5.6

Based on the alternatives refinement process discussed earlier in this chapter, including input from the PAG and project co-sponsors, Alternative 6 received further evaluation and was identified as the Selected Alternative. A final comparison of the Selected Alternative to the No-Build Alternative confirms that the proposed project is a better option than making no improvements at all.

Table 6-15 presents a comparison of key evaluation measures between the No-Build and the Selected Alternative. It is important to note that many measures are assumed to remain the same for the No-Build and Selected alternatives. Per FTA's technical policies and procedures for alternatives analysis studies, socio-economic and land use characteristics were assumed to remain the same for all alternatives. For example, while the Selected Alternative will provide premium transit service to more residents and workers than the No-Build Alternative, the total population and employment in the OIA study area served by transit will not change. Also, many evaluation measures were calculated as

increments to the No-Build alternative (e.g., reduction in vehicle-hours travelled and vehicle-miles travelled).

Overall, the Selected Alternative shows significant improvements over the No-Build in mobility and transit accessibility in a rapidly growing and already congested area. It meets the project goals of maximizing transit ridership and the reliability of transit service; minimizing travel times on currently burdened roadways and provides stations near major employment and leisure activity centers. The forecasting results show that in the Current Year the Selected Alternative attracts more total weekday daily linked transit trips in comparison to other evaluated alternatives, including No-Build, with most of the increase coming from households reliant on transit. The Selected Alternative also attracts a higher number of special purpose trips in comparison to other alternatives which serves as one of the primarily purposes of implementing OIA AA service to provide better connectivity between airport and the major attractions in the area.

Table 6-15. Comparison of No-Build and Selected Alternative

Objective/Measure	No-Build Alternative	Selected Alternative
Mobility Benefits		
Travel Time OIA-Destination Parkway (Express Route via Sand Lake Rd.)	41:00 ⁽¹⁾	31:57
Travel Time Sand Lake SunRail-Destination Parkway (Local Route via Winegard/Oak Ridge Rd.)	67:00 ⁽²⁾	38:17
Current Year total daily transit trips systemwide	114,400	117,000
Future Year total daily transit trips systemwide	251,400	254,700



Environmental Benefits						
Current Year reduction in vehicle hours travelled (VHT) compared to No Build	-	3,000				
Future Year reduction in VHT compared to No Build	-	10,000				
Community Acceptance						
Level of support (number of supportive comments received)	n/a	Widespread support from public comments, PAG and co-sponsors				
Land Use and Development Patterns						
Consistency with local land use plans and transit policies	Minimal	Orange FLU 1.1.5 encourage mixed-use & infill; 2.2.4 high density; 2.3.9 TOD; UD TOD; UD 5.1				
Acres of land with economic and zoning development incentives within ½-mile of proposed stations	-	1,820				
Acres of vacant or underutilized land within ½-mile of transit stations	-	2,200				
Economic Development						
Consistency with local economic development plans and policies	n/a	Premium transit is endorsed in local comprehensive plans				

(1) No-build travel times are based on common origin and destination points which are currently served by existing LYNX 111 service, however routing varies from the proposed express BRT service in the Selected Alternative.

(2) No-build travel times are based on common origin and destination points which are currently served by existing LYNX 42 service, however routing differs from the proposed local BRT service in the Selected Alternative.



7 Financial Analysis and Funding Strategies

This chapter presents the estimated capital and O&M costs for the Selected Alternative and compares them with Alternative 6 for reference. The chapter also summarizes financial planning strategies that could be used to provide stable capital and operating funding sources for the Selected Alternative. Specifically, the objective is to assist the FDOT and other project sponsors in identifying potential revenue sources that could be targeted in the near future to implement the Selected Alternative.

7.1 Capital and O&M Costs for the Selected Alternative

7.1.1 Capital Costs

Using the methodology described in section 5.6, capital costs were developed for the Selected Alternative based on the FTA's Standard Cost Category (SCC) worksheets. The estimated capital costs are shown below in **Table 7-1** along with a comparison to Alternative 6.

Standard Cost Category (SCC)	Alternative 6 \$(x000)	Selected Alternative \$(x000)
10 Guideway	\$47,880	\$32,427
20 Stations	\$5,600	\$6,600
30 Support Facilities	\$0	\$0
40 Sitework	\$55,617	\$43,119
50 Systems	\$13,719	\$12,967
CONSTRUCTION SUBTOTAL	\$122,816	\$94,842
60 Right-of-Way	\$4,652	\$5,669
70 Vehicles	\$17,500	\$23,100
80 Professional Services	\$53,425	\$41,256
90 Contingency	\$39,679	\$32,973
TOTAL PROJECT COST	\$238,072	\$197,841

Table 7-1. Selected Alternative Estimated Capital Costs

Note: All costs are based on 2013 dollars (x000). No escalations of costs are reflected in the above estimates.

As shown above, the Selected Alternative is estimated to cost approximately \$198 million to construct, approximately \$40 million less than Alternative 6. The Selected Alternative BRT project is each completely at-grade, with major cost components being roadway widening, vehicles, systems, and right-of-way. The Selected Alternative has lower costs than Alternative 6 for Guideway and Sitework, since it does not include exclusive BRT lanes on Sand Lake Road. On the other hand, the Selected Alternative has higher Station (two more stations) and Vehicle costs.



7.1.2 **O&M Costs**

Following the completion of the evaluation of Viable Alternatives, operations and maintenance unit costs were updated to reflect the most recent National Transit Database information (fiscal year 2012). Therefore, O&M cost estimates for the Selected Alternative have been developed for the projected Current Year (2010) and Future Year (2035) and were estimated using 2012 dollars. The O&M cost methodology for the FY 2012 costs is the same as described in **Chapter 5** and FY 2012 unit costs were applied to the projected operating statistics for the Selected Alternative.

O&M costs were developed for both the local and express portions of the Selected Alternative and were aggregated to provide a total annual O&M cost and a cost per bus hour. The estimated costs are shown in **Tables 7-2** and **7-3** on the following page.

Using the bus operating statistics from the 2010 and 2035 regional travel demand model networks and 2012 unit costs, feeder bus O&M cost estimates were developed for the Recommended Alternative. A summary of the feeder bus operating cost estimates for Current (2010) and Future (2035) years are shown in **Tables 7-4** and **7-5**, respectively.

Table 7-4. Current Year (2010) Feeder Bus Operating Cost Estimates

			Annual	Annual	Annual
Alternative	Routes	Peak Buses	Rev Bus-Miles	Rev Bus-Hours	O&M Cost (\$2012)
No-Build	LYNX	77	7,242,428	470,661	\$38,655,000
Recommended Alternative	OIA Feeder Service	74.5	7,013,355	456,710	\$37,510,000
Recommended Alternative	Increment Over No-Build	-2.5	-229,073	-13,951	(\$1,146,000)

Table 7-5. Future Year (2035) Feeder Bus Operating Cost Estimates

			Annual	Annual	Annual
Alternative	Routes	Peak Buses	Rev Bus-Miles	Rev Bus-Hours	O&M Cost (\$2012)
No-Build	LYNX	125.5	11,273,000	639,842	\$52,550,000
Recommended Alternative	OIA Feeder Service	114.0	10,086,715	580,557	\$47,681,000
Recommended Allemative	Increment Over No-Build	-11.5	-1,186,286	-59,286	(\$4,869,000)

7.2 BRT Funding Strategies Across the Nation

As background for the identification of potential capital funding sources, **Table 7-6** provides a summary of the strategies used by fourteen BRT projects that are currently under development and seeking FTA New Starts or Small Starts funding.

Table 7-7 shows a selected number of BRT lines in operation that have utilized FTA funding. The BRT lines utilized a combination of federal, state, regional and local funding sources.



Table 7-2. Current Year (2010) Selected Alternative O&M Cost Estimates

Current Year 2016 BRT Unit Costs	BRT Stations* \$9,164	Garages \$2,191,635	Bus-Hrs \$39.88	Bus-Miles \$1.82	Peak Buses \$45,664	Total Annual O&M Cost
Alternative 6 - Sand Lake - Desination Parkway via Winegard	12.0	0.04	32,940	527,300	6	
Cost by Variable	\$110,000	\$79,000	\$1,314,000	\$961,000	\$274,000	<u>\$2,738,000</u>
			т	otal Annual O&M Co	st (2012 Dollars)	\$2,738,000
*9 exclusive and 6 shared with express service			Average Annual O	&M Cost per Bus-Hou	ur (2012 Dollars)	\$83

	BRT Stations*	Garages	Bus-Hrs	Bus-Miles	Peak Buses	Total Annual
Current Year 2016 BRT Unit Costs	\$9,164	\$2,191,635	\$39.88	\$1.82	\$45,664	O&M Cost
Alternative 6 Express - OIA - Destination Parkway						
Express	5.0	0.04	30,050	611,000	6	
Cost by Variable	\$46,000	\$79,000	\$1,199,000	\$1,113,000	\$274,000	<u>\$2,711,000</u>
				Total Annual O&M (Cost (2012 Dollars)	\$2,711,000
*2 exclusive and 6 shared with local service Average Annual O&M Cost per Bus-Hour (2012 Dollars)				our (2012 Dollars)	\$90	

Grand Total Annual O&M Cost (2012 Dollars)	\$5,449,000
Aggregated Average Annual O&M Cost per Bus-Hour (2012 Dollars)	\$87





Table 7-3. Future Year (2035) Selected Alternative O&M Cost Estimates

	BRT Stations*	Garages	Bus-Hrs	Bus-Miles	Peak Buses	Total Annual
Future Year 2035 BRT Unit Costs	\$9,164	\$2,191,635	\$39.88	\$1.82	\$45,664	O&M Cost
Alternative 6 - Sand Lake - Desination Parkway						
via Winegard	12.0	0.05	47,960	773,400	9	
Cost by Variable	\$110,000	\$118,000	\$1,913,000	\$1,409,000	\$411,000	<u>\$3,961,000</u>
			Т	otal Annual O&M Co	st (2012 Dollars)	\$3,961,000
*9 exclusive and 6 shared with express service			Average Annual O	&M Cost per Bus-Hou	ur (2012 Dollars)	\$83

	BRT Stations*	Garages	Bus-Hrs	Bus-Miles	Peak Buses	Total Annual
Future Year 2035 BRT Unit Costs	\$9,164	\$2,191,635	\$39.88	\$1.82	\$45,664	O&M Cost
Alternative 6 Express - OIA - Destination Parkway						
Express	5.0	0.05	40,050	916,400	8	
Cost by Variable	\$46,000	\$105,000	\$1,597,000	\$1,670,000	\$365,000	<u>\$3,783,000</u>
				Total Annual O&M C	ost (2012 Dollars)	\$3,783,000
*2 exclusive and 6 shared with local service			Average Annual C	D&M Cost per Bus-H	our (2012 Dollars)	\$94

	Grand Total Annual O&M Cost (2012 Dollars)	\$7,744,000
Agg	regated Average Annual O&M Cost per Bus-Hour (2012 Dollars)	\$88
Table 7-6. Funding Summary of Current BRT Projects Seeking FTA Funding

	Funding Strategies for Bus Rapid Transit (\$, in millions)													
	Fresno Area Express BRT	East Bay BRT	Van Ness Avenue BRT	El Camino Real Corridor BRT	JTA BRT Southeast Corridor	JTA BRT North Corridor	Ashland Avenue BRT Ph. I	Mich./ Grand River BRT	N/E Corridor BRT	E/W Connector BRT	Dyer Ave BRT	Montana Ave. BRT	Provo- Orem BRT	Fourth Plain BRT
Location	Fresno, CA	Oakland, CA	San Francisco, CA	San Jose, CA	Jax, FL	Jax, FL	Chicago, IL	Lansing, MI	Columbus, OH	Nashville, TN	El Paso, TX	El Paso, TX	Provo, UT	Vancouver, WA
Total Project Cost	\$48.75	\$177.99	\$125.63	\$188.00	\$23.88	\$33.23	\$116.90	\$215.36	\$39.43	\$174.00	\$35.89	\$43.36	\$159.38	\$53.40
Station Count	27	34	9	16	7	18	14	28	43	16	12	16	15	20
Route Miles	15.7	9.5	2	17.4	11.1	9.3	5.4	8.5	15.6	7.1	12	16.8	10.5	6
Federal Funding Sources														
FTA Small Starts Section 5309 Bus Discretionary	\$39.00	\$74.99 \$3.06	\$74.99	\$74.99	\$19.10	\$26.59	\$58.30	\$74.99	\$31.54	\$74.99	\$20.40	\$25.74	\$74.99	\$38.72
FHWA Funds USDOT Competitive Grants STIP Funds		\$41.35	\$13.04					\$64.21 \$15.26		\$4.00	\$7.29	\$8.85		\$4.00
Federal Economic Dev. Funds								\$10.00						
Total Federal Funds	\$39.00	\$119.40	\$88.03	\$74.99	\$19.10	\$26.59	\$58.30	\$164.46	\$31.54	\$78.99	\$27.69	\$34.59	\$74.99	\$42.72
Total Federal Funding Share	80.0%	67.1%	70.1%	39.9%	80.0%	80.0%	49.9%	76.4%	80.0%	45.4%	77.2%	79.8%	47.1%	80.0%
State Funding Sources														
Florida New Starts Transit					\$2.39	\$3.32								
CA Prop 1B Bonds	\$9.75	\$4.03												
State Hwy and Protection Program			\$8.44											
MI Trunk Line Bonds								\$46.97						
State Match for Federal Funds								\$3.93						
TN Gas Tax										\$35.00				
 State DOT									•		\$0.98			\$3.00
Total State Funds	\$9.75	\$4.03	\$8.44	\$0.00	\$2.39	\$3.32	\$0.00	\$50.90	\$0.00	\$35.00	\$0.98	\$0.00	\$0.00	\$3.00
	20.0%	2.3/0	0.770	0.0%	10.076	10.0%	0.0%	23.0%	0.076	20.1/0	2.1/0	0.076	0.0%	5.0%
Measure 2: Bridge Tolls		\$44.90										_		
Alameda County Sales Tax		\$9.38												
, Local Sales and Property Tax		\$0.28	\$6.14											
Prop K Sales Tax			\$2.50											
Gas, Sales and Use Tax					\$2.39	\$3.32			\$7.89				\$84.39	
Local Governments										\$60.01	\$7.22	\$8.77		\$0.49
Transit Capital Reserve														\$7.19
Total Local Funds	\$0.00	\$54.56	\$8.64	\$0.00	\$2.39	\$3.32	\$0.00	\$0.00	\$7.89	\$60.01	\$7.22	\$8.77	\$84.39	\$7.68
Total Local Funding Share	0.0%	30.7%	6.9%	0.0%	10.0%	10.0%	0.0%	0.0%	20.0%	34.5%	20.1%	20.2%	52.9%	14.4%
Project Status	Approved for Project Dev.; Planning on hold.	Seeking Grant Agreement 2014; Operations 2017	Seeking Grant Agreement 2015; Operations 2018	Adopted LPA; Seek SSGA late 2015	Seeking SSGA 2014; Operations 2016	Seeking SSGA 2014; Operations Dec 2015	LPA in 2013; SSGA in late 2015	SSGA April 2015; Operations July 2016	SSGA in early 2016; Operations late 2017	SSGA in late 2014; Operations 2016	Construction Grant late 2014; Operations 2017	Construction Grants 2015/2016; Operations Dec 2016	SSGA 2015; Operations late 2016	SSGA 2014; Operations July 2016

Alternatives Analysis Report

Page 92

Table 7-7. Funding Summary of In-Service BRT Projects

	Funding Strategies for Completed BRT Projects (\$, in millions)					
	New Britian - Hartford Busway	Healthline (Cleveland)	Mason Corridor (MAX) BRT	Silver Line BRT		
Location	Hartford, CT	Cleveland, OH	Ft. Collins, CO	Grand Rapids, MI		
Total Project Cost	\$572.69	\$200.00	\$81.98	\$37.00		
Station Count Route Miles		7.1	8 5	19 9.8		
Federal Funding Sources						
FTA New Starts FTA Small Starts Section 5307 Urbanized Area Funds Section 5309 Fixed Guideway Mod. Section 5309 Bus Discretionary FHWA Funds FHWA NHS Funds	\$275.30 \$18.20 \$21.18 \$25.92 \$112.75 \$6.00	\$82.20	\$65.58	\$29.60		
Total Federal Funds	\$459.35	\$82.20	\$65.58	\$29.60		
Total Federal Funding Share	80.2%	41.1%	80.0%	80.0%		
State Funding Sources						
CO Senate Bill 1 Funding MI Comp Transport. Funds State Flexible Funds State Transportation Funds	\$113.34	\$50.00	\$8.56	\$7.40		
Total State Funds	\$113.34	\$50.00	\$8.56	\$7.40		
Total State Funding Share	19.8%	25.0%	10.4%	20.0%		
Local Funding Sources RTA Funds Local Governments		\$26.60 \$17.00	\$7.84			
Total Local Funds	\$0.00	\$43.60	\$7.84	\$0.00		
Total Local Funding Share	0.0%	21.8%	9.6%	0.0%		
Project Status	Expected Revenue Service 2015	Revenue Service in 2008	Operations began Spring 2014	Operations began Summer 2014		

A review of the funding sources for recently programmed and built BRT projects indicates the following funding trends:

• Federal Funding: All of the proposed BRT lines have secured or are seeking federal funding. The magnitude of Federal participation is expected to range from \$19.0 million to \$164.0 million and include funding programs from the Federal Transit Administration (FTA), the Federal Highway Administration (FHWA), and the United States Department of Transportation (USDOT). Pursuant to Federal funding requirements, the Federal funding share when all FTA and FHWA sources are

Alternatives Analysis Report

considered does not exceed 80% of total project costs. Notably, all of the current BRT projects in the FTA funding process are seeking funds under the FTA Small Starts program, as no project size exceeds the \$250 million limit under the Small Starts Program.

- FTA Capital Investment Grant Program (New Starts / Small Starts Program): This is FTA's primary discretionary program for supporting locally planned, implemented, and operated transit "guideway" capital investments, including BRT projects. Projects applying for New Starts / Small Starts funding must undergo evaluation by the FTA throughout the project implementation process. Projects are evaluated according to a variety of measures and criteria including: mobility improvements, economic development effects, environmental benefits, cost-effectiveness, transit supportive land use, congestion relief, and local financial capacity. While the New Starts Program provides for potentially larger dollar contributions for projects, the Small Starts Program provides for a shorter approval process, allowing projects to potentially reach revenue service sooner. The current BRT projects have an average cost of just over \$100 million, which allows for a high percentage of Small Starts funding for the projects.
- Other FTA Funding Programs: Two projects are supported by funds from other FTA programs including the Section 5309 Bus Discretionary Program and the Section 5307 Urbanized Area Formula program.
- FHWA Programs: Six BRT projects anticipate funding from FHWA programs which can fund transit projects. As described in more detail in Section 3, three programs -- Congestion Mitigation and Air Quality Improvement (CMAQ) program, Surface Transportation Program (STP), and Transportation Alternatives Program (TAP) -- could potentially provide funding to support specific elements of a BRT line.
- US DOT Competitive Grants: In recent years, two USDOT competitive grant programs have provided federal funding for BRT projects. The Urban Circulator Program and Transportation Investment Generating Economic Recovery (TIGER) Program were options for BRT funding, though the TIGER Program is the only one currently in existence. In 2014 alone, the TIGER Program provided \$58.6 million in funding four different BRT projects at various stages; funding announced varied from as little as \$300,000 for a BRT study and planning efforts to \$24.9 million for 50% of BRT project costs in Richmond, VA.
- **State Funding:** Nine of the BRT projects shown in **Table 7-6** and all of the completed BRT projects from **Table 7-7** received funding support from their respective state governments. Funding is typically provided by one or more State DOT programs.
- **Regional and Local Funding:** Most BRT projects receive regional and local funding from a number of programs. The largest levels of regional and local funding were provided through dedicated sales taxes, general fund contributions, and bond proceeds. One project received contributions from a transit agency's own capital reserve fund.

• **Private Participation:** Funding support from the private sector reflects a combination of businesses within an existing improvement or assessment district agreeing to add funding for a BRT project as part of the district's existing expenditure plan, partnerships with a local energy provider, and donations. Naming rights for the BRT line is a novel approach that has been successfully implemented in Cleveland's "Heathline", by the hospitals along the route, and the "Cleveland State" line funded by Cleveland State University.

7.3 Potential Capital Funding Sources

The following provides an overview of potential federal, State, and local capital funding sources that could be targeted to implement the proposed BRT line. Additionally, conceptual funding strategies are discussed that reflect different ranges of participation from the federal, state and local sources described below. Details of these funding sources are found in the **Financial Strategies Technical Memorandum**.

7.3.1 Potential Federal Funding

The primary funding source to support implementation of the Selected Alternative will likely be the FTA's Section 5309 Capital Investment Grant Program and flexible FHWA funding programs. FTA's New Starts program funds projects with capital costs exceeding \$250 million and provides federal funding for up to 50 percent of a project's capital cost. The New Starts program requires that BRT projects have more than 50 percent of the alignment using exclusive lanes. FTA's Small Starts Program funds fixed guideway projects with capital costs less than \$250 million and provides grant funding up to 80 percent of a project's total capital costs, but with an overall limit of \$75 million. BRT projects under the Small Starts program are not required to have 50 percent of the alignment in exclusive lanes.

The subsequent project development phase will determine which federal program best supports implementation of the Selected Alternative. In addition to the New Starts and Small Starts programs, there are also federal highway programs the project partners could pursue to provide funding for specific elements of the BRT project.

7.3.2 Potential State Funding

The State of Florida, through the Florida Department of Transportation, has many funding programs available to grantees for both transit capital and operating programs.

FDOT New Starts Transit Funding

The New Starts Transit Program (NSTP) was established to assist local governments in developing and constructing fixed guideway and bus rapid transit projects to accommodate and manage urban growth and development. A secondary purpose of the program is to leverage State of Florida funds to generate local transportation revenues and secure FTA New Starts Program funding for Florida projects. NSTP funds may be used to support final design, right-of-way acquisition, and construction projects. The NSTP follows the selection guidelines of the FTA Section 5309 New Starts Program. To receive funding, a project must have either a Record of Decision (for an EIS) from the Federal Transit Administration or a Finding of No Significant Impact (for an EA).

Orlando International Airport (OIA) Connector Refresh Alternatives Analysis Financial Project ID: 429215-1-12-01

The state's participation of transit capital projects may not exceed 50 percent of the nonfederal share of a project. For individual fixed guideway projects not approved for federal funding, the maximum state share is 12.5 percent of the costs of final design, right-of-way acquisition, and construction. Other state funds, such as Transportation Regional Incentive Program funds or Intermodal Program funds, cannot be used as match for NSTP funds.

Intermodal Development Program

The Intermodal Development Program was developed to provide funding for major capital investments in fixed-guideway transportation systems; access to airports and other transportation terminals; and construction of intermodal or multimodal terminals. FDOT is authorized to fund projects within the Intermodal Development Program, which are consistent, to the maximum extent feasible, with approved local government comprehensive plans. Eligible projects include major capital investments in public rail and fixed-guideway transportation facilities and systems which provide intermodal access; road, rail, intercity bus service, or fixed-guideway access to, from, or between seaports, airports, and other transportation terminals; construction of intermodal or multimodal terminals; development and construction of dedicated bus lanes; and projects that otherwise facilitate the intermodal or multimodal movement of people and goods.

Public Transit Block Grant Program

The Public Transit Block Grant Program was established to provide a stable source of funding for public transit. Funds are awarded by FDOT to those public transit providers eligible to receive funding from the FTA's Sections 5307 and 5311 programs and to Community Transportation Coordinators. FDOT distributes 85 percent of the funds to FTA Section 5307 providers and to FTA Section 5311 providers who are not Community Transportation Coordinators. The Florida Commission for the Transportation Disadvantaged distributes 15 percent of the funds to Community Transportation Coordinators according to their own funding formula. Public Transit Block Grant funds may be used for eligible capital and operating costs of providing public transit service. Program funds may also be used for transit service development and transit corridor projects. Public Transit Block Grant projects must be consistent with applicable approved local government comprehensive plans. State participation is limited to 50 percent of the non-federal share of capital projects. Program funds may be used to pay up to 50 percent of eligible operating costs or an amount equal to the total revenue, excluding farebox, charter, and advertising revenue, and federal funds received by the provider for operating costs, whichever is less.

Transit Corridor Program

The Transit Corridor Program provides funding to Community Transportation Coordinators or transit agencies to support new services within specific corridors when the services are designed and expected to help reduce or alleviate congestion or other mobility issues within the corridor. Transit Corridor funds are discretionary and are distributed based on documented need. Transit Corridor Program funds may be used for capital or operating expenses. Eligible projects must be identified in a Transit Development Plan, Congestion Management System Plan, or other formal study undertaken by a public agency. The FDOT Central Office annually reviews all existing Transit Corridor projects and allocates sufficient funds to cover these ongoing projects. Projects are funded at one-half the non-federal share. Projects designed to alleviate congestion in a region may receive up to 100%.

County Incentive Grant Program (CIPG)

The purpose of the County Incentive Grant Program (CIGP) is to provide grants to counties to improve a transportation facility (including transit) that is located on the State Highway System or that relieves traffic congestion on the State Highway System. Municipalities are also eligible to apply and can do so by submitting their application through the county. CIGP funds are distributed to each FDOT district office by statutory formula. FDOT will cover 50 percent of eligible project costs.

Eligible projects include those that improve the mobility on the State Highway System (SHS); encourage, enhance, or create economic benefits; foster innovative public-private partnerships; maintain or protect the environment; enhance intermodalism and safety; and those that advance other projects. New technologies such as intelligent transportation systems that enhance the efficiency of projects also are eligible. CIGP is managed within the FDOT district. Each year, each district notifies the counties within its boundaries of the availability of CIGP funds and asks that applications be submitted by a certain deadline. The District ranks the projects according to the selection criteria and selects projects as funds are made available.

Transportation Regional Incentive Program (TRIP)

TRIP was created to improve regionally significant transportation facilities in "regional transportation areas." State funds are available to provide incentives for local governments and the private sector to help pay for critically needed projects that benefit regional travel and commerce. FDOT will pay for 50 percent of project costs, or up to 50 percent of the non-federal share of project costs for public transportation facility projects. This program can be used to leverage investments in regionally significant transportation facilities and must be linked to growth management objectives.

Eligible TRIP projects must be identified in appropriate local government capital improvements program(s) or long-term concurrency management system(s) that are in compliance with State comprehensive plan requirements. In addition, projects must be consistent with the Strategic Intermodal System and support facilities that serve national, statewide, or regional functions and function as an integrated transportation system. Upon funding availability, the FDOT district offices will provide district priorities for TRIP funds to the FDOT Central Office. Based on the guidance developed by the FDOT Central Office, the District Office will notify successful applicants and program those projects. Selected projects may also be eligible for revolving loans and/or credit enhancements from the State Infrastructure Bank (SIB) program. If project funding is awarded through the SIB, the funding must be matched by a minimum of 25 percent from funds other than the SIB. SIB loans can be made to a FDOT district office or the Turnpike Enterprise, or they can be between the Department and an entity external to the Department (e.g., County, City, or Expressway Authority).

Park and Ride Program

This program provides for the purchase and/or leasing of private land for the construction of park and ride lots, the promotion of these lots, and the monitoring of their usage. This program is an integral part of the commuter assistance program efforts to encourage the use of transit, carpools, vanpools and other high occupancy modes.

Local agencies may request the use of Park and Ride Programs funds by filing a project proposal with the FDOT district office, which sends a project priority list to the FDOT Central Office. FDOT will fund up to

one-half the non-federal share of Park and Ride capital projects. If a local project is in the best interest of FDOT, then the local share may be provided in cash, donated land value or in-kind services. If federal funds are involved, federal match guidelines shall be used.

Transit Corridor Development Funds

Discretionary funding allocated to specific projects by FDOT policy makers to assist in initiating new transit or rail service. Assistance can be either capital or operating grants, although operating assistance is limited to a defined timeframe – typically three years. Projects must be consistent with the local comprehensive plan, and be included in MPO plan and TIP. The project funding can be as much as 50% of the non-federal share of capital and operating costs. However, it should be noted that this State program has funding issues, and the competition is high for project funding. Local transit agencies submit projects to the Districts, and the Districts prioritize the projects and distribute based on ranking and available funds.

7.3.3 Potential Local Funding

There are several potential local funding sources that could support implementation of the project. Based on prior discussions with FDOT and project sponsors, potential local sources could include general funds, the value of property donated for the project, implementation of an assessment district, or a future voter approved dedicated revenue source. Local funding sources may include:

- Donation of Property and/or Right-of-Way
- Assessment District Revenue
- I-Drive Community Redevelopment Area
- I-Drive Improvement District
- Voter Approved Local Funding Source
- Private Sector Participation
- General Fund Appropriation

7.4 Operating Revenue

Annual operating expenses will be partly offset by other operating revenues including passenger fares, advertising, private contributions, state and federal formula grants, and local operating support. These operating revenues are described below.

7.4.1 Farebox Recovery Ratio

Farebox collections are assumed to fall within a national average of about 20-30% of annual operating expenses. The expected operator for the Project, LYNX, had a 32% farebox recovery ratio for motor bus operations as reported in the 2012 National Transportation Database. Farebox revenues will be incorporated into subsequent detailed funding models for the Recommended Alternative.

7.4.2 Federal and State Formula Grants Programs

There are several Federal and State programs which provide operating assistance to transit programs. The potential programs identified for this project include:

• Federal Section 5307: Urbanized Area Grant Program

- Federal Section 5337: State of Good Repair Program
- Florida Public Transit Block Grant Funds
- Florida Transit Corridor Program

These programs are discussed in greater detail in the **Financial Strategies Technical Memorandum**.

7.4.3 Conceptual Operating Funding Strategy

Based on the potential sources for operating funds, an operating funding strategy has been developed for the Selected Alternative. It is assumed that farebox and other operating revenues cover approximately 25 percent of the annual operating costs.

As part of the further development of the Selected Alternative, ridership and fare revenue projections will further define the annual operating subsidy needs of the project. This is expected to form the basis of discussions among potential partners to allocate the annual subsidy needs for the project.

The conceptual operating funding strategy for the Selected Alternative is shown in **Table 7-8**.

Table 7-8. Potential Funding Sources for Operations

Source of Funds	Funding Share						
Passenger Revenue							
Farebox Collections	25%						
Federal Funds							
Section 5307/5337 Grants	10-15%						
State of Florida							
FDOT Funds	10-20%						
Local Partners							
Local Funds	40-50%						



8 Implementation Plan

Following the completion of the OIA AA study, FDOT, local project sponsors and other stakeholders will consider whether to proceed with implementation of the Selected Alternative, conduct further study and deliberation, or take no action. In order for FDOT, sponsors and stakeholders to make an informed decision, an implementation plan should list the steps necessary to advance the project and identify risks and considerations associated with implementing the project.

The next steps for implementation of the Selected Alternative include identifying and enlisting project champion(s) and sponsor(s), complying with state and federal requirements for major transit initiatives, coordinating the project with other planned and programmed transportation and development projects, completing environmental documentation and design activities, identifying and committing capital and operational funding sources, and successfully meeting all regulatory and permitting requirements. This section identifies an implementation path followed by similar transit projects and identifies relevant risks and considerations that should be considered in determining next steps.

As of the writing of this report, a MAGLEV proposal has been received by FDOT. As such, discussions with the project sponsors revealed that adequate time should be given to the MAGLEV proposal prior to initiating the Project Development phase for this project. More information on the MAGLEV proposal is presented in **Section 8.5.1**.

8.1 Identify Project Champion(s), Project Sponsor and Service Operator

Upon completion of the Alternatives Analysis and selection of Selected Alternative, FDOT should continue to work with other project sponsors to maintain project support and identify further opportunities for additional agencies and organizations to champion the project. Prior to Project Development (refer to Section 8.4), the project sponsor for subsequent phases must be identified. To date, the primary sponsor has been FDOT, with co-sponsorship from the City of Orlando, Orange County, Osceola County and GOAA. A clear definition on project sponsorship and the relationship among various agencies will need to be determined prior to the FTA New Starts or Small Starts application process.

Additionally, prior to or during Project Development, the potential service operator should be identified. LYNX is presently responsible for providing public transit services in the City of Orlando and Seminole, Orange and Osceola counties. The project sponsor(s) would need to determine if LYNX would be the service operator of the Selected Alternative or if the provision of service would be contracted to a private operator.

8.2 Project Management Plan

Clear roles and responsibilities on planning, design, construction and operation of the proposed service should be developed in the Project Management Plan (PMP). The PMP is a document required by the FTA for projects seeking federal grants for major capital projects. It is a living document typically prepared by the project sponsor and documents the process in which the project will be effectively managed from Project Development through design, construction and operation, and will be updated throughout the course of the project as key milestones are reached. The PMP will specifically monitor

scope, schedule, budget and QA/QC procedures throughout the course of the project as well as identify the organization and responsibilities of key staff involved in the process.

8.3 Adoption into MetroPlan Orlando Long Range Transportation Plan

Following the conclusion of the Alternatives Analysis, the Selected Alternative may be adopted by MetroPlan Orlando into the financially constrained Long Range Transportation Plan (LRTP). Under FTA and NEPA guidelines, adoption of the Selected Alternative in the LRTP is required before a project sponsor(s) can advance the project to the Project Development phase.

8.4 State and Federal Compliance

As the project advances, the planning, design and implementation process must comply with state and federal regulations in order to maintain eligibility for funding. Should the project sponsor(s) decide to apply for federal New Starts funding, the project sponsor(s) would submit a letter to the US DOT Secretary requesting permission to enter the Project Development phase under the New Starts (or Small Starts) program defined in Moving Ahead for Progress in the 21st Century Act (MAP-21). Under state and federal law, the project sponsor(s) will be required to prepare documentation that evaluates environmental impacts associated with the proposed action. The detail and type of environmental documentation will be at the discretion of the FTA and is discussed in section 8.5. MAP-21 specifies that the Project Development phase, including NEPA activities, must be completed within two years.

The scope of the Project Development phase will be dependent on whether the project sponsor(s) applies for a New Starts or Small Starts Grant Agreement or Small Starts Grant Agreement under 49 USC Section 5309 Fixed Guideway Capital Investment Grants. The Project Development process for Small Starts and New Starts is summarized in **Figure 8-1**.



Figure 8-1. New Starts and Small Starts Project Development Process



Source: FTA New and Small Starts Evaluation and Rating Process, PowerPoint Presentation, August 2013

Under Small Starts, sufficient preliminary design is required and funding commitments secured in the Project Development phase; after which FTA will consider and award an Expedited Grant Agreement for construction.

Under New Starts, the FTA requires a three-phased approach where environmental documentation is completed during Project Development. After FTA approval, the project advances into engineering where preliminary and final design takes place and funding commitments are secured. Upon completion and approval of this phase, a Full Funding Grant Agreement is awarded for construction.

8.5 Compatibility with Other Transportation and Development Projects

There are dozens of other transportation and development projects planned and programmed in the OIA AA study area. These transportation and development projects were key considerations in the initial assessment of mobility needs (Purpose and Need) as well as the development and evaluation of the OIA AA Initial and Final Alternatives. The Selected Alternative should be implemented and carefully coordinated with the following key projects.

8.5.1 MAGLEV

In April 2014, the FDOT received a proposal from Florida EMMI, LLC for the leasing of rights-of-way and other real property owned by FDOT, the Orlando Orange County Expressway Authority (OOCEA), Orange County, the City of Orlando, and the Greater Orlando Aviation Authority (GOAA), for the purposes of constructing and operating a fixed guideway transportation system between OIA and the Orange County Convention Center (OCCC). FDOT subsequently selected EMMI to negotiate lease agreements for their proposed low-speed magnetic levitation transit project (MAGLEV).

The OIA AA project team was tasked with determining if there are any potential right-of-way (R/W) impacts (i.e., identify locations where the EMMI project and the OIA AA alternatives have been planned to use the same R/W envelope) and how the EMMI ridership projections would affect the projected ridership for the OIA AA alternatives (i.e., will the EMMI and OIA AA projects serve similar geographic or socio-economic travel markets). The EMMI proposal contained little detailed information regarding its alignment plans, operating plans, passenger fares or ridership projections, so the evaluation of R/W and ridership impacts was high-level. Nonetheless, the Maglev project does not appear to have any significant R/W impacts on the Selected Alternative since the Local BRT and Express BRT would operate in existing travel lanes on the Beachline Express BRT element of the Selected Alternative (e.g., Central Florida visitors travelling between OIA and the OCCC and I-Drive resort area). For this reason, OIA AA project co-sponsors have indicated that advancing the Selected Alternative may depend on whether and when the Maglev project is implemented.

MAGLEV has until 2016 in which to develop agreements and finalize various analyses to document that it is a financially feasible and technically sound proposal that can be developed with private investment. The various data and analysis supporting this AA study may need to be updated in part; however, the majority of the analysis would remain applicable in the event in the MAGLEV proposal does not move forward and the project sponsors wish to move forward with the Selected Alternative.

8.5.2 I-4 / Grand National Drive Overpass

The Selected Alternative includes Local BRT operations over the proposed Grand National Drive overpass (over I-4) between W. Oak Ridge Road and Major Blvd. The Grand National Drive Overpass is included in MetroPlan Orlando's FY 2014/15 - 2018/19 Orlando Urban Area Transportation Improvement Program (TIP, adopted July 9, 2014) as part of the I-4 Ultimate project. As such, the Grand National Drive Overpass is scheduled to be completed by 2018. If the completion of the Grand National Drive Overpass is delayed, the Local BRT element of the Selected Alternative will need to be rerouted between W. Oak Ridge Road and Universal Blvd. Further coordination will be necessary as and when both projects advance.

8.5.3 SunRail Connection to OIA

The Selected Alternative features Local BRT service between the Sand Lake Road SunRail station and the DPTC and Express BRT service between OIA's new Intermodal Center and DPTC. The proposed SunRail connection to OIA would serve OIA air passengers and employees who live in the north and south SunRail corridors. The OIA AA Selected Alternative would serve different travel markets: (1) Central Florida visitors (air passengers) travelling between OIA and resort and convention center destinations in

the Universal Studios and I-Drive resort area and (2) residents and workers in the Oak Ridge and Tangelo Park neighborhoods and jobs at OIA, Universal Studios and I-Drive. Because they would serve different travel markets, the SunRail Connection to OIA and the OIA AA Selected Alternative projects would be complementary rather than competing (i.e., the SunRail Connection to OIA project may add riders to the OIA AA Selected Alternative since north-south riders would have a convenient and attractive connection to the Universal Studios and I-Drive resort areas and vice versa).

8.6 Project Development and Environmental Documentation

Once Metroplan Orlando has adopted the Selected Alternative in its LRTP, the project may be advanced into the Project Development process outlined by FTA for major capital investments and in accordance with FTA rules and regulations specified under NEPA. The project sponsor(s) must submit a letter to the US DOT Secretary requesting permission to enter the Project Development phase under either the New Starts or Small Starts programs defined in Moving Ahead for Progress in the 21st Century Act (MAP-21). The FTA then has 45 days to approve or reject the request to enter Project Development. At the time of the letter request, FTA requires project sponsors to identify the specific funding source for the Project Development phase. Once approved by FTA, the project sponsor has two years to complete Project Development.

The Project Development phase includes the preparation of an environmental document that identifies and evaluates environmental impacts associated with a proposed major transit investment, consistent with both state and federal law. At this time, it is not known what class of action would be required for the Selected Alternative. However, for similar BRT projects FTA often requires either Categorical Exclusion (CE) or Environmental Assessment (EA) documentation.

In consultation with the Region IV office of the FTA, a determination will be made regarding the preferred level of environmental documentation required for the project. A CE could take 9-15 months to complete while an EA could take 18-24 months to complete.

The environmental documentation (CE or EA) would evaluate two alternatives, the No Build Alternative and the Recommended Alternative. Preliminary steps will be taken to allow FTA and the project sponsor to evaluate the project's potential for significant adverse impacts during construction and operation. Analysis of socio-economic impacts would include the evaluation of land use and neighborhood impacts, parks/recreational areas, historic/archaeological resources, displacement and environmental justice (disproportionate adverse impacts on minority and low-income populations), visual and aesthetic impacts, transit (ridership, operations, and maintenance), traffic, and parking. Impacts to the natural environment would include Outstanding Florida Waters, Wild and Scenic Rivers, aquatic preserves, wetlands, and threatened and endangered species. The physical impact analysis would include the evaluation of noise and vibration, air quality, energy, potential hazardous materials, water quality, and coastal zone consistency. The environmental evaluation would consider construction and cumulative and secondary impacts. Measures to mitigate any adverse impacts would also be addressed. Upon completing the environmental documentation, FTA would issue a Finding of No Significant Impact (FONSI), as required by NEPA.

Alternatives Analysis Report

The Project Development phase also includes conceptual engineering, schematic drawings, urban design and architectural concepts for the project sufficient to support the environmental review analysis for determining areas of potential impacts and to provide reliable cost estimates for construction.

At the conclusion of Project Development, the project sponsor(s) would submit a rating package to FTA which would consider a request for the project to enter the Engineering phase (for New Starts projects) or receive an Expedited Grant Agreement (for Small Starts projects). For New Starts projects, Engineering is the last phase of project development, and includes preparations for right-of-way acquisition, planning for utility relocation, and the preparation of final construction plans, detailed specifications, construction cost estimates and bid documents. The project culminates in construction with physical construction, procurement of vehicles, and pre-service testing of the system before revenue operations commence.

8.7 Community Engagement

To move forward with implementation of the project, hands-on public involvement is critical to the overall process and success of the project. Engaging the community is expected to take place throughout the environmental, engineering and construction phases of the project. At that time, the appropriate level and frequency of community meetings will be determined. A public involvement plan will be developed which lays out overall strategies for obtaining and incorporating community input into the project process.

8.8 Transit Funding

As described in **Chapter 7**, capital and operating funding strategies should be defined to support building and operating the system into the future. At this time, there are no dedicated funding sources for the project's capital and operational expenses. However, **Chapter 7** has identified several realistic potential funding sources that can serve as the starting point for developing capital and operating funding strategies.

For capital funding, it is assumed that the project sponsor(s) will explore the possibility of funding through the either FTA's New Starts or Small Starts programs, the State of Florida's New Starts program, local public agency contributions, and private funding. FTA's New Starts program can fund up to 50% of the capital cost, with no limits on the maximum amount of funding provided. FTA's Small Starts program is specifically designed to "fast track" qualified small projects through the FTA approval process. Small Starts projects, however, cannot exceed \$250M total cost, and there is a maximum \$75M federal contribution. If Small Starts funds are pursued, the remaining funding could be provided through a combination of other federal funds (as long as the total federal share is less than 80 percent of the total costs), State matching funds, and/or local/private funds. For the OIA AA Selected Alternative, identifying and targeting the preferred capital funding strategy, including the decision on whether or not to pursue Small Starts funds, will need to be a priority as the project advances through Project Development.

To qualify for either New Starts or Small Starts in the FTA Capital Investment Grant Program, the Selected Alternative must include certain elements to qualify as either a fixed guideway BRT project (New Starts) or a corridor-based BRT project (Small Starts). Corridor-based BRT projects must include:

- Defined stations with ADA accessibility.
- Provide shelter and route/schedule information.
- Transit Signal Priority and/or queue jump lanes to facilitate improved travel times.
- Unique branding identity for stations and vehicles.
- Short headways and bi-directional service for at least a fourteen-hour span of service on weekdays and a ten-hour span of service on weekends.

These specific elements for Selected Alternative are yet to be fully defined, but will be needed to qualify for the FTA Capital Investment Grant Program. As the Selected Alternative advances through Project Development, these elements will be fully identified and incorporated into the project.

For operating funding, potential funding sources include State operating assistance, passenger fare revenue, advertising and naming rights, and other private contributions. Defining a viable long term operating funding strategy will be an essential requirement to implementing the project.





This page intentionally left blank.

