SECTION 4
ENVIRONMENTAL CONSEQUENCES

4.1 COMMUNITY IMPACTS

4.1.1 Community Cohesion

In February 1994, the President of the United States issued *Executive Order 12898* (Environmental Justice) requiring federal agencies to analyze and address, as appropriate, disproportionately high adverse human health and environmental effects of federal actions on ethnic and cultural minority populations and low-income populations. All proposed projects should include measures to avoid, minimize, and/or mitigate disproportionately high and adverse impacts and provide offsetting benefits and opportunities to enhance communities, neighborhoods, and individuals affected by these activities.

Avoidance of impacts to low-income and minority populations was one of the initial study goals as the Florida High Speed Rail Authority (FHSRA) identified alternate alignments. The primary focus was to locate alignments near or within previously disturbed areas, such as the right-of-way (ROW) of limited access roadways and within existing railroad corridors, in order to minimize impacts to all neighborhoods. In most areas, the land uses abutting the roadways are commercial or rural non-residential uses. As detailed in Section 6, community outreach included two series of workshops and a series of public hearings to provide information and opportunity for input from the communities.

The following section addresses land use and population impacts for the No-Build Alternative and the Design/Build Alternatives 1 through 8. Figure 2-7 displays retained corridors and alignments. The various combinations of alignments (routes) within the corridors results in the eight alternatives displayed in Figure 2-8.

Alternatives 1, 2, 5, and 6 contain Alignment A1. Alignment A1 abuts Interstate 275 (I-275) from its western terminus until it turns east at the I-275/Interstate 4 (I-4) interchange. It then runs just south of I-4 until it enters the I-4 median near 18th Street. Alignment A1 is located within the proposed and existing ROW of the "Ultimate" Tampa Interstate (I-4). By locating Alignment A1 within the Tampa Interstate Study Record of Decision[1] ROW, it runs along I-4 and avoids impacts to historic Tampa Heights' residences, the Central Park Village public housing, and the Ybor City Historic Landmark District. The Florida Department of Transportation (FDOT) and the FHSRA have developed a Memorandum of Agreement (MOA) (Appendix B) allowing the Florida High Speed Rail (FHSR) to be in this location until the I-4/I-275 interchange is reconstructed. Alignment A1 would require the relocation of three residences located in two structures that directly abut I-4 in a low-income, minority neighborhood. Three businesses near I-275 would also require relocation. These three residences, as well as others nearby, were previously identified under the Tampa Interstate Study Environmental Impact Statement[2] as needing relocation for the Tampa Interstate Study (TIS) "Ultimate Design." The

FHSR project travels through Census tracts 51.01 and 38 (year 2000 census), which have a median income as $12,772, and $11,217, respectively, and predominantly minority residents.

Alternatives 3, 4, 7, and 8 contain Alignment A2. Alignment A2 heads south and east from the terminus to the former CSX railroad line. The alignment bisects an area of vacant land, parking lots, and small businesses. It requires the relocation of 15 businesses prior to reaching the former CSX tracks. These businesses are west and south of the Central Park Village public housing. The alignment was developed to avoid relocation of residences within the public housing complex or direct impacts to Union Station. These impacts occur in a low-income, minority area. Year 2000 census tract data indicates the median income ranging from $12,772 to $23,889, respectively.

Alternatives 1, 2, 5, and 6 contain Alignment B1. Alignment B1 is located within the median of I-4. Land uses along I-4 are a mixture of commercial, industrial, and minimal residential. There are no relocations in Alignment B1.

Alternatives 3, 4, 7, and 8 contain Alignment B2. Alignment B2 travels along the former CSX Line until it reaches the active CSX tracks and the Uceta Yards. It follows the active CSX Line until near Interstate 75 (I-75), where it is located in the median of I-75. South of the I-75/I-4 interchanges, it turns east and merges into the I-4 median. Land uses along the former and existing CSX tracks are primarily industrial with a scattering of residential uses. Land uses along I-75 are a mixture of vacant, commercial, and residential uses. There are no concentrations of low-income or minority residents. No relocations are required within Alignment B2.

All alternatives contain Alignment C1. Alignment C1 is located in the median of I-4 as it travels through Plant City and eastern Hillsborough County. The land uses are agriculture and commercial. There are no concentrations of low-income or minority residents. There are no relocations in Alignment C1.

All alternatives contain Alignment D1. Alignment D1 is located in the median of I-4 as it travels through Lakeland and Polk County. The land uses are agriculture and commercial. There are no concentrations of low-income or minority residents. There are no relocations in Alignment D1.

Alternatives 1, 3, 5, and 7 contain Alignment E1. Alignment E1 is located in the median of I-4 as it travels north. Land uses adjacent to the roadway are primarily commercial tourist services and developments of middle- and high-income residential uses. As Alignment E1 turns east, it is within the ROW of the Florida Turnpike's Bee Line Expressway (S.R. 528). Land uses are primarily tourist commercial and retail. As Alignment E1 leaves the Bee Line Expressway (S.R. 528) and joins the Taft/Vineland Road ROW, it is located south of the Taft neighborhood. The Design/Build Alternatives 1, 3, 5, and 7 separate the neighborhood from existing and future industrial uses located within the Tradeport Industrial Park. Alignment E1 is located approximately 60 feet (ft.) from the southern edge of the neighborhood. The Taft neighborhood is located in census tracts 168.03 and 168.04. Both tracts are primarily non-minority with median incomes of $57,460 and $33,922, respectively. No relocations or other impacts result from Alignment E1.

Alternatives 2, 4, 6, and 8 contain Alignment E2. Alignment E2 turns west from I-4 and connects to the Central Florida Greeneway (S.R. 417). Design/Build Alternatives 2 and 4 are located within the median of the Central Florida Greeneway (S.R. 417). Design/Build Alternatives 6 and 8 are located on the north side of the existing road within the ROW. There are eight business relocations, all located in a strip commercial center. There are nine neighborhoods that are a part of the Hunter's Creek Community Association, which includes new, middle, and high-income residential subdivisions both north and south of the Central Florida Greeneway (S.R. 417). There are no residential relocations that result from Alignment E2.

The FHSRA has developed this project in accordance with the *Civil Rights Act of 1964*, as amended by the *Civil Rights Act of 1968*, and in accordance with *Executive Order 12898*. The proposed project would not result in any disproportionate adverse impacts to any distinct minority, ethnic, elderly, or handicapped groups and/or low-income households. Alignment A1 is the only alignment that would result in the relocation of any (3) minority/low-income households; however, these were previously scheduled for relocation under the TIS Environmental Impact Statement Record of Decision (FHWA-FL-EIS-95-03-F; January 31, 1997). If a decision is made to proceed with the construction of FHSR, the construction would likely occur prior to the acquisition of these units for the I-4 improvements. Based upon the fact that these relocations have been previously identified and coordinated and that there is suitable housing available for relocation within the neighborhood, the impacts resulting from the relocations to minority and low-income households are considered minimal. Both non-drivers and transit-dependent individuals would benefit from the project and its increase of accessibility to current and future public transportation.

No-Build Alternative

The No-Build Alternative would not bisect an area of the Tampa Central Business District (CBD), nor require 15 business relocations, as would Design/Build Alternatives 3, 4, 7, and 8.

Preferred Alternative

The Preferred Alternative (Design/Build Alternative 1) will result in the relocation of the three minority households; however, these were previously scheduled for relocation under the TIS Environmental Impact Statement Record of Decision (FHWA-FL-EIS-95-03-F; January 31, 1997). If a decision is made to proceed with the construction of FHSR, the construction would likely occur prior to the acquisition of these units for the I-4 improvements. Based upon the fact that these relocations have been previously identified and coordinated and that there is suitable housing available for relocation within the neighborhood, the impacts resulting from the relocations to minority and low-income households are considered minimal. Both non-drivers and transit-dependent individuals would benefit from the project and its increase of accessibility to current and future public transportation.

4.1.2 Community and Land Use Impacts

Land Use

Existing and future land uses, along with adopted land use plans are presented in detail in Sections 3.2 and 3.3 of this report. Section 3.4 indicates where updates are under way and where they are needed for the transportation elements of the adopted comprehensive plans. Most of the proposed station locations are in areas already identified for special developments; therefore, changes to future land uses would be minor and would be accomplished for all stations through minor zoning amendments or site plan approvals. Impacts to existing land uses for all the sites would range from none to minimal. Listed below are current zoning categories:

- The Tampa CBD station site is zoned CBD-1. It likely allows all of the required station uses and contains design standards to create a visual appeal for new structures. No zoning changes are anticipated. The land in the Tampa CBD, where the proposed FHSR station would be located, contains paved parking lots, the former Hillsborough County Jail, and vacant land at this time; therefore, minimal land use impacts are anticipated. Hillsborough County Jail has no equipment in the building and is looking for redevelopment opportunities. There is an abundance of paved parking lots within the area and the CBD. Commercial redevelopment would likely occur as a result of the new station in order to be consistent with local redevelopment goals.
- The Polk Parkway station site is zoned Business Park Center-2. This zoning is for Light Manufacturing and Distribution, which limits commercial use and has suburban intensities; therefore, a change in zoning may be required for this site. The site would be located on and surrounded by vacant land. However, the site is located at the interchange of two major roadways and commercial development is expected to occur. The station may accelerate growth in the area.
- The proposed Kathleen Road station site is zoned as Planned Unit Development (PUD). The PUD is a multi-use approval for multi-family, commercial, light industrial, and office park uses. The site is vacant land and a station at the location would further development and redevelopment goals for the area.
- The proposed station site for the Disney station would fall within the Reedy Creek Improvement District. The site is designated as Mixed Use. This designation likely allows all the uses necessary for the station site. No zoning changes are anticipated. The proposed FHSR Disney station site is vacant at this time and meet the Improvement District's goals for future growth in the area.
- The Orange County Convention Center (OCCC) station site is zoned as Planned Development. It has a Mixed Use designation, as it contains design criteria. No zoning changes are anticipated. The site contains a paved parking lot and a building, both owned by Orange County. The site is identified by Orange County as the preferred inter-modal station site. Current county uses would be moved to other facilities.
- The Orlando International Airport station site is identified within the Airport Master Plan. No zoning changes are anticipated. This proposed station site and maintenance facilities sites would be located on vacant land. The Airport has identified the site as compatible with existing plans and desirable in conjunction with a new terminal.

No-Build Alternative

There would be no transportation-related redevelopment within the Tampa CBD or land development of the identified station sites under the No-Build Alternative.

Preferred Alternative

The preferred station locations throughout the project corridor will not require zoning changes. Minimal land use impacts are anticipated as a result of the Tampa CBD site and commercial redevelopment would likely occur as a result of the new station in order to be consistent with local redevelopment goals.

Community Services

Several community service facilities are located within approximately a ¼ mile (mi.) of either side of the FHSR Design/Build Alternatives 1 through 8. However, with the exception of Perry Harvey Sr. Park (Design/Build Alternatives 1, 2, 5, and 6), none of these facilities are directly impacted by ROW acquisition or access relocation. Of the retained alignments, Alignment A1 (Design/Build Alternatives 1, 2, 5, and 6) with 14 facilities and Alignment C1 (all design/build alternatives) with 15 facilities have the greatest number of community service facilities within a ¼ of a mi. of the proposed ROW. The following text provides a discussion of the community service facilities within a ¼ mi. of the retained alignments for the design/build alternatives.

Design/Build Alternatives 1, 2, 5, and 6

Along Alignment A1, the following 14 community services facilities lie adjacent to I-4: three schools, including Hillsborough Community College in historic Ybor City and Stetson Law School complex; two community facilities, including a post office and the former Hillsborough County Jail; three park and recreation areas, including Perry Harvey Sr. Park; one cemetery; and five churches.

Near Alignment B1, there are four community service facilities: the Florida State Fairgrounds; the Seminole Indian Reservation; and two churches, New Mt. Silla Missionary Baptist Church and Living Water Church.

There are 15 community service facilities near Alignment C1: two schools, Armwood High School and Gordon Burnett Middle School; three community facilities, including the Hillsborough County Landfill, a wastewater treatment plant, and a Hillsborough County Fire Station; two parks and recreation facilities, Evan Neighborhood Park and Sansone Community Park; three cemeteries; and five churches.

Adjacent to Alignment D1, there are nine community service facilities: two schools, Winston Elementary and Watson Elementary Schools; one community facility, Lakeland Municipal Water Plant; one park and recreation area, the proposed Van Fleet Trail Extension; two cemeteries, the New Home Cemetery and Oak Hill Cemetery; and three churches, Victory Assembly of God, Oak Hill Baptist Church, and Lake Gibson Church of God.

There are three community service facilities near Alignment E1: OCCC; a water treatment plant; and one park and recreation area, the Shingle Creek Greenway.

There are eight community service facilities adjacent to Alignment E2; four schools, Hunters Creek Middle School, Meadow Woods Elementary School, Meadow Woods Middle School, and New Vistas Elementary School; one community facility, a water treatment plant; two park and recreation areas, the Shingle Creek Greenway and Bear Creek Recreation Complex; and one church, Peace United Methodist Church.

Design/Build Alternatives 3, 4, 7, and 8

The following five community service facilities are located adjacent to Alignment A2: one school, Shore Elementary; two cemeteries, Fortune Street Cemetery and Oaklawn Cemetery; and two churches, Greater Bethel Baptist Church and St. Paul African Methodist Episcopal (AME) Church.

There are three community service facilities adjacent to Alignment B2: one park and recreation area, Williams Road Park; and two churches, Christian Fellowship Church and First Apostolic Church.

Alignments C1, D1, E1, and E2 are discussed in the previous text.

A summary of the alignments' proximity to community services are aggregated into each of the Design/Build Alternatives 1 through 8 and summarized in Table 4-1.

Table 4-1
Community Service
Evaluation Matrix

	Alternative							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Community Services								
Schools	8	12	5	9	8	12	5	9
Community Facilities	10	9	6	5	10	9	6	5
Parks & Recreation	5	7	5	6	5	7	5	6
Cemeteries	4	6	6	6	4	6	6	6
Churches	15	16	12	13	15	16	12	13

In conclusion, Design/Build Alternatives 1, 2, 5, and 6 require acquisition of ROW from one community facility, Perry Harvey Sr. Park. Design/Build Alternatives 3, 4, 7, and 8 would require acquisition of ROW from the St. Paul AME Church. The acquisition and impacts to Perry Harvey Sr. Park are discussed in detail in Section 5 of this report.

No-Build Alternative

All the community facilities identified in Table 4-1 would remain their current distance from transportation facilities under the No-Build Alternative.

Preferred Alternative

The Preferred Alternative will require acquisition of ROW from Perry Harvey Sr. Park. The acquisition, impacts, and mitigation are discussed in detail in Section 5 of this report.

4.1.3 Economic Impacts

Both direct and indirect beneficial impacts to economic resources would result from the construction of the FHSR system. Direct impacts would include the addition of actual jobs associated with the construction, operation, and maintenance of the FHSR infrastructure. Indirect impacts would include the additional jobs that result from the production of the materials used during construction of the FHSR system. Indirect impacts also include the additional wages earned and recycled into the economy by the suppliers of materials during construction and when FHSR is in operation.

In addition to construction, permanent economic benefits would accrue from the materials needed for the high speed rail trains' operation and maintenance, and, as a result, permanent jobs would be created for individuals to perform those operations.

Many high speed rail studies have been completed in Florida over the last 30 years. In general, these studies have concluded that high speed rail systems would, over time, have benefits that are greater than the costs of these systems. The Florida High Speed Rail Economic Impact Analysis[3] was presented to the FHSRA on August 15, 2002. This study analyzed and compared the anticipated costs and benefits of two previous high speed rail studies and the FHSRA report to the Florida State Legislature. The FHSRA report is entitled Florida High Speed Rail Authority, 2002 Report to the Legislature[4]. The two previous high speed rail studies are: Cross-State Feasibility Final Report[5] and Travel Time, Safety, Energy and Air Quality Impacts of High Speed Rail[6]. The studies concluded:

> That over the past five years, three comprehensive Florida studies of high speed rail have been completed and each study documented the findings that the amount of benefits flowing from the development of a high speed rail project in the evaluated corridor areas generates considerable amounts of benefits well in excess of project costs.

The comparison of high speed transportation systems cost impacts and economic benefits also stated: "In each case, operational revenues exceeded operational costs and deferred a varying percentage of capital costs." Figures 4-1, 4-2, and 4-3 display the benefits each study has predicted resulting from a high speed rail system.

Table 4-2 illustrates the economic benefits and costs from the Florida High Speed Rail Economic Impact Analysis that was presented to the Florida State Legislature.

Table 4-2
Summary of Present Value (PV) of Economic Benefits and Costs
Tampa to Orlando in 2002 $

Total PV of Benefits	$2,401
Total PV of Costs	$2,085
Ratio of Benefits to Costs	1.15
Mid Point Jobs Created-Tampa to Orlando	6,500
PV of FHSR Benefits Created per Corridor Mile (Millions 2002 $)	$28,243,272
Number of Jobs Created per Corridor Mile (Millions 2002 $)	76.5

Source: 2002 Report to the Legislature, Florida High Speed Rail Authority. HNTB Corporation, with Transportation Economics and Management Systems. Public Financial Management, and Booz-Allen and Hamilton, January 2002.

4.1.4 Safety and Public Health

Safety

The FHSR would require a System Safety Program Plan that would also incorporate a system security plan. A system safety program would ensure the security and safety of the passengers, staff, and public for the duration of the development, construction, and operation of the FHSR project. This program would be prepared in conjunction with the selected technology; would be based on Federal Railroad Administration (FRA) and FDOT design, construction, and safety requirements; and would be submitted to FRA for comment and concurrence. At a minimum, the System Safety Program Plan would:

- Establish the safety program and management system for the whole system and would cover all the phases of the development, construction, commissioning, and operation of the FHSR project.
- Provide the framework and system architecture for the implementation of safety policy and the achievement of FHSR safety-related goals and objectives.
- Ensure that FHSR commitment to safety is documented, communicated, and made visible to all.
- Standardize and synchronize all the various elements of the system safety regime throughout the organization.
- Serve as the foundation by which FHSR would plan, manage, and control system safety activities and provide the framework for FHSR to monitor its effectiveness, exercise leadership, and establish control over these activities.
- Provide the methodology and planning process to ensure that all applicable federal and state requirements and best industry standards would be met and establish a system safety organization that:
  - Provides clear lines of communication.
  - Identifies and controls interface between system safety and other functional disciplines.

- Allocates clearly the safety responsibilities and accountabilities within FHSR and to all subcontractors.
- Provides and establishes the structure and framework of authority for safety decision-making and for the resolution of identified hazards.
- Identifies and records the system safety milestones and their relationship to the major program milestones and project phases.
- Establishes an incident and accident investigation and reporting process.
- Provides the process for the identification of safety hazards and the assessment of safety risks, including a risk matrix containing probability and severity thresholds.
- Contains the process for recording all identified safety hazards and their associate risk so that they can be communicated and allocated to the hazard owner(s).

The FHSR project would be subject to the FRA comprehensive railroad safety regulations, 49 Code of Federal Regulations (CFR) Parts 207-244 and any waivers or modifications for this project.

Vehicle

The gas turbine train power car design and coaches have been used for high speed service in the northeast corridor of the United States. The technology is compliant with FRA's Tier II Passenger Equipment Safety Standards for speeds up to 150 miles per hour (mph) and has undergone testing at the United States Department of Transportation's (USDOT) Technology Center in Pueblo, Colorado. The power and passenger car bodies meet the structural requirements of the FRA and Association of American Railroads Standards S-034 and S-580. The passenger coach also meets *Americans with Disabilities Act of 1990* (ADA) requirements.

The electric train technology is the French TGV system that has over twenty years of successful operation. This system is not currently approved for operation in the United States. As part of the request for proposals (RFP) process, the electric train proposer requested clarification on the operational status of the technology. The following text is an excerpt from the FHSRA response:

> The TGV technology does not comply with all FRA safety standards as defined in the USC Title 49. Under the Florida Overland eXpress (FOX) high speed rail program in Florida, the FOX team petitioned FRA to establish safety rules governing the design and operation of a TGV system between Miami and Tampa via Orlando. On December 12, 1997, the FRA issued a proposed Rule of Particular Applicability, 49 CFR Part 243, applying specifically to the FOX program. This rule was never formally approved, as the FOX program was cancelled.
>
> With the establishment of the new FHSR program, under the auspices of the FHSRA, a series of meetings was held with the FRA to discuss design criteria, safety, and regulatory issues. The FRA indicated that they would be able to expedite the approval of the electric train proposal based on the work performed on the previous proposed rule making.

Pedestrian Access

Rail operations of the FHSR would be separated from any vehicle or pedestrian access throughout the corridor. In the 2002 Florida High Speed Rail Authority Report to the Florida State Legislature, the FHSRA found that if high speed rail crosses motor vehicle traffic, crossings should be vertically separated (grade-separated). FHSRA issued the following policy that must be met by the project:

> The Authority reviewed the issue of grade separated from automobile and pedestrian traffic in order to provide reliable and efficient service. However, there may be instances where at-grade crossing may be considered due to factors such as physical constraints, cost, and community impacts. In exceptional cases, the Authority agreed that at-grade crossings could be considered on a case-by-case basis.

The proposed FHSR between Tampa and Orlando includes no at-grade crossings. The pedestrian access at stations would be separated from any track crossings by either elevated tracks with pedestrian access underneath or by pedestrian bridges crossing over the tracks.

System Safety and Security

The criteria to ensure safety and security for the passengers, employees, and the general public, as well as measures for the protection of the FHSR system, would be in accordance with Title 49 Chapter II - FRA, USDOT, Part 200 to 268.

Chapter 7 of National Fire Protection Association's 130 Standard for Fixed Guideway Transit and Passenger Rail Systems (NFPA 130) would apply to emergency procedures for passenger rail systems and would serve as guidance for the development of fire/life safety procedures for the FHSR.

The FHSR system design would ensure a high level of security for patrons and operating personnel. Facility design and operating procedures would promote a sense of well being for patrons and personnel, by discouraging acts of crime, violence, and abuse. Security provisions would also discourage acts of vandalism, theft, and fraud.

Project facilities would include features that enhance patron and personnel security. These would include maximum visibility from surrounding areas, with no hidden corners or alcoves; locks on the doors to any rooms; and landscaping and lighting levels that support the intended means of surveillance. In addition, any surfaces or equipment accessible to the public, such as fare vending machines, station floors, and walls, would be of rugged, vandal-resistant design.

As a minimum, the following security criteria would apply:

- Prevention: Project features to deter breaches of security
  - Barriers to unauthorized intrusions to non-public areas of the project
  - Protective covers to prevent damage or loss

  - Vandal-resistant materials
  - Hazardous materials handling and storage
  - Coordinated lock access and system
- Detection: Project features to permit timely detection of criminal acts
  - Intrusion Detection
  - Fire Alarm
  - Closed Circuit Television
- Restoration: Project features to enable rapid responses to security problems and restoration of normal service
  - Ease of access for non-project emergency personnel and vehicles
  - Emergency procedures training programs
  - Maintenance procedures which minimize repair-in-place time
  - Security training programs

The gas turbine train technology addresses the requirements identified in the FHSR proposal documents, except in the following issues. An intrusion detection system would not be provided, since FRA safety requirements do not identify the need for such a system when the maximum operating speed is 125 mph or less. Access detection would be provided only at access/egress gates in the fencing. The FHSRA identified installation of Test Level (TL)-5 intrusion barriers between the rail system and the parallel highway in tangent sections, and TL-6 intrusion barriers on highway curves and overhead highway structures. The gas turbine train proposal utilizes FDOT Index 410 barriers at retained earth fill sections and TL-5 barriers at other sections on tangent. No overhead highway structure barriers would be replaced except where overpasses are reconstructed. Under 49 CFR 213.361, FRA requires preparation of a barrier plan for systems operating at speeds over 125 mph. The gas turbine train is proposed to operate at 125 mph or less.

The electric train meets the design criteria established by the FHSRA.

Public Health

The health and safety of exposures to extremely low frequency (ELF) electric and magnetic fields (EMF) commonly associated with all electric power transmission and distribution lines, with existing electric transportation systems and facilities, as well as with homes, industrial and office buildings, schools, and urbanized outdoors is an issue subject to research and continued debate. The construction and operation of the FHSR systems may affect the environment along the proposed design/build alternatives by incrementally raising current levels of EMF from existing electric power transmission and distribution along the ROW, or from operating transit, airport, port, etc., facilities.

The proposed gas turbine train technology (Design/Build Alternatives 1 through 4) is non-electrified, and therefore is unlikely to generate EMFs of concern. The stations and maintenance facilities would be provided power through standard electrical systems.

The electric train technology (Design/Build Alternatives 5 through 8) would generate some EMFs. The low frequency EMF associated with the electric train technology, proposed for operation in the FHSR corridors, is documented in the Safety of High Speed Guided Ground Transportation Systems Final Report (USDOT/FRA/ORD-93/03.1) Executive Summary.

The EMF measurements were made using the *MultiWave*™ System instrumentation package originally developed under sponsorship of the Electric Power Research Institute (EPRI). This system quantified both the spatial and temporal characteristics of the magnetic field. By recording the actual waveform of the magnetic field with sensors having frequency responses from 0 to 3 kilohertz (kHz), the *MultiWave*™ system (waveform capture system) makes it possible to examine the temporal characteristic throughout the ELF band. The waveform capture system recorded the electric field at head height and was complemented by recording data on a TEAC Model RD 130 T digital audio tape to capture transient events and with two personal dosimeters to record the root mean square (rms) of the magnetic field. These personal exposure recorders were EMDEX-II's.

The magnetic field and electric field measurements associated with the electric train technology were grouped into four areas: onboard the trains; in the passenger stations; along the track ROW; and near the substations, which supply power to rail system.

Onboard, the train measurements were taken in the passenger coaches and in the engineer's cab. At the stations, EMF measurements were taken at both ends of the platforms at points nearest the track where a person could reasonably stand. Wayside measurements were taken to quantify the field environment in areas open to the general public. Wayside refers to the public accesses along the system of the track ROW. Field measurements were taken with no trains on the track and during times of passing trains. Power substation measurements were taken near the substation fences and under the connected transmission lines.

The EMF effects on the physical environment are predominately from electric current in the catenary, feeder circuit, and track. EMF field levels for the electric train technology are within the ranges of other common environmental EMF sources, but have specific frequency signatures. Findings from the Safety of High Speed Guided Ground Transportation Systems Final Report suggest that EMF effects were found to be comparable to those produced by common home, work, and power lines. Thus, the EMF field levels associated with Design/Build Alternatives 5 through 8 are not expected to have a significant impact on human health.

No-Build Alternative

The No-Build Alternative would result in increased roadway use and congestion, thereby reducing the safety of existing roadways.

Preferred Alternative

The Preferred Alternative (Alternative 1) will have a System Safety Program Plan developed based upon FRA and FDOT design, construction, and safety requirements and will be submitted to FRA for comment and concurrence.

The gas turbine train power car body design and the same coaches have been used for high speed service in the northeast corridor of the United States. The technology is compliant with FRA's Tier II Passenger Equipment Safety Standards for speeds up to 150 mph and has undergone testing at the USDOT Technology Center in Pueblo, Colorado. The power and passenger car bodies meet the structural requirements of the FRA and Association of American Railroads Standards S-034 and S-580. The passenger coach also meets *Americans with Disabilities Act of 1990* (ADA) requirements.

The Preferred Alternative does not include at-grade crossings. The pedestrian access at stations would be separated from any track crossings by either elevated tracks with pedestrian access underneath or by pedestrian bridges crossing over the tracks.

The gas turbine train technology proposed by the Fluor Bombardier Team addresses the design criteria requirements with the exception of the following: no provision of intrusion detection system, only provision for access detection at access/egress gates, and utilization of FDOT Index 410 barriers at retained earth fill sections and TL-5 barriers at other sections on tangent.

The FHSRA will require the Fluor Bombardier Team to meet the design criteria requirements as identified in the RFP process, specifically the intrusion detection system and the barrier system. Any changes and/or revisions to these design criteria requirements will be coordinated and approved through the appropriate agencies including, but not limited to, the FRA, FHWA, FDOT and FHSRA. The barrier requirements for the FHSR, as identified in the RFP, are as follows:

- Meeting requirements of the National Cooperative Highway Research Program (NCHRP) Report 350 TL-5 guidelines shall be installed between the high speed ground transportation system guideway and the parallel roadway. Such barriers shall be installed where the highway is on a tangent.
- Where the highway is on curve and within 100 ft. of a highway curve, reinforced concrete barriers meeting the requirements of NCHRP Report 350 TL-6 guidelines shall be installed between the high speed ground transportation system guideway and the parallel roadway.
- Where the guideway is on earthen fill structure with vertical walls exceeding 4 ft. in height above the roadway shoulder, barrier wall shall be required.
- Where the guideway is on pier supported structures within 100 ft. of the highway, NCHRP Report 350 TL-5 barriers shall be required to protect guideway piers and occupants of highway vehicles.

The gas turbine train technology is not electrified and is not likely to generate EMFs of concern. The stations and maintenance facilities would be provided power through standard electrical systems.

4.1.5 Relocation and Right of Way Impacts

The FHSR project could involve residential and business relocations as a result of ROW acquisitions required for proposed design/build alternatives, stations, and maintenance facilities.

All of the design/build proposals assume use of existing ponds or medians for drainage. Relocations due to unforeseen pond location or expansion cannot be determined until an agreement is reached with FDOT regarding proposed roadway improvements. Despite the project length of approximately 95 mi., there are minimal relocations and reduced ROW costs as I-4 is proposed for use for a significant portion of the distance.

Relocations

In order to minimize the unavoidable effects of ROW acquisition and displacement of people, the FHSRA would carry out a ROW and relocation program in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policy Act of 1970* (Public Law 91-646 as amended by Public Law 100-17). The FHSRA would provide advance notification of impending ROW acquisition. Before acquiring ROW, FHSRA would appraise all properties on the basis of comparable sales and property values in the area. Owners of property to be acquired would be offered and paid fair market value for their property rights. No person lawfully occupying real property would be required to move without at least 90 days written notice of the intended vacation date, and no occupant of a residential property would be required to move until decent, safe, and sanitary replacement housing is made available. Relocation services and payments are provided without regard to race, color, religion, sex, or national origin.

Financial assistance is available to the eligible relocatee to:

- Reimburse the relocatee for the actual reasonable costs of moving from homes, businesses, and farm operations acquired for a highway project.
- Make up the difference, if any, between the amounts paid for the acquired dwelling and the cost of a comparable decent, safe, and sanitary dwelling available on the private market.
- Provide reimbursement of expenses, incidental to the purchase of a replacement dwelling.
- Make payment for eligible increased interest cost resulting from having to get another mortgage at a higher interest rate. A combined total estimate for replacement housing payments, increased interest payments, and closing costs is approximately $22,500.

A preliminary evaluation matrix has been developed in order to compare the potential impacts of each alternative being considered. Table 4-3 shows a comparison of relocation impacts for Design/Build Alternatives 1 through 8.

Table 4-3
Comparison of Relocations

Residential Relocations		Business Relocations	
Alt. 1	**Alt. 5**	**Alt. 1**	**Alt. 5**
3	3	3	3
Alt. 2	**Alt. 6**	**Alt. 2**	**Alt. 6**
3	3	8	8
Alt. 3	**Alt. 7**	**Alt. 3**	**Alt. 7**
0	0	15	15
Alt. 4	**Alt. 8**	**Alt. 4**	**Alt. 8**
0	0	23	23

The three residential relocations within Design/Build Alternatives 1, 2, 5, and 6 are located in two structures near I-4 and 12th Avenue in the Ybor City area. The residences are located in a low-income minority area.

The three business relocations within Design/Build Alternatives 1, 2, 5, and 6 include the City of Tampa Recreation Department and the former Hillsborough County Sheriff's Office and Jail Complex. The other relocatee is a bail bondsman. The jail has been decommissioned and the Sheriff's office and prisoners moved. Design/Build Alternatives 2 and 6 contain eight business relocations, three were previously noted in the Tampa CBD, and five more are located in a small strip mall near the Central Florida Greeneway (S.R. 417) as it transitions from I-4. These include a restaurant, car repair, and other services. Design/Build Alternatives 3 and 7 have 15 business relocations. Nine of the relocations are within the Tampa CBD and all are State of Florida departments located in the Florida State Office Building. Five of the relocations include the parking lot of the St. Paul AME Church, a vacant building, a hair salon, a bindery, and an auto detailing shop. There is one relocation along the CSX rail line on Adamo Drive, an auto sales company.

Design/Build Alternatives 4 and 8 contain 23 business relocations including the 15 relocations in or near the Tampa CBD for Design/Build Alternatives 3 and 7, as well as the eight relocations contained in Design/Build Alternatives 2 and 6.

No-Build Alternative

No acquisitions would be required under the No-Build Alternative. The two residential structures (containing three households) identified for acquisition for FHSR Design/Build Alternatives 1, 2, 5, and 6 are also identified to be acquired in the future for improvements to I-4 under the TIS. If the construction of FHSR occurs, then acquisition of the structures would likely occur sooner, but would also be acquired if the No-Build Alternative is selected and future plans for I-4 proceed as planned.

Preferred Alternative

The Preferred Alternative would require three residential relocations located in two structures near I-4 and 12th Avenue in the Ybor City area. It would also require three business relocations including the City of Tampa Recreation Department, the former Hillsborough County Sheriff's Office and Jail Complex, and a bail bondsman.

Right of Way Cost

Acquisition impacts relative to ROW requirements and the corresponding acquisition costs were estimated for each alternative. Although each proposal adhered generally to the same alignments, the gas turbine train technology (Design/Build Alternatives 1 through 4) resulted in some slight centerline modifications with additional lands in the Disney area, and therefore resulted in differences in total ROW cost. Also, Design/Build Alternatives 1 through 4 proposed the location of the Bee Line Maintenance Facility on Orlando International Airport property, which resulted in a reduction in cost.

The cost estimate is based on aerial maps with an overlay of the proposed FHSR Design/Build alternatives. Construction plans were not available. For this reason, the fee acquisitions have been considered as 100 percent fee take at grade level. In this worst-case scenario, many of the properties could retain some measure of utility at grade level given certain assumptions that were made for the cost estimates and the railway's elevated design. Exceptions to this assumption were made for various parcels where access, utilities, and drainage would be otherwise severed. These parcels were estimated with consideration of the proposed elevated superstructure. The real estate and business damages considered the most realistic acquisition scenario of air rights (for railway decking) and fee rights (for column footers) to provide continued ingress/egress. This scenario allows for the continuance of the business without a total buy-out (of real estate and business).

The acquisition areas and property impacts were estimated by overlaying the scale drawing onto raster/aerial images and Property Appraiser tax parcel ownership lines utilizing Geographical Information Systems (GIS). For this reason, the acquisition areas, parcel count, and estimated costs are all considered preliminary and are subject to change as more accurate design, survey, and title information becomes available.

A preliminary evaluation matrix has been developed in order to compare the potential ROW cost impacts of each alternative being considered. Table 4-4 shows the comparative cost impacts for Design/Build Alternatives 1 thru 8.

Table 4-4
ROW Costs
Corridors, Stations, and Maintenance Facilities

Alt. 1	Alt. 5
$117,871,000	$101,170,300
Alt. 2	**Alt. 6**
$148,956,200	$128,087,700
Alt. 3	**Alt. 7**
$150,384,700	$133,684,000
Alt. 4	**Alt. 8**
$181,469,900	$160,601,400

No-Build Alternative

The No-Build Alternative would not require the expenditure of funds for ROW identified above. However, it is anticipated that transportation funding for roadway capacity improvements would be required earlier and in greater amounts.

Preferred Alternative

The ROW cost associated with the Preferred Alternative (Alternative 1) with the gas turbine train is $117,871,000.

4.1.6 Environmental Justice

Potential disproportionate impacts to low-income and minority populations were evaluated in accordance with *Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."* In response to this Executive Order, the project design/build alternatives were evaluated to identify the presence of low-income and minority residents and potential impacts to them.

An adverse effect on minority and/or low-income populations occurs when: 1) the adverse effect occurs primarily to a minority and/or low-income population; or 2) the adverse effect suffered by the minority and/or low-income population is more severe or greater in magnitude than the adverse effect suffered by the non-minority and/or non-low-income populations.

Census tracts along the project corridor were mapped and evaluated to determine if there was a disproportionate affect on minority or low-income populations. High concentrations of minorities were identified as tracts in which minorities comprise 50 percent or greater of the population. Low-income tracts were identified as those with 25 percent or greater of the

population living below the poverty level. There is a total population of approximately 285,000 people located in census tracts running along the FHSR Design/Build Alternatives. The population in these tracts is primarily non-minority and not below the poverty level with minorities comprising approximately 26 percent of the population and approximately 5 percent of the population living below the poverty level. However, there are three concentrations of minority and/or low-income residents located in three different counties (Orange, Polk, and Hillsborough).

Orange County tract 170.01 contains a population of 2,367 with minority populations comprising approximately 95 percent and residents living below the poverty level comprising approximately 14 percent. This tract contains the Taft-Vineland neighborhood. FHSR Alignment E1 (Design/Build Alternatives 1, 3, 5, and 7) would run south of this neighborhood within an industrial area. The number of residential noise impacts is expected to range between 15 and 37 sites. Relocation and vibration impacts are not expected to affect this tract.

Polk County tracts 111 and 112.01 have a combined population of 8,218 people with minority populations comprising approximately 78 percent of the population and residents living below the poverty level comprising approximately 33 percent of the population. All eight of the FHSR Design/Build Alternatives would be located in the median of I-4 in rural Polk County; therefore, no identified noise impacts to the area are expected. In addition, no relocation and vibration impacts are expected to affect these tracts.

The largest concentration of minority and low-income residents occurs within the Tampa CBD in tracts 32, 33, 35, 36, and 38 through 41. The tracts contain a combined population of 16,337 people with a minority population of approximately 66 percent. Approximately 35 percent of the population is below the poverty level. Alternatives 1, 2, 5, and 6 would have three residential relocations within this area. Alternatives 3, 4, 7, and 8 would have 15 business relocations. Alternatives 1, 2, 5, and 6 would have 16 noise impacts and Alternatives 3, 4, 7, and 8 would have one noise impact within this area. Alternatives 1, 2, 5, and 6 would have four vibration impacts.

In conclusion, the largest potential for environmental impacts to minority or low-income residents within the FHSR project area occurs in the Tampa CBD. However a comparison of the population and income characteristics of all census tracts, as well as total noise, vibration, and relocation impacts along the design/build alternatives clearly demonstrates there is no adverse effect on minority and/or low-income populations as no effect occurs primarily to a minority and/or low-income population, No effect suffered by the minority and/or low-income population is more severe or greater in magnitude than the adverse effect suffered by the non-minority and/or non-low-income populations.

This project is being developed in accordance with the *Civil Rights Act of 1964*, as amended by the *Civil Rights Act of 1968*, and in accordance with *Executive Order 12898*. The proposed project would not result in any disproportionate adverse impacts to any distinct minority, ethnic, elderly or handicapped groups and/or low-income households.

No-Build Alternative

The No-Build Alternative would not result in impacts to any concentrations of minority or low-income residents.

Preferred Alternative

The largest potential for environmental impacts to minority or low-income residents within the FHSR project area occurs in the Tampa CBD. The Preferred Alternative would result in three residential relocations in this area. It would result in no noise impacts, but would have vibration impacts to four residential sites within this area. However, when these impacts were compared to the overall impacts resulting from the Preferred Alternative to non-minority and minority populations, the Preferred Alternative would not result in any disproportionate adverse impacts to any distinct minority, ethnic, elderly or handicapped groups, or low income households.

4.1.7 Archaeological and Historic Resources

The cultural resource assessment survey for the FHSR study was undertaken to assist in complying with *National Environmental Policy Act* (NEPA) *of 1969* (Public Law 91-190); *Section 106 and 110* of the *National Historic Preservation Act* (NHPA) *of 1966* (Public Law 89-665, as amended), as implemented by *Title 36 Code of Federal Regulations (CFR) Part 800* (*Protection of Historic Properties*, revised January 2001); and Section 4(f) of the *Department of Transportation Act of 1966* (Public Law 89-670, as amended). This study was also conducted in accordance with Chapters 253, 267, and 872 of the *Florida Statutes*. A Cultural Resource Assessment Survey Report[7] (CRAS) (July 2003), is published separately. As part of the CRAS several viable alternatives were surveyed. Seven properties currently listed in the National Register of Historic Places (NRHP); nine properties previously determined NRHP-eligible; and five properties newly determined NRHP-eligible were identified as part of the CRAS. Data gathered from the CRAS report is included in Section 3.6.1 of this EIS. The CRAS Report was submitted by the FHSRA and FRA to the Florida State Historic Preservation Officer (SHPO), Federal Highway Administration (FHWA), and U.S. Army Corps of Engineers (USACE) for review. In a letter dated September 15, 2003, the SHPO concurred with the findings of the CRAS Report and identified two additional historic resources to be potentially eligible for listing in the NRHP (Appendix B). These additional properties are the St. Paul AME Church Parsonage (8HI6757) and the CSX Railroad Depot (8HI8739). They are described briefly below.

St. Paul AME Church Parsonage (8HI6757)/1103 N. Marion Street

The St. Paul AME Church Parsonage (8HI6757), currently located immediately north of the St. Paul AME Church, was constructed around 1925 in the Masonry Vernacular style. The building was moved in 1995 from its original site directly west of the church building, on Harrison Street. This red brick building is two stories in height and has a rectangular exterior plan. The hipped roof is covered with composition shingles and all window openings are covered with plywood. Additionally, the porch supports are currently wood posts. The St. Paul AME Church Parsonage was determined eligible for listing in the NRHP in September of 2003

under NRHP Criteria A in the area of Ethnic History. The building is considered to be significant at a local level based on its associations with the historical development of the African-American community in Tampa. This building is included with the St. Paul AME Church as a City of Tampa Landmark.

CSX Railroad Depot (8HI8739)/5300 Uceta Road

The CSX Railroad Depot (8HI8739) is located in the Uceta Railroad Yard. It was constructed circa 1950 in the International Style. This two-story masonry building has a flat roof, stucco finish and brick windowsills. Cantilevered ledges define the second floor and roof levels. A large brick chimney is located on the west side. The CSX Railroad Depot was determined eligible for listing in the NRHP in September of 2003 under NRHP Criteria A in the areas of Transportation and Commerce.

This section evaluates potential impacts that the proposed FHSR project may have on the NRHP-listed and eligible historic resources located within the FHSR Alternatives Area of Potential Effect (APE). There are no NRHP-listed or eligible archaeological sites associated with the FHSR Alternatives.

FHSRA established a Cultural Resource Committee (CRC) to assist in the evaluation of significant resources, potential effects, and methods for mitigation. The CRC consists of representatives from federal, state, and local agencies and citizen groups. These include FRA, FHWA, SHPO, USACE, City of Tampa, and other local interested parties. Three meetings were held in Tampa on December 6, 2002, February 14, 2003, and December 12, 2003. At the December 2002 meeting, the members were provided background information on the FHSR project and the Section 106 process. Preliminary alignments, as well as those carried forward for further study, were presented. Other topics included the proposed CRAS methodology and the APE. The February 2003 meeting included the Corridor Level Analysis Report results and a bus tour of the NRHP-listed and eligible resources located in downtown Tampa and Ybor City. The committee concurred with the information presented during these two meetings. In September 2003, the Draft Environmental Impact Study (DEIS) was mailed to all of the members of the CRC. At the third and last meeting, in December 2003, the results of the Section 106 consultation were presented and comments were requested. The CRC made the following formal statement at the meeting: "The CRC commended the study team and the FHSRA on designing a project and technology that results in no adverse impacts to historic resources."

The Tribal Historic Preservation Officers (THPOs) were sent letters in January 2003 inviting them to join the CRC and/or submit comments on the project. They were also included in the mailing list for review of the DEIS. No comments have been received from any of the THPOs.

Archeological Resources

Two archaeological sites are recorded as NRHP-eligible within the alignments in Corridors A and B. The first, the Columbus Drive Site (8HI83), was recorded as per "general vicinity." Thus, the exact site location is unknown. As plotted in the Florida Master Site File[8], the site is proximate to I-4 within a severely altered and developed area of Tampa. Based on field reconnaissance, this site

appears to have been destroyed by urban development. Similarly, the Diamond Dairy Site (8HI476), originally recorded within the proposed ROW of I-75, was previously subjected to Phase III mitigative excavation, and subsequently destroyed by construction of the interstate. Thus, neither 8HI83 nor 8HI476 are still extant within the FHSR project APE.

Design/Build Alternatives 1 Through 8

None of the proposed Design/Build Alternatives 1 through 8 have any involvement with NRHP-listed, eligible, or potentially eligible archaeological sites. Therefore, the proposed FHSR project would have no effect on any significant archaeological resources.

Historic Resources

Twenty-two NRHP-listed, eligible, or potentially eligible historic resources were identified along Alignments A1 and A2, located in downtown Tampa and Ybor City. These historic resources are described in further detail in Section 3.6.1 and earlier in this section. As mentioned in Section 3.6.1, the previously recorded Tampa Heights Historic District was found to be outside of the FHSR project APE and is not discussed in this section.

There are no NRHP-listed, eligible, or potentially eligible historic resources within Alignments B1, B2, C1, D1, E1, or E2.

Potential impacts to the historic resources for each alternative are described as follows. Site and map sheet numbers, identified in the tables, correspond to the FHSR concept plans included in Appendix A. These concept plans show the proximity of each significant historic resource to the proposed FHSR Design/Build alternatives.

Design/Build Alternatives 1, 2, 5, and 6

Design/Build Alternatives 1, 2, 5, and 6 use Alignment A1; therefore, the impacts to historic resources would be the same for each of these alternatives. Potential effects for each of the 12 significant historic resources associated with these alternatives are shown in Table 4-5 and discussed in the following paragraphs. In summary, based on the project information available, these alternatives would have no effect on seven historic resources and a conditional no adverse effect on five historic resources. These impacts were evaluated as part of the Section 106 process. There is a direct taking of two contributing historic resources within the Ybor City National Historic Landmark District (NHLD), which would result in an adverse effect; however, these buildings have already been included in a MOA for the TIS project, as described in further detail in the following paragraphs, therefore resulting in a conditional no adverse effect. The other impacts are primarily visual and possible vibration occurring during construction.

There would be no effect to seven NRHP-listed or eligible historic resources within these alternatives, as noted in Table 4-5. This preliminary evaluation of effects is primarily based on the proximity of the significant resources to the proposed alternatives. These resources would

Table 4-5
Potential Impacts to Historic Resources along Alternatives 1, 2, 5, and 6

Alignment	Site No./ Map Sheet No.	FMSF No.	Site Name	Address	City	NRHP Or NHL Status	Potential Impacts
A1	1/1	8HI8536	North Franklin Street Historic District	North Franklin Street, between E. Harrison and E. Fortune Streets	Tampa	NRHP-Listed	Visual (Tampa Station)
A1	7a/1	8HI155	St. Paul AME Church	506 E. Harrison Street	Tampa	NRHP-Eligible, City of Tampa Landmark	None
A1	7b/1	8HI6757	St. Paul AME Church Parsonage	1103 N. Marion Street	Tampa	NRHP-Eligible, City of Tampa Landmark	Visual (Tampa Station)
A1	8/1	8HI5595	Oaklawn Cemetery	606 E. Harrison Street	Tampa	NRHP-Eligible	Visual; Construction Vibration
A1	9/1	8HI3282	Greater Bethel Baptist Church	1206 N. Jefferson Street	Tampa	NRHP-Eligible	None
A1	11/2 & 186	8HI8574	St. James Episcopal Church	1001 India Street/1202 N. Governor Street	Tampa	Potentially NRHP-Eligible	None
A1	12/2	8HI3688, 8HI8575	Allen Temple AME Church and Parsonage	1112-1116 E. Scott Street (Located within Central Park Village	Tampa	Potentially NRHP-Eligible	None
A1	13/2	8HI3659	St. Peter Claver Catholic School	1401 N. Governor Street	Tampa	Potentially NRHP-Eligible	None
A1	17/3	8HI313	Ybor City NHLD	Approximate NHLD Boundaries: 21st Ave., 25th and 26th St., Adamo Dr. and 2nd Ave., Nebraska Ave.	Tampa	NHL, Locally Listed Historic District (different boundaries)	Direct taking of two contributing buildings: 8HI4174/916 E. 12th Avenue, and the rear building at 8HI4178/1006 E. 12th Avenue; Visual; Construction Vibration
A1	18/3	8HI142	German American Club	2105 N. Nebraska Avenue	Tampa	NRHP-Eligible, Contributing Resource within the Ybor City NHLD	Visual; Construction Vibration

Table 4-5
Potential Impacts to Historic Resources along Alternatives 1, 2, 5, and 6

Alignment	Site No./ Map Sheet No.	FMSF No.	Site Name	Address	City	NRHP Or NHL Status	Potential Impacts
A1	19/3	8HI835	Centro Asturiano	1913 N. Nebraska Avenue	Tampa	NRHP-Listed, Contributing Resource within the Ybor City NHLD	None
A1	20/6	8HI4415	I-Type House	2210 N. 31st Street	Tampa	NRHP-Eligible	None

not be directly impacted by ROW acquisitions associated with Design/Build Alternatives 1, 2, 5, and 6. There would be no secondary impacts, such as visual, noise, access, or use impacts to these resources due to their distance from the proposed design/build alternatives. Additionally, in most cases, these historic resources face away from the alternatives, further minimizing the likelihood of visual impacts. The proposed FHSR improvements would be constructed directly adjacent to the present I-4 facility and therefore would be consistent with the existing environment.

There may be potential secondary impacts (noise and visual) to the German American Club, which were evaluated due to the close proximity of this resource to the proposed improvements. This building is currently located directly adjacent to the I-4/I-275 Interchange and its setting has already been compromised; therefore, it was determined that the noise levels and visual impacts would not change significantly due to the construction of the FHSR improvements. The improvements would not require any ROW acquisition from the historic resource. Any potential damaging vibrations that could occur during construction activities would be evaluated and minimized at this location in order to avoid impacts to the historic building.

There may also be potential secondary noise impacts to the Greater Bethel Baptist Church, the St. Paul AME Church, and the St. Paul AME Church Parsonage. It was determined that the noise levels would not increase at these three resources with either the electric or gas turbine engines; therefore, there would be no noise impacts to these resources. The Oaklawn Cemetery is located immediately south of the alignment for Design/Build Alternatives 1, 2, 5, and 6, and about one block east of the proposed Tampa Station location. At this location, the alignment would be north of Laurel Street and elevated on piers and mechanically stabilized earth (MSE) walls approximately 38 to 40 ft. above grade. The FHSR's speed would be greatly reduced. The proposed FHSR improvements would not require any ROW acquisition from the historic cemetery but they would introduce new visual elements within close proximity to the cemetery. Consequently, it appears there may be potential visual impacts to the Oaklawn Cemetery. Any changes in noise would not affect the use of the cemetery, so it does not appear that there would be noise impacts at this location. Any potential damaging vibrations that could occur during

construction activities would be minimized at this location in order to avoid impacts to the historic cemetery wall and markers.

Potential visual impacts to the North Franklin Street Historic District and the St. Paul AME Church Parsonage, resulting from the construction of the proposed Tampa Station, will be minimized or avoided by coordinating with the SHPO during the design phase.

The Ybor City NHLD is located north and south of I-4, between Nebraska Avenue and 26th Street. Improvements related to Design/Build Alternatives 1, 2, 5 and 6 would require the direct use of only two contributing resources located within the Ybor City NHLD: 916 E. 12th Avenue and the rear dwelling unit at 1006 E. 12th Avenue (the main house will remain in place). Because the two contributing properties would be impacted by ROW acquisitions, the Ybor City NHLD would be adversely affected by FHSR improvements proposed for Alternative 1, 2, 5, and 6. However, these two resources were previously identified as being acquired by the TIS project since they are located within the TIS Ultimate ROW. A MOA was prepared at that time to mitigate adverse effects to the Ybor City NHLD and fulfill the Section 4(f) requirements. If a decision is made to proceed with construction of the FHSR, it would likely occur prior to acquisition of these two resources for the I-4 improvements. The MOA is included as an appendix to the Tampa Interstate Study Final Environmental Impact Statement and Section 4(f) Evaluation[9] (1996) and consists of specific commitments and stipulations, including the documentation, relocation, and rehabilitation of historic structures, plus architectural/historical salvage for structures not relocated and rehabilitated. Therefore, the FHSR project will comply with the requirements of the existing TIS MOA. In addition, due to the proximity of contributing resources within the Ybor City NHLD boundaries located on the south side of I-4 to the proposed FHSR improvements, potential secondary visual and noise impacts were evaluated. Measured ambient (existing) noise level for the first row of houses in this area was 69 decibels (dBA). The predicted noise level for these same houses was also 69 dBA for both electric and gas turbine engines; therefore, there would be no noise impact. For potential visual impacts, it is important to note that their current settings have already been substantially compromised by the presence of the I-4 facility. Consequently, the addition of the FHSR improvements would not qualitatively change their present settings or views to and from the buildings. The character and appearance of E. 12th Avenue's streetscape will remain much the same following the construction of the FHSR improvements. Contributing resources to the Ybor City NHLD north of I-4 would not be affected by the FHSR project because Design/Build Alternatives 1, 2, 5, and 6 are located either within the I-4 median or south of I-4 within the Ybor City NHLD. In addition, noise walls are being constructed along the north side of I-4 as part of the TIS project, which will also serve to avoid potential impacts of the FHSR to the portion of the Ybor City NHLD located north of I-4.

Design/Build Alternatives 1, 2, 5, and 6 are located along the south side of I-4 directly adjacent to the north (side) elevation of the contributing Gonzalez, Fisher and Company Cigar Factory (U-Haul Building) at 2311 N. 18th Street. Due to the close proximity of the FHSR improvements at this location, visual and noise impacts were evaluated, but Design/Build Alternatives 1, 2, 5, and 6 are not expected to cause visual and noise impacts to this contributing resource, since it is used for storage and all of its windows have been enclosed with brick.

Design/Build Alternatives 3, 4, 7, and 8

Design/Build Alternatives 3, 4, 7, and 8 use Alignment A2; therefore, the impacts to historic resources would be the same for each of these alternatives. Potential effects for each of the 16 significant historic resources associated with these alternatives are shown in Table 4-6 and discussed in the following paragraphs. In summary, based on the project information available, it appears that these alternatives would have no effect on seven historic resources, but may have an effect on nine other historic resources, including the Ybor City NHLD. These potential adverse and no adverse effects are primarily due to potential visual and noise impacts but were not evaluated in detail since none of these alternatives was selected as the Preferred Alternative.

Table 4-6
Potential Impacts to Historic Resources along Alternatives 3, 4, 7, and 8

Alignment	Site No./ Map Sheet No.	FMSF No.	Site Name	Address	City	NRHP Or NHL Status	Potential Impacts
A2	1/1	8HI8536	North Franklin Street Historic District	North Franklin Street, between E. Harrison and E. Fortune Streets	Tampa	NRHP-Listed	Visual (Tampa Station)
A2	2/186	8HI8744	First United Methodist Church's Thomas Henderson Memorial Chapel	1001 N. Florida Avenue	Tampa	Potentially NRHP-Eligible	None
A2	3/186	8HI741	Floridian Hotel	905 N. Florida Avenue	Tampa	NRHP-Listed, City of Tampa Landmark	Visual
A2	4/	8HI753	J.J. Newberry Building	815-819 N. Franklin Street	Tampa	NRHP-Eligible	None
A2	5/	8HI752	Kress Building	811 N. Franklin Street	Tampa	NRHP-Listed	None
A2	6/	8HI751	Woolworth Building	801 N. Franklin Street	Tampa	NRHP-Eligible	None
A2	7a/1 & 186	8HI155	St. Paul AME Church	506 E. Harrison Street	Tampa	NRHP-Eligible, City of Tampa Landmark	Visual; Noise; Use of Parking; Construction Vibration

Table 4-6
Potential Impacts to Historic Resources along Alternatives 3, 4, 7, and 8

Alignment	Site No./ Map Sheet No.	FMSF No.	Site Name	Address	City	NRHP Or NHL Status	Potential Impacts
A2	7b/1 & 186	8HI6757	St. Paul AME Church Parsonage	1103 N. Marion Street	Tampa	NRHP-Eligible, City of Tampa Landmark	Direct Taking
A2	8/1 & 186	8HI5595	Oaklawn Cemetery	606 E. Harrison Street	Tampa	NRHP-Eligible	Visual; Construction Vibration
A2	9/1 & 186	8HI3282	Greater Bethel Baptist Church	1206 N. Jefferson Street	Tampa	NRHP-Eligible	None
A2	10/186	8HI124	Fire Station No. 1/ Tampa Firefighters Museum	720 E. Zack Street	Tampa	NRHP-Eligible, City of Tampa Landmark	None
A2	14/186	8HI906	Jackson Hotel	851 E. Zack Street	Tampa	NRHP-Eligible	Visual; Noise; Construction Vibration
A2	15/186	8HI6939	Union Depot Hotel	858-864 E. Zack Street	Tampa	NRHP-Listed, City of Tampa Landmark	Visual; Noise; Construction Vibration
A2	16/186	8HI298	Tampa Union Station	601 N. Nebraska Avenue	Tampa	NRHP-Listed, City of Tampa Landmark	Visual; Noise; Construction Vibration
A2	17/188	8HI313	Ybor City NHLD	Approximate NHLD Boundaries: 21st Ave., 25th and 26th St., Adamo Dr. and 2nd Ave., Nebraska Ave.	Tampa	NHL, Locally Listed Historic District (different boundaries)	Visual; Noise
B2	21/?	8HI8739	CSX Railroad Depot	5300 Uceta Road	Tampa	NRHP-eligible	Visual; Noise; Construction Vibration

As noted in Table 4-6, there would be no effect to seven NRHP-listed or eligible historic resources within these alternatives. This preliminary evaluation of effects is based primarily on the proximity of the significant resources to the proposed alternatives. These resources would not be directly impacted by ROW acquisitions associated with Design/Build Alternatives 3, 4, 7, and 8. It also appears there would be no secondary impacts, such as visual, noise, access, or use

impacts, to these resources. As previously noted, these resources are some distance from the proposed alternatives, which reduces the probability of secondary impacts. In addition, in most cases, these historic resources face away from the alternatives, thereby further minimizing the likelihood of visual impacts.

Due to the 18-story height of the Floridan Hotel, there may be potential secondary visual impacts to this resource, as construction of the FHSR improvements would introduce new visual elements within its sightline. The improvements would not require any ROW acquisition from the historic resource, and they would be located several blocks from the building.

Design/Build Alternatives 3, 4, 7, and 8 would be located directly adjacent to the north and east sides of the St. Paul AME Church and would require a direct taking of the St. Paul AME Church Parsonage. The proposed FHSR improvements would require ROW acquisition from the church property, including the relocated Parsonage building and the church parking lot, but not the historic church building. The taking of land from the parking lot could affect the property's use. These alternatives would also introduce new visual elements within close proximity to the church; therefore, it appears there could be potential visual, noise, and use impacts to the St. Paul AME Church and direct impacts to the Parsonage, which will be evaluated further if any of these alternatives are selected. Any potential damaging vibrations that could occur during construction activities would be minimized at this location in order to avoid impacts to the historic church building. Design/Build Alternatives 3, 4, 7, and 8 would be located west of Morgan Street, southwest of the southwest corner of the Oaklawn Cemetery. The proposed FHSR improvements would not require any ROW acquisition from the historic cemetery, but would introduce new visual elements within close proximity to the cemetery. Consequently, it appears there may be potential visual impacts to the Oaklawn Cemetery. Any changes in noise would not affect the use of the cemetery, so it does not appear that there would be noise impacts at this location. Any potential damaging vibrations that could occur during construction activities would be minimized at this location, in order to avoid impacts to the historic cemetery wall and markers.

The Jackson Hotel and Union Depot Hotel are situated within close proximity to Design/Build Alternatives 3, 4, 7, and 8, which pass directly north of these buildings. The proposed FHSR improvements would not require any ROW acquisition from the two historic properties. In addition, existing CSX railroad tracks are located in the same area as the proposed FHSR tracks. The addition of elevated FHSR tracks, however, would introduce new visual elements to the buildings' immediate surroundings. Therefore, it appears there may be potential visual impacts to the Jackson Hotel and Union Depot Hotel, as well as potential noise impacts. Any potential damaging vibrations that could occur during construction activities would be minimized at these locations, in order to avoid impacts to the historic buildings.

Design/Build Alternatives 3, 4, 7 and 8 would also pass directly north of the Tampa Union Station. The proposed FHSR improvements would require a small amount of ROW from the NRHP-listed boundaries and not from the historic structure itself. The proposed FHSR tracks would be located between the existing CSX railroad tracks and the historic Tampa Union Station. The addition of elevated FHSR tracks would also introduce new visual elements to the

building's immediate surroundings. Therefore, it appears there may be potential visual impacts to the Tampa Union Station, as well as potential noise impacts. Any potential damaging vibrations that could occur during construction activities would be minimized at these locations in order to avoid impacts to the historic building.

Design/Build Alternatives 3, 4, 7, and 8 would be located immediately south of the southernmost boundary of the Ybor City NHLD near Adamo Drive. The portion of the NHLD that is closest to these alternatives is primarily industrial in character with some residential use between 22nd and 24th Streets. This may result in potential secondary visual and noise impacts, primarily for the residences. The impacts, however, should be minimal to the industrial buildings due to their use.

Design/Build Alternatives 3, 4, 7, and 8 would be located within the existing railroad corridor, which passes northeast of the CSX Railroad Depot in the Uceta Railroad Yard, but does not require any ROW from the building's NRHP-eligible boundaries. Therefore, it appears there may be potential visual impacts to the depot, as well as potential noise impacts. Any potential damaging vibrations that could occur during construction activities would be minimized at this location in order to avoid impacts to the historic building.

No-Build Alternative

Under the No-Build Alternative, roadway congestion would increase and resulting roadway improvements would likely impact cultural resources. The two contributing historic structures within the Ybor City NHLD, identified for acquisition within the FHSR Design/Build Alternatives 1, 2, 5, and 6, are also identified to be acquired for future improvements to I-4 under the TIS. If construction of FHSR occurs, acquisition of these two structures would likely occur sooner, but would also be acquired by FDOT under the FHSR No-Build Alternative, if FDOT's improvements to I-4 proceed as planned.

Preferred Alternative

A Section 106 Consultation Case Report[10] for the Preferred Alternative (described in the report as the Proposed Action) was prepared in December 2003 for coordination with the SHPO. A Section 106 consultation meeting was held on December 10, 2003, with representatives from PBS&J, Archaeological Consultants, Inc., Janus Research, and the SHPO. Based on the project information available and consultation with the SHPO, it was agreed at that meeting that the FHSR Preferred Alternative would have no effect on seven historic resources and a conditional no adverse effect on five historic resources. The specific conditions are commitments agreed to by the FHSRA, FRA, and SHPO and will be incorporated into future design, build, operate, maintain and finance contracts in a manner that will be binding to the vendor. The final Section 106 Consultation Case Report was submitted to the SHPO on behalf of FRA on December 24, 2003. A response letter from the SHPO, dated January 5, 2004, concurred with the findings of the report (Appendix B) and agreed to the stipulated conditions for the "conditional no adverse effect" determination. The Section 106 Consultation Case Report was then forwarded to the Advisory Council on Historic Preservation (ACHP) and the National Park

Service (NPS) Atlanta Regional office on February 20, 2004, for their reference and opportunity to comment. No comments have been received from the ACHP or the NPS.

The commitments agreed upon by the FHSRA, FRA, and SHPO are as follows:

1. Provide the FHSR design plans (for the Tampa CBD and Ybor City areas) to the SHPO for review and comment at 30 percent, 60 percent, and 90 percent submittal.

2. Coordinate the design of the Tampa Station with the SHPO to ensure that historic integrity is maintained at the nearby North Franklin Street Historic District and the St. Paul AME Church Parsonage.

3. Implement vibration monitoring during construction adjacent to the Oaklawn Cemetery, German American Club, and within the Ybor City NHLD to determine if damage is likely to occur according to damage criteria described in FRA's guidance manual, *High Speed Ground Transportation Noise and Vibration Impact Assessment*, Chapter 10. If vibration levels approaching the damage criteria are found to occur during construction, immediate coordination with the SHPO will be conducted to determine the use of less destructive methods and/or minimization methods for continuing the construction.

4. The stipulations of the TIS MOA will be fulfilled for any impacts to contributing historic structures within the Ybor City NHLD and the TIS Ultimate ROW.

5. Aesthetic treatment for the FHSR will be compatible with the existing Urban Design Guidelines set up for the TIS within the Tampa CBD and Ybor City areas. At minimum, the color of the concrete should be compatible with the TIS concrete color. The SHPO, City of Tampa, and local community groups, will be included in the development of the FHSR aesthetics.

Based on the Section 106 Consultation Case Report, there will be no effect to seven NRHP-listed or NRHP-eligible historic resources due to the Preferred Alternative, as noted in Table 4-7. These resources include the St. Paul AME Church, Greater Bethel Baptist Church, St. James Episcopal Church, Allen Temple AME Church and Parsonage, St. Peter Claver Catholic School, Centro Asturiano, and I-Type House. This effects analysis is primarily based on the proximity of the significant resources to the Preferred Alternative. These resources would not be directly impacted by ROW acquisitions associated with the Preferred Alternative. There would be no secondary effects, such as visual, noise, access, or use impacts to these resources due to their distance from the Preferred Alternative.

Table 4-7

Effects Analysis for Historic Resources Associated with the FHSR Preferred Alternative

FMSF No.	Site No. / Map Sheet No.	Site Name/Address	NRHP Status	Effects Analysis
8HI8536	1/1	North Franklin Street Historic District/ North Franklin Street, between E. Harrison and E. Fortune Streets	NRHP-Listed	Conditional No Adverse Effect
8HI155	7A/1	St. Paul AME Church/506 E. Harrison Street	NRHP-Eligible, City of Tampa Landmark	No Effect
8HI6757	7B/1	St. Paul AME Church Parsonage /1103 N. Marion Street	NRHP-Eligible, City of Tampa Landmark	Conditional No Adverse Effect
8HI5595	8/1	Oaklawn Cemetery/606 E. Harrison Street	NRHP-Eligible	Conditional No Adverse Effect
8HI3282	9/1	Greater Bethel Baptist Church/1206 N. Jefferson Street	NRHP-Eligible	No Effect
8HI8574	11/2	St. James Episcopal Church/1001 India Street/1202 N. Governor Street	NRHP-Eligible	No Effect
8HI3688, 8HI8575	12/2	Allen Temple AME Church and Parsonage/1112-1116 E. Scott Street	NRHP-Eligible	No Effect
8HI3659	13/2	St. Peter Claver Catholic School/1401 N. Governor Street	NRHP-Eligible	No Effect
8HI835	19/3	Centro Asturiano/1913 N. Nebraska Avenue	NRHP-Listed, Contributing Resource within the Ybor City NHLD	No Effect
8HI142	18/3	German American Club/2105 N. Nebraska Avenue	NRHP-Eligible, Contributing Resource within the Ybor City NHLD	Conditional No Adverse Effect
8HI313	17/3	Ybor City NHLD/Approximate NHLD Boundaries: 21st Avenue, 25th and 26th Street, Adamo Drive and 2nd Avenue, Nebraska Avenue	NHL, Locally Listed Historic District (different boundaries)	Conditional No Adverse Effect
8HI4415	20/6	I-Type House/2210 N. 31st Street	NRHP-Eligible	No Effect

Additionally, in most cases, these historic resources face away from the alignment, further minimizing the likelihood of visual or aesthetic effects. Therefore, the FHSR Preferred Alternative would not alter the characteristics of a historic property qualifying it for inclusion in or eligibility for the NRHP.

As part of the evaluation of effects, further noise analysis for secondary noise effects was conducted for three resources, St. Paul AME Church, St. Paul AME Church Parsonage, and Greater Bethel Baptist Church, because potential secondary noise effects were noted during the preliminary effects evaluation phase in the DEIS. The existing noise conditions for the above mentioned historic resources are the equivalent of 68 dBA, 66 dBA, and 66 dBA respectively per hourly Leq. The hourly Leq is the noise level for a specific one-hour period. It can be considered as the average sound level in dBAs that occurs in a specific hourly period. The future noise conditions for both the gas turbine train technology and electric train technology will not increase at the three historic resources. The three historic resources are too far away from the Preferred Alternative to generate a notable change in noise levels; therefore, there will be no secondary noise effects to these resources. As mentioned previously, there will not be any other primary or secondary effects to these three resources due to their proximity to the Preferred Alternative.

The Preferred Alternative will have no adverse effect, contingent upon certain conditions, on five historic resources. Three of these, the Oaklawn Cemetery, German American Club, and Ybor City NHLD, will have no adverse effect based on the condition that any potential damaging vibrations that could occur during construction activities will be minimized, as described in the conditions listed earlier in this section. For these three resources, vibration monitoring will be implemented during construction to insure that no damage is caused to the historic resources. A more detailed discussion of effects for each of these three properties is provided below. Two other historic resources, the North Franklin Street Historic District and the St. Paul AME Church Parsonage are located near the proposed Tampa Station location, which was included in the FHSR APE. The actual size and configuration of the station is not known at this time. The proposed station, however, will have no adverse effect of these historic properties based on continued coordination with the SHPO during design of the proposed Tampa Station to ensure that historic integrity in maintained, as described in the conditions listed earlier in this section.

The Criteria of Effect has been applied to the Oaklawn Cemetery, the German American Club, and the Ybor City NHLD, as described in further detail in the following paragraphs.

The Oaklawn Cemetery is located immediately south of the FHSR Preferred Alternative and about one block east of the proposed Tampa Station location. At this location, the alignment would be north of Laurel Street and elevated on piers and MSE walls approximately 38 to 40 ft. above grade. The FHSR's speed would be greatly reduced. The proposed FHSR improvements would not require any ROW acquisition from the historic cemetery nor will it affect access to the property. Although the proposed FHSR improvements would introduce new visual elements within close proximity to the cemetery, it would not be significantly impacted. The FHSR Preferred Alternative is located immediately adjacent to the existing I-275 facilities at this location, which already has altered the properties' historic setting. In addition, the cemetery's

current setting is urban and the surrounding environment includes parking lots and modern buildings such as the former Hillsborough County Jail and the Marion Transit Center. The cemetery also contains numerous mature trees, particularly oak trees, which obscure most views of the FHSR structure from within the cemetery boundaries. The modern Morgan Street Jail will be demolished to make way for the proposed FHSR facility. Any change in noise will not affect the use of the cemetery, so there will not be noise impacts at this location. The potential vibration impacts that could occur during construction activities will be minimized based on the conditions described earlier. In summary, the construction of the FHSR improvements will not alter the use, visual and aesthetic qualities, and other characteristics that qualify the cemetery for inclusion in the NRHP, based on the condition to monitor vibration during construction.

The German American Club is currently located about one-half block south of the I-4/I-275 Interchange on the east side of Nebraska Avenue. The FHSR Preferred Alternative would be constructed contiguous to the I-4/I-275 structure, which is currently being improved and expanded. The FHSR Preferred Alternative, located immediately north of 12th Avenue, would be supported on piers at Nebraska Avenue and on MSE retaining walls east and west of Nebraska Avenue. It would be 32 ft. in height, which is actually lower than the I-4 ramp currently being constructed. The Preferred Alternative would not require any ROW acquisition from the German American Club nor will it affect access to this property which is currently accessed from the south and west sides. The building's setting has already been substantially compromised by the presence of the I-4/I-275 structure. The construction of the lower FHSR facility immediately next to the existing structure would not further compromise the quality of the German American Club's setting or the views to and from the building. The existing noise condition for the historic resource is the equivalent of 74 dBA per hourly Leq. The future noise condition will not increase with the gas turbine train technology and will increase by just 1 dBA with the electric train technology. In comparison to the existing noise conditions, both proposed train technologies will not create a noticeable noise increase. Any changes in noise will not affect the use of the building, so there will not be noise impacts at this location. The potential vibration impacts that could occur during construction activities will be minimized based on the conditions described earlier. In summary, the construction of the FHSR Preferred Alternative will not alter the use, visual and aesthetic qualities, and other characteristics that qualify the German American Club for inclusion in the NRHP, based on the condition to monitor vibration during construction.

The Ybor City NHLD is located north and south of I-4, between Nebraska Avenue and 26th Street. The Preferred Alternative would require the direct use of only two contributing resources located within the Ybor City NHLD: 916 E. 12th Avenue and the rear dwelling unit at 1006 E. 12th Avenue (the main house will remain in place). These two resources were previously identified as being acquired by the TIS project since they are located within the TIS Ultimate ROW. A MOA was prepared at that time to mitigate adverse effects to the Ybor City NHLD and fulfill the Section 4(f) requirements. If a decision is made to proceed with construction of the FHSR, it would likely occur prior to acquisition of these two resources for the I-4 improvements. The MOA is included as an appendix to the Tampa Interstate Study Final Environmental Impact Statement and Section 4(f) Evaluation (1996) and consists of specific commitments and stipulations, including the documentation, relocation, and rehabilitation of historic structures,

plus architectural/historical salvage for structures not relocated and rehabilitated. The two properties, 916 E. 12th Avenue and the rear dwelling unit at 1006 E. 12th Avenue, are subject to the mitigation agreed upon as part of the TIS MOA, and the mitigation will be executed prior to any construction. Therefore, the FHSR Preferred Alternative will comply with the requirements of the existing TIS MOA. Some ROW will be required from the rear of three other contributing resources as part of the improvements, but the historic houses fronting the street should remain in place. These resources include 920 and 921 E. 12th Avenue, which are located on one parcel, and 1004 E. 12th Avenue on another parcel. Due to the minor amount of land needed for the FHSR ROW, this will not prevent the houses from continuing to be used as residences. They will also remain as contributing historic resources in the Ybor City NHLD and the local streetscape. In addition, due to the proximity of contributing resources within the Ybor City NHLD boundaries located on the south side of I-4 to the FHSR Preferred Alternative, potential secondary visual and noise impacts were evaluated. Measured ambient (existing) noise level for the first row of houses in this area was 69 dBA. The predicted noise level for these same houses was also 69 dBA for both electric and gas turbine engines; therefore, there would be no noise impact. For potential visual impacts, it is important to note that their current settings have already been substantially compromised by the presence of the I-4 facility. Consequently, the addition of the FHSR would not qualitatively change their present settings or views to and from the buildings. The character and appearance of E. 12th Avenue's streetscape will remain much the same following the construction of the Preferred Alternative. Potential vibration impacts that could occur during construction activities will be minimized based on the conditions described earlier.

Contributing resources to the Ybor City NHLD north of I-4 would not be affected by the Preferred Alternative because it is located either within the I-4 median or south of I-4 within the Ybor City NHLD. In addition, noise walls are being constructed along the north side of I-4 as part of the TIS project, which will also serve to avoid potential impacts of the FHSR to the portion of the Ybor City NHLD located north of I-4.

The FHSR Preferred Alternative is located along the south side of I-4 directly adjacent to the north (side) elevation of the contributing Gonzalez, Fisher and Company Cigar Factory (U-Haul Building) at 2311 N. 18th Street. Due to the close proximity of the Preferred Alternative at this location, visual and noise impacts were evaluated but would not affect this contributing resource, since it is used for storage and all of its windows have been enclosed with brick.

In summary, the construction of the FHSR Preferred Alternative will not alter the use, visual and aesthetic qualities, and other characteristics that qualify the Ybor City NHLD for inclusion in the NRHP, based on the condition to monitor vibration during construction.

4.1.8 Recreational/Parkland

A Proximity Effects Analysis was conducted for the five parks and recreational facilities (Perry Harvey Sr. Park, Nuccio Parkway Linear Park, Williams/Tanner Road Park, Evans Park, and Shingle Creek Greenway) located adjacent to or in the vicinity of the FHSR Design/Build Alternatives 1 through 8 (Figure 2-8). The analysis addressed projected noise-level increases,

impairment of aesthetic features or attributes, restriction on access to the facilities, vibration impacts, and ecological intrusion at each park based on field observations and analysis using the preliminary design plans. Only one park, Perry Harvey Sr. Park, would be directly affected by project ROW acquisition associated with Alignment A1, Design/Build Alternatives 1, 2, 5, and 6. A Section 4(f) Evaluation for the Perry Harvey Sr. Park is found in Section 5 of this report. None of the alternatives would require ROW acquisition from the other four parks.

Each of these parks is discussed in detail in the following paragraphs.

Perry Harvey Sr. Park

Perry Harvey Sr. Park, approximately 9.2 acres (ac.) in size, is located at 1201 N. Orange Street in the vicinity of Alignments A1 and A2, Design/Build Alternatives 1 through 8. The park is officially designated as a neighborhood park in the City of Tampa Comprehensive Plan. The park contains a variety of active recreational facilities. These include a covered picnic area, tennis courts, basketball courts, playground equipment/sand lot, exercise/jogging path, and a unique "skatebowl" area. There are also restrooms and a wooden deck. Primary access and parking (50 spaces) for Perry Harvey Sr. Park are located at Cass Street and Central Avenue, which would be maintained. Additional access with limited parking is available at Kay Street near the tennis courts (Appendix A, Sheets 2 and 186).

Design/Build Alternatives 1, 2, 5, and 6 would require the acquisition of 0.184 ac. of Perry Harvey Sr. Park; however, the acquisition would not affect park facilities. The Section 4(F) Evaluation of Perry Harvey Sr. Park is included in Section 5 with the park boundaries and proposed acquisition illustrated in Figure 5-1. Design/Build Alternatives 3, 4, 7, and 8 avoid direct impact to Perry Harvey Sr. Park (Section 5.1, Figure 5-3).

Ambient noise monitoring was performed on January 20, 2003. Because the park is located between the I-275 and the CSX corridor, ambient readings were taken at two locations (the northern portion of park nearest to the interstate and the southern portion of the park closest to the CSX corridor). For the area nearest I-275, ambient noise levels were determined to be 77 dBA (decibels [A-weighting]). For the build scenario, Alignment A1 (Design/Build Alternatives 1, 2, 5, and 6) is predicted to have a 77 dBA noise level for Design/Build Alternatives 1 and 2 (gas turbine train) and a 78 dBA noise level for Design/Build Alternatives 5 and 6 (electric train). The high existing ambient noise level in this area, compared to the proposed project noise level, suggests a minimal noise impact to the park. Further discussion of this topic is included in Section 4.2.3 and Section 5.1 of this report. For the area nearest the CSX corridor, ambient noise levels were determined to be 53 dBA. For the build scenario, Alignment A2 (Design/Build Alternatives 3, 4, 7, and 8) is predicted to have a 54 dBA noise level for Design/Build Alternatives 3 and 4 (gas turbine train) and a 55 dBA noise level for Design/Build Alternatives 7 and 8 (electric train), which would result in a 1 and 2 dBA increase, respectively, for the area. Decibel increases below 3 dBA are not perceptible to the average human ear.

The City of Tampa has indicated that park usage ranges from 100 to 150 persons per day. The proposed project would not cause an aesthetic problem for the park users because an existing

transportation corridor is already in place. There are no vibration-sensitive structures associated with the park and no natural connections to any wildlife habitats or wildlife or waterfowl refuges. In a letter dated March 27, 2003 (see Appendix B), the City of Tampa stated the Perry Harvey Sr. Park is considered a significant park. See Figure 3-13 for the location of this park.

Nuccio Parkway Linear Park

Measuring 9.1 ac., Nuccio Parkway Linear Park is officially designated as a neighborhood park in the City of Tampa Comprehensive Plan. The park is located in Tampa on Nuccio Parkway between Nebraska and Palm Avenues. The park is approximately 0.71 mi. in length and lies within the vicinity of Alignment A2, Design/Build Alternatives 3, 4, 7, and 8. From the information gathered to date, the park consists of the green space within the median and either side of Nuccio Parkway between Nebraska and Palm Avenues. The northwest shoulder is a pedestrian walkway with a sidewalk and a landscaped utility strip from Nebraska Avenue to East 7th Street, approximately 0.58 mi. long. There are plans to use the southeast shoulder for an off-road greenway between Nuccio Parkway and the railroad tracks from Nebraska Avenue to the Ybor City Turnaround, which is approximately 0.43 mi. long. Currently, the park is used as a visual parkway as you can travel Nuccio Parkway from downtown Tampa to the Ybor City entertainment district (Appendix A, Sheet 187).

Ambient noise monitoring was performed on January 22, 2003. For this area, ambient noise levels were determined to be 65 dBA. For the build scenario, the area is predicted to have a 66 dBA noise level for Alignment A2, Design/Build Alternatives 3, 4, 7, and 8, which results in a 1 dBA increase for the area. Again, decibel increases below 3 dBA are not perceptible to the average human ear. Predicted noise levels were not considered for Alignment A1, Design/Build Alternatives 1, 2, 5, and 6 due to the long distance between the northern portion of the park and the interstate (approximately 1000 ft.). There are no anticipated noise increases from Design/Build Alternatives 1, 2, 5, and 6 in this area. Usage figures are not available. The proposed project would not cause an aesthetic impact for the park users because an existing transportation corridor is already in place. There are no vibration-sensitive structures associated with the park and there are no natural connections to any wildlife habitats or wildlife or waterfowl refuges. In summary, the proposed project would not substantially impair or diminish the park's activities, features, or attributes. In a letter dated March 27, 2003 (see Appendix B), the City of Tampa stated it is not considered a significant park.

Williams/Tanner Road Park

Williams/Tanner Road Park, approximately 32.7 ac. in size, is located at 10611 Tanner Road in the vicinity of Alignment B2, Design/Build Alternatives 3, 4, 7, and 8 and is owned and operated by Hillsborough County. The park is bordered by Tanner Road to the north; vacant lands and Williams Road to the east, vacant lands to the south, and I-75 to the west. The park is classified as a local park and is currently undeveloped. There is a lake on the property which was a former borrow pit. Parking facilities are not provided (Appendix A, Sheet 203).

I-75 is approximately 270 ft. from the nearest boundary of the park. Ambient noise monitoring

was performed on January 22, 2003. For this area, ambient noise levels were determined to be 70 dBA. For the build scenario, the area is predicted to have a 70 dBA noise level (for Design/Build Alternatives 3, 4, 7, and 8) resulting in neither an increase nor decrease for the area. Usage figures are not available for this park. However, because it is undeveloped, it can be assumed usage is very limited. The proposed project would not cause an aesthetic impact for the park users because an existing transportation corridor is already in place and the park use was not established for aesthetic viewing. The proposed improvements would not change access to the park. There are no vibration-sensitive structures associated with the park and no natural connections to any wildlife habitats or wildlife or waterfowl refuges. In summary, the proposed project would not substantially impair or diminish the park's activities, features, or attributes. A letter requesting significance was sent on March 17, 2003, to Hillsborough County. To date, the County has not responded and, therefore, the park is assumed to be significant.

Evans Park

Evans Park, approximately 17.70 ac. in size, is located at 1004 Kingsway Road in the vicinity of Alignment C1, Design/Build Alternatives 1 through 8 and is owned and operated by Hillsborough County. The park is bordered by I-4 to the north, Kingsway Road to the east, Gordon Burnett Middle School to the south, and Brinwood Drive to the west. The park is classified as a local park and contains a variety of active recreational facilities. These include a picnic area, softball field, basketball courts, soccer field, football field, hockey court, playground equipment, and a community center. In addition, there are shaded rest areas with benches. A parking lot is also provided with access from Kingsway Road (Appendix A, Sheet 24).

Alignment C1 (Design/Build Alternatives 1 through 8) is within the median of I-4, with I-4 being directly adjacent to the park property. Ambient noise monitoring was performed on January 21, 2003. For this area, ambient noise levels were determined to be 66 dBA. For the build scenario, the area is predicted to have a 66 dBA noise level for Design/Build Alternatives 1 through 8, resulting in neither an increase or decrease for the area. Park use varies per month; however, it averages approximately 3,692 persons per month. The soccer/football field, which is the closest recreational facility to the interstate, is approximately 150 ft. from I-4. The proposed project would not cause an aesthetic impact for the park users because an existing transportation corridor is already in place and the park use was not established for aesthetic viewing. The proposed improvements would not change access to the park. There are no vibration-sensitive structures associated with the park and there are no natural connections to any wildlife habitats or wildlife or waterfowl refuges. In summary, the proposed project (Design/Build Alternatives 1 through 8) would not substantially impair or diminish the park's activities, features, or attributes. A letter requesting significance was sent on March 17, 2003, to Hillsborough County. To date, the County has not responded and, therefore, the park is assumed to be significant.

Shingle Creek Greenway

The Shingle Creek Greenway is a portion of the Shingle Creek Swamp that covers more than 7,000 ac. in southern Orange and northern Osceola counties. It is located in the vicinity of

Alignments E1 and E2, Design/Build Alternatives 1 through 8. The swamp is a major receiving body for stormwater runoff from areas south and southwest of Orlando. It is largely isolated, except for its connection to Shingle Creek, which flows along the eastern border of the swamp. The University of Florida, College of Landscape Architecture is working with the South Florida Water Management District (SFWMD) to develop a plan that would address public use for the project as a whole. Orange and Osceola counties, the City of Kissimmee, and the SFWMD are also working cooperatively to establish a 'greenbelt' along Shingle Creek that will link common areas. The plans would create a natural corridor along the Shingle Creek from its origin near Highway 50 in Orange County, extending to Lake Tohopekaliga in Osceola County (Appendix A, Sheets 139 and 163 through 165).

The portion of the property adjacent to the Central Florida Greeneway (S.R. 417) and the Bee Line Expressway (S.R. 528) is owned by SFWMD. Currently, there is limited public access to the Central Florida Greeneway (S.R. 417). A small portion of a trail along the east side of Shingle Creek and a connection to Hoagland Boulevard in Osceola County was completed in 1999 by private developers. The trail, which allows for bicycling, skating, and walking, is 10-ft. wide and extends approximately 2/3 of a mi. with plans for further extension. Public access in Orange County is primarily through the Marriott Hotel, located approximately 5 mi. north of the Central Florida Greeneway (S.R. 417) and 4 mi. south of the Bee Line Expressway (S.R. 528), allowing for access to the interior of the swamp. Currently, there is no public access to the greenway in the area adjacent to the proposed project and estimated usage figures are not available. This portion of the greenway is mainly undeveloped and there are no existing facilities; therefore, usage is anticipated to be low. Various agencies are cooperating to acquire the land and develop the trail network and boardwalk.

The Central Florida Greeneway (S.R. 417) and the Bee Line Expressway (S.R. 528) (Alignments E1 and E2, Design/Build Alternatives 1 through 8) are adjacent to the Shingle Creek property. Ambient noise monitoring was performed January 27, 2003, on the Shingle Creek property adjacent to the Central Florida Greeneway (S.R. 417) (Alignment E2, Design/Build Alternatives 2, 4, 6, and 8). Ambient noise levels were determined to be 59 dBA. For the build scenario, the area is predicted to have a 60 dBA noise level for the gas turbine train (Design/Build Alternatives 2 and 4) resulting in a 1 dBA increase for this area. Also, noise levels ranging from 72 dBA for the portion of the property that lies approximately 25 ft. from the Central Florida Greeneway (S.R. 417) ROW to 61 dBA for the portion of the property that lies approximately 250 ft. from the Central Florida Greeneway (S.R. 417) ROW (Design/Build Alternatives 6 and 8) are expected.

As stated in the previous paragraph, the Shingle Creek property adjacent to Alignment E2 (Central Florida Greeneway [S.R. 417]) is currently undeveloped and there is no access. There are no official site plans yet; however, the vision of the SFWMD is to use the property for passive recreation. There has been discussion concerning connection of the Hunters Creek Middle School, which lays to the east of the Shingle Creek property, to The Vistas, a new residential development to the west of the Shingle Creek property. This potential future trail may be used to travel to and from these two areas. The SFWMD is working with the Orange County School Board to develop a cooperative agreement that would give area students

opportunities for special programming within the Shingle Creek property. Due to the itinerant nature of this trail/greenway system, users will not be on the trail for long enough periods of time to have their use of the greenway's activities, features, or attributes substantially impaired or diminished by the noise level increase.

Ambient noise monitoring was performed March 27, 2003, on the Shingle Creek property adjacent to the Bee Line Expressway (S.R. 528) (Alignment E1, Design/Build Alternatives 1, 3, 5, and 7). Ambient noise levels were determined to be 63 dBA. For the build scenario, the area is predicted to have a 64 dBA noise level (for both the electric and the gas turbine trains, Design/Build Alternatives 1, 3, 5, and 7) resulting in a 1 dBA increase for the area. As mentioned, decibel increases below 3 dBA are not perceptible to the average human ear.

The proposed project would not cause an aesthetic impact for the greenway users because an existing transportation corridor is already in place, and the greenway use was not established for aesthetic viewing. There are no vibration-sensitive structures associated with the Shingle Creek property and there are no natural connections to any wildlife habitats or wildlife or waterfowl refuges. The proposed project is not anticipated to cause a noise level increase that would substantially impair or diminish the greenway's activities, features, or attributes. Therefore, the proposed project would not substantially impair or diminish the Shingle Creek property's activities, features, or attributes. In a letter dated April 14, 2003 (see Appendix B), the SFWMD stated the Shingle Creek project will continue to play a vital role in the District's mission of water resource protection and developing appropriate public use of its lands.

No-Build Alternative

The No-Build Alternative would not require the acquisition of land from the Perry Harvey Sr. Park. The increase in congestion on I-4 and the Central Florida Greeneway (S.R. 417) under the No-Build would also increase future noise levels in the Perry Harvey Sr. Park and the Shingle Creek Park.

Preferred Alternative

The Preferred Alternative would result in the acquisition of 0.184 ac. from Perry Harvey Sr. Park. The acquisition, impacts and mitigation are discussed in detail in Section 5.

4.1.9 Secondary and Cumulative Impacts

Metropolitan Planning Organizations (MPOs) are responsible for developing the Long Range Transportation Plan (LRTP) within an urban area. The primary purpose of the LRTP is to guide the development of transportation systems to serve the travel demands of existing and projected future growth. One of the guiding principles in developing the LRTP is the Future Land Use Plan. This plan identifies the development potential of an area and is also used to identify the transportation facilities and improvements needed to support future growth and development in a region. The Future Land Use Plan indicates the kind and intensity of activity approved for the various land uses. Transportation improvement needs are identified in response to the

development allowed in the Local Government Comprehensive Plans, of which the LRTP and Future Land Use Plan are elements.

Given the projected future growth and land use designations, the implementation of the FHSR project is not expected to substantially alter development patterns along any of the design/build alternatives. The alternatives all occur within or next to existing roadway ROW with only small areas of exception. Undeveloped land near some of the station locations may result in development at a slightly faster rate than without FHSR; however, not building FHSR is unlikely to defer development of the vacant land along I-4 between Orlando and Tampa. All of the other routes of the various alternatives are already developed or are planned to be developed.

The greatest potential for development, economic activity, and job creation is near proposed station sites that are now undeveloped. Those proposed locations are:

- I-4/Polk Parkway, west entry
- I-4/Kathleen Road (S.R. 539) in the City of Lakeland
- I-4 near Walt Disney World

These sites are all in highly developed areas, and growth is anticipated in the near future, according to local future land use plans.

The Tampa CBD station site location has been previously identified as the site of a multi-modal center and is expected to support redevelopment opportunities in the area. The Orlando International Airport station is included in the approved Airport Master Plan. The OCCC station site includes plans for a multi-modal center.

4.2 NATURAL AND PHYSICAL IMPACTS

4.2.1 Visual/Aesthetic

All of the Design/Build Alternatives 1 through 8 are elevated above ground level on structures or on a retaining wall; therefore, all alternatives are visible to surrounding land uses when outside of existing roadway medians. There are no known visual or aesthetic impacts; however, there are design guidelines which may be applicable to station sites, operation and maintenance facilities, piers, or retaining walls. Table 4-8 presents regulations that govern each specific geographical area. All contain some reference to aesthetics.

Table 4-8
Current Visual/Aesthetic Design Standards

Station Site/Alignment	Location	Standards
City of Tampa Station	City of Tampa	City of Tampa Development Regulations[11]: -Development District North (CBD) Urban Design Guidelines[12]
I-4 Alternatives 1, 2, 5, 6 (Alignment A1)	City of Tampa	City of Tampa Development Regulations: -Development District North (CBD) - Urban Design Guidelines
CSX Alternatives 1, 3, 5, 7 (Alignment A2)	City of Tampa	City of Tampa Development Regulations: -Development District North (CBD) -East Office District (CBD) Urban Design Guidelines
Walt Disney World Station	Reedy Creek Jurisdiction (Osceola County)	Reedy Creek Improvement District Guidelines[13]
Orange County Multi-modal Center Station	Orange County	Orange County Development Code[14]: -Ordinance No. 2001-14, Sections 2-9 The Commercial Design Standards Guidebook[15]
Maintenance Facility	City of Orlando: (Orlando International Airport)	Code of the City of Orlando[16]: -Ordinance of May 5, 2003, Document #030505704, (Supp. No. 13), Chapter 16.

It is anticipated that the greatest sensitivity to aesthetics of the FHSR would occur when the FHSR is not located within an existing roadway or when specific official design standards are mandated. Sensitive areas along the proposed FHSR alternatives include the Tampa CBD (all alternatives) and OCCC and Taft/Vineland neighborhood (along Alignment E1, Design/Build Alternatives 1, 2, 5, and 6). The only specific known visual/aesthetic issues occur within the Tampa CBD. For Design/Build Alternatives 1, 2, 5, and 6 (Alignment A1) where the FHSR leaves the I-4 median within the Ybor City area, the City of Tampa has requested future coordination with the FHSRA to ensure the design of FHSR in this location is compatible in height and design with the proposed Ybor City Gateway design at I-4 and 21st Street.

No-Build Alternative

The No-Build Alternative would not change the visual character of the project corridor.

Preferred Alternative

The Preferred Alternative would result in potential visual/aesthetic issues within the Tampa CBD and Taft/Vineland neighborhood. Where the FHSR leaves the I-4 median within Ybor City,

coordination will need to occur with the City of Tampa to ensure design compatibility in height and design with the proposed Ybor City Gateway design at I-4 and 21st Street.

4.2.2 Air Quality

Emissions from the trains, operational/maintenance (O&M) facilities supporting the trains and O&M activities would be a new source that would contribute to the regional pollutant load. Conversely, there would be a reduction in emissions from motor vehicles as travelers use the train as an alternate mode of transportation. Within a region, motor vehicles are typically the single largest source of carbon monoxide, oxides of nitrogen, and volatile organic compounds. These are also the three primary pollutants associated with train operations. An emissions inventory was developed for these three pollutants to determine the net change that would result from the proposed FHSR Design/Build Alternatives 1 through 8.

Motor Vehicle Emissions

The two parameters required to quantify emissions from motor vehicles are vehicle miles traveled (VMT) and emission factors. Based on the 2002 Ridership Study, use of the FHSR would result in an annual reduction of 4,253,000 motor vehicle trips. Regional transportation modeling data was used to convert the vehicle trips to person VMT shown in Table 4-9. Vehicle occupancy rates by trip type shown in Table 4-10 were obtained from highway survey data and were then used to convert the person VMT to motor VMT shown in Table 4-11.

Table 4-9
Annual Person Vehicle Miles Traveled (VMT)

Alternative	Rail Rider Person Vehicle Miles	Person Vehicle Miles to Access Train Station		
		Car Access	Shuttle Access	Taxi Access
1, 3, 5, and 7[1]	59,227,809	8,232,366	3,497,600	635,800
2, 4, 6, and 8[2]	37,212,248	7,711,022	3,311,162	565,361

Notes:
[1] Alternatives using the Bee Line Expressway (S.R. 528).
[2] Alternatives using the Central Florida Greeneway (S.R. 417).

Table 4-10
Vehicle Occupancy Rates

Trip Type	Vehicle Occupancy
Residential Commuter	1.16
Residential Business	1.25
Residential Other	2.26
Non-Residential Business	1.12
Non-Residential Other	3.52

Table 4-11
Reduction/Addition of Motor Vehicle Miles Traveled (VMT)

Alternative	Reduced Rail Rider VMT	Additional Train Station Access VMT	Net Reduction in VMT
1, 3, 5 and 7[1]	25,751,221	4,670,258	21,080,963
2, 4, 6 and 8[2]	20,673,471	4,352,302	16,321,169

Notes:
[1] Alternatives using the Bee Line Expressway (S.R. 528).
[2] Alternatives using the Central Florida Greeneway (S.R. 417).

The motor vehicle emission factors used in preparing the most current maintenance plan for the Hillsborough County ozone maintenance area were developed using the MOBILE6 model. This is the most current emission factor model available from U.S. Environmental Protection Agency (EPA). Therefore, MOBILE6 (version 6.2) was used to develop emission factors for this analysis. Input parameters for MOBILE6 were adjusted for site and project specific conditions as follows:

- Emissions factors were developed for year 2010 to coincide with the planning year for the regional transportation model.
- Consistent with the General Conformity Rule, motor vehicle emissions are calculated on an annual basis; therefore, average daily minimum and maximum temperatures of 64° and 82° (Fahrenheit) were used.
- One measure of fuel volatility is the Reid Vapor Pressure (RVP). The RVP of fuel that can be sold within an area depends on the designated attainment status. All four counties within the project limits are designated as attainment areas, although Hillsborough County is a maintenance area for ozone. Consistent with these designations and *40 CFR Part 80*, an RVP of 9.0 was used.
- The reduction in VMT only applies to passenger type vehicles; therefore, the composite emission factor developed by MOBILE6 only considers the four passenger type vehicles designated within the model at the following percentages: light duty gas vehicles (50.42 percent), light duty gas trucks 1 and 2 (48.80 percent), light duty diesel vehicles (0.05 percent), and motorcycles (0.73 percent).
- Composite emission factors from MOBILE6 include emissions from two main categories: 1) exhaust emissions applicable to carbon monoxide, oxides of nitrogen, and volatile organic compounds and 2) evaporative emissions applicable only to volatile organic compounds. These two main categories are further divided into several subcategories. Only those emission subcategories applicable to a trip type that would be eliminated by use of the FHSR system were included in the composite emission factor. The subcategories included are: running exhaust emissions, running loss emissions, crankcase loss emissions, and refueling loss emissions (fuel displacement and spillage). Other evaporative loss emissions that would not be included are diurnal loss emissions (evaporative emissions caused by daily temperature fluctuations) and resting loss emissions (leaks and seepage) since these emissions would occur even with the elimination of a trip. Additionally, exhaust start emissions (excess emission before

emission control systems are heated and fully functional) and hot soak loss emissions (evaporative emissions after trip end but while engine is still hot) were not included because a rider would still have to drive to and from the train station to access the train.

The emission factors developed through MOBILE6 and the reduction in carbon monoxide, oxides of nitrogen, and volatile organic compounds attributable to the decreased motor VMT are provided in Table 4-12.

Table 4-12
Motor Vehicle Emissions

Pollutant	Emission Factor (grams/mile)	Reduction in Annual Motor VMT		Total Reduction in Emissions (tons per year)	
		Alt. 1, 3, 5, 7[1]	Alt. 2, 4, 6, 8[2]	Alt. 1, 3, 5, 7[1]	Alt. 2, 4, 6, 8[2]
Carbon Monoxide	7.291	21,080,963	16,321,169	169.1	130.9
Oxides of Nitrogen	0.499	21,080,963	16,321,169	11.6	9.0
Volatile Organic Compounds	0.411	21,080,963	16,321,169	9.5	7.4

Notes:
[1] Alternatives 1, 3, 5, and 7 using the Bee Line Expressway (S.R. 528) route.
[2] Alternatives 2, 4, 6, and 8 using the Central Florida Greeneway (S.R. 417) route.

Train Emissions

Parameters required to quantify emissions from the FHSR system depend upon the train technology. Emissions were estimated for two different technologies, the gas turbine train and the electric train. Emission factors vary by train technology. The combustion of fuel in the gas turbine train would produce emissions directly. In contrast, the electric train would produce emissions indirectly (i.e., at the power plant providing electricity).

Gas turbine train emission factors and estimated fuel consumption information provided by the proposer are summarized in Tables 4-13 and 4-14. The annual fuel consumption is based on the proposer's estimate of 4,062,000 gallons for 969,360 annual train-miles. This annual fuel consumption was then adjusted to account for differences in annual train-miles traveled under each alternative.

Table 4-13
Gas Turbine Train Technology Emission Factors

Pollutant	Emission Factor (grams emitted per gallon of fuel burned)
Carbon Monoxide	12.5
Oxides of Nitrogen	43.3
Volatile Organic Compounds	3.9

Table 4-14
Gas Turbine Train Technology Annual Fuel Consumption (2010)

Alternative	Fuel Consumption[1]
1	4,094,000 gallons
2	4,029,000 gallons
3	4,146,000 gallons
4	4,080,000 gallons

Notes:
[1] Proposer's estimate of 4,062,000 gallons for 969,360 annual train-miles adjusted by 2.68 gallons per mile for Tampa-Orlando trains, and 3.42 gallons per mile for Disney shuttles. Fuel consumption at idle assumed to be 100 gallons per hour.

Emissions from the electric train would depend upon power consumption by the train and emission rates for the power plant providing electricity. Estimated annual power consumption by trip type is provided in Table 4-15. As a worst-case, emission factors for a coal-fired power plant were used to calculate annual emissions. Emissions factors provided by the Florida Department of Environmental Protection (FDEP) for a coal-fired facility are summarized in Table 4-16.

Table 4-15
Power Usage for the Electric Train

Trip Type	Annual Gigawatt Hours[1]			
	Alternative 5	Alternative 6	Alternative 7	Alternative 8
Direct Tampa to Orlando International Airport	6.006	5.677	6.236	5.908
Tampa to Orlando International Airport with stops	18.682	18.343	18.845	18.506
Shuttles between Disney and Orlando International Airport	5.940	5.645	5.994	5.699

Notes:
[1] Consumed at the generating station, including transmission and distribution losses.

Table 4-16
Emission Factors for Coal-Fired Facility

Pollutants	Emission Factor (pounds per megawatt hour)
Carbon Monoxide	0.195
Oxides of Nitrogen	1.6
Volatile Organic Compounds	0.016

Train emissions by technology and design/build alternative are provided in Table 4-17. For a particular train technology, the amount of emissions is nearly identical for all of the alternatives.

The minor differences are a result of variations in the train trip length for the alternatives. The results also demonstrate that the electric train technology would produce considerably less emissions of carbon monoxide, oxides of nitrogen, and volatile organic compounds compared to the gas turbine train technology. This is a result of the relatively strict controls and emission reduction measures that are employed by power plants, which would be the source of electricity for the electric train technology.

Table 4-17
Annual Emissions by Train Technology

Alternative	Amount of Pollutant (tons per year)					
	Carbon Monoxide		Oxides of Nitrogen		Volatile Organic Compounds	
	Gas Turbine Train	Electric Train	Gas Turbine Train	Electric Train	Gas Turbine Train	Electric Train
1	56.4	N/A	195.4	N/A	17.5	N/A
2	55.5	N/A	192.3	N/A	17.3	N/A
3	57.1	N/A	197.8	N/A	17.8	N/A
4	56.2	N/A	194.7	N/A	17.5	N/A
5	N/A	2.99	N/A	24.50	N/A	0.25
6	N/A	2.89	N/A	23.73	N/A	0.24
7	N/A	3.03	N/A	24.86	N/A	0.25
8	N/A	2.94	N/A	24.09	N/A	0.24

Operational/ Maintenance Activities and Facilities Emissions

Emissions associated with O&M facilities were divided into two categories 1) exhaust emissions associated with vehicles used by security patrols and maintenance crews, and 2) emissions associated with electric power production to service train stations and maintenance facilities.

The two parameters used to quantify exhaust emissions from vehicles used by security patrols and maintenance crews are VMT and emission factors. Estimated VMT by alternative are provided in Table 4-18.

Table 4-18
Annual Vehicle Miles Associated with O&M Activities

Alternative	Security (miles/year)	Maintenance (miles/year)
1	744,783	181,153
2	734,765	178,720
3	755,592	183,923
4	745,574	181,350
5	744,783	376,078
6	734,765	371,019
7	755,592	381,536
8	745,574	376,478

The model (MOBILE6 version 6.2) and assumptions previously used to develop emission factors for motor vehicles were also used to develop emission factors for security and maintenance vehicles with the following exceptions:

- All security vehicles were assumed to be passenger vehicles traveling on roadways categorized as arterial/collectors at an average speed of 45 mph.
- All maintenance vehicles were assumed to be trucks spread evenly amongst the four light duty truck designations available in MOBILE6. The maintenance vehicles were assumed to travel on roadways categorized as arterial/collectors at an average speed of 35 mph.
- The composite emission factors included all exhaust and evaporative emissions.

The emission factors developed through MOBILE6 are provided in Table 4-19 and the annual amount of carbon monoxide, oxides of nitrogen and volatile organic compounds associated with O&M activities are provided in Table 4-20.

Table 4-19
Motor Vehicle Emission Factors for O&M Activities

Pollutant	Emission Factor for Security Vehicles (grams/mile)	Emission Factor for Maintenance Vehicles (grams/mile)
Carbon Monoxide	9.840	11.574
Oxides of Nitrogen	0.549	0.872
Volatile Organic Compounds	0.667	1.060

Table 4-20
Annual Motor Vehicle Emissions from O&M Activities

Alternative	Pollutant		
	Carbon Monoxide (tons/year)	Oxides of Nitrogen (tons/year)	Volatile Organic Compounds (tons/year)
1	10.4	0.6	0.8
2	10.2	0.6	0.7
3	10.5	0.6	0.8
4	10.4	0.6	0.8
5	12.9	0.8	1.0
6	12.7	0.8	1.0
7	13.1	0.8	1.0
8	12.9	0.8	1.0

Emissions associated with electric power production to service train stations and maintenance facilities would depend upon the amount of power consumed and emission rates for the power plant. As with the electric power consumption associated with the train, emission factors for a coal-fired power plant (see Table 4-15) were used as a worst-case. Estimated electric power consumption for the proposed stations and maintenance facilities are provided in Table 4-21.

Table 4-21
Annual Electric Power Consumption for O&M Facilities

Alternative	Annual Gigawatt Hours
1	5.779
2	5.311
3	5.779
4	5.311
5	12.043
6	10.717
7	12.043
8	10.717

Annual emissions associated with electric power production to service train stations and maintenance facilities are provided in Table 4-22 and total emissions for O&M activities and facilities are provided in Table 4-23. Compared to the gas turbine train alternatives, emissions for O&M activities and facilities are higher for the electric train alternatives. This is a result of the larger stations associated with the electric train alternatives, the fully doubled tracked corridor associated with the electric train which increases maintenance and the electric traction power supply system which also requires additional field maintenance.

Table 4-22
Annual Emissions from Electric Power Consumption at O&M Facilities

Alternative	Pollutant		
	Carbon Monoxide (tons per year)	Oxides of Nitrogen (tons per year)	Volatile Organic Compounds (tons per year)
1	0.56	4.62	0.05
2	0.52	4.25	0.04
3	0.56	4.62	0.05
4	0.52	4.25	0.04
5	1.17	9.63	0.10
6	1.04	8.57	0.09
7	1.17	9.63	0.10
8	1.04	8.57	0.09

Table 4-23
Total Annual Emissions for O&M Activities and Facilities

Alternative	Pollutant		
	Carbon Monoxide (tons per year)	Oxides of Nitrogen (tons per year)	Volatile Organic Compounds (tons per year)
1	11.0	5.2	0.9
2	10.7	4.9	0.7
3	11.1	5.2	0.9
4	10.9	4.9	0.8
5	14.1	10.4	1.1
6	13.7	9.4	1.1
7	14.3	10.4	1.1
8	13.9	9.4	1.1

Change in Regional Emissions

The increase in regional emissions resulting from the operation of the FHSR would be offset by the decrease in emissions resulting from a reduction in miles traveled by motor vehicles. Table 4-24 summarizes the change in emissions using the gas turbine train as the selected technology. Based on the anticipated train ridership, regional emissions of carbon monoxide would be substantially reduced; regional emissions of volatile organic compounds would remain fairly constant; and regional emissions of oxides of nitrogen would show an increase. The increase in oxides of nitrogen is a result of the relatively high emission rate of this pollutant from gas turbine engines.

Table 4-24
Gas Turbine Train Technology Net Change in Emissions

Alternative	Train and O&M Emissions (tons per year)			Reduction in Motor Vehicle Emissions (tons per year)			Net Change in Regional Emissions (tons per year)		
	CO[1]	NOX[2]	VOC[3]	CO[1]	NOX[2]	VOC[3]	CO[1]	NOX[2]	VOC[3]
1	67.4	200.6	18.4	169.1	11.6	9.5	-101.7	+189.0	+8.9
2	66.2	197.2	18.0	130.9	9.0	7.4	-64.7	+188.2	+10.6
3	68.2	203.0	18.7	169.1	11.6	9.5	-100.9	+191.4	+9.2
4	67.1	199.6	18.3	130.9	9.0	7.4	-63.8	+190.6	+10.9

Notes:
[1] CO is carbon monoxide.
[2] NOX is oxides of nitrogen.
[3] VOC is volatile organic compounds.

Table 4-25 summarizes emissions using the electric train as the selected technology. Based on the anticipated train ridership, regional emissions of carbon monoxide and volatile organic compounds would be reduced. As with the gas turbine train technology, regional emissions of oxides of nitrogen would increase. The increase in oxides of nitrogen is a result of the relatively

high emission rate of this pollutant from power plants that produce electricity through the combustion of fossil fuels. The relatively high emission rate for oxides of nitrogen is demonstrated through comparison of emission factors provided by FDEP and previously documented in Table 4-15.

Table 4-25
Electric Train Technology Net Change in Emissions

Alternative	Train and O&M Emissions (tons per year)			Reduction in Motor Vehicle Emissions (tons per year)			Net Change in Regional Emissions (tons per year)		
	CO[1]	NOX[2]	VOC[3]	CO[1]	NOX[2]	VOC[3]	CO[1]	NOX[2]	VOC[3]
5	17.1	34.9	1.4	169.1	11.6	9.5	-152.0	+23.3	-8.1
6	16.6	33.1	1.3	130.9	9.0	7.4	-114.3	+24.1	-6.1
7	17.3	35.3	1.4	169.1	11.6	9.5	-151.8	+23.7	-8.1
8	16.8	33.5	1.3	130.9	9.0	7.4	-114.1	+24.5	-6.1

Notes:
[1] CO is carbon monoxide.
[2] NOX is oxides of nitrogen.
[3] VOC is volatile organic compounds.

General Conformity

The *General Conformity Rule* (*40 CFR Part 93 Subpart B*) is applicable to areas that have been designated as non-attainment or maintenance with respect to the National Ambient Air Quality Standards (NAAQS). The EPA has designated Polk, Osceola, and Orange counties as attainment for all the NAAQS; therefore, the General Conformity Rule is not applicable to these three counties. Hillsborough County is designated as a maintenance area for ozone; therefore, the General Conformity Rule is applicable to the portion of the FHSR project that traverses this county.

The General Conformity Rule contains rates, which if exceeded, require a conformity determination. The rates vary depending on the pollutant and designation of the area. As an ozone maintenance area, the rates applicable to Hillsborough County are 100 tons per year of either volatile organic compounds or oxides of nitrogen. The net change for these two pollutants in Hillsborough County was determined by segregating the train emissions, O&M emissions and reduction in VMT occurring in Hillsborough County from the total train emissions, total O&M emissions and total reduction in VMT attributable to the FHSR.

Emissions within Hillsborough County were based on the percentage of total annual train miles traveled that would occur within the county. The annual train emissions within Hillsborough County are provided by alternative in Table 4-26.

Table 4-26
Train Emissions within Hillsborough County

Alternative	Train Emissions (tons per year)		
	Carbon Monoxide	Oxides of Nitrogen	Volatile Organic Compounds
1	16.0	55.3	5.0
2	16.0	55.5	5.0
3	16.7	57.8	5.2
4	16.7	58.0	5.2
5	0.8	6.1	0.1
6	0.8	6.2	0.1
7	0.8	6.6	0.1
8	0.8	6.5	0.1

For Alternatives 1 through 4, it was determined that 37 percent of the gasoline consumed for O&M activities would occur in Hillsborough County. For Alternatives 5 through 8, 32 percent of the gasoline consumed for O&M activities would occur in Hillsborough County. These percentages were applied to the total annual motor vehicle emissions from O&M Activities (previously provided in Table 4-19). Estimated electric power consumption for the proposed stations and maintenance facilities in Hillsborough County are provided in Table 4-27. Based on the gasoline and electric power consumption within Hillsborough, the total annual emissions for O&M activities and facilities within Hillsborough County were determined and are summarized in Table 4-28.

Table 4-27
Annual Electric Power Consumption for O&M Facilities in Hillsborough County

Alternative	Annual Gigawatt Hours
1	0.974
2	0.974
3	0.974
4	0.974
5	1.495
6	1.495
7	1.495
8	1.495

Table 4-28
Total Annual Emissions for O&M Activities and Facilities in Hillsborough County

Alternative	Pollutant		
	Carbon Monoxide (tons/year)	Oxides of Nitrogen (tons/year)	Volatile Organic Compounds (tons/year)
1	3.9	1.0	0.3
2	3.9	1.0	0.3
3	4.0	1.0	0.3
4	3.9	1.0	0.3
5	4.3	1.5	0.3
6	4.2	1.5	0.3
7	4.3	1.5	0.3
8	4.3	1.5	0.3

The net change in emissions occurring within Hillsborough County for the gas turbine train technology and electric train technology are provided in Tables 4-29 and 4-30, respectively. Regardless of the train technology, the net change in emissions for oxides of nitrogen or volatile organic compounds is below the 100 ton per year rate of increase stipulated in the General Conformity Rule. Therefore, a conformity determination pursuant to the General Conformity Rule is not required for the FHSR project.

Table 4-29
Gas Turbine Train Technology
Net Change in Emissions within Hillsborough County

Alternative	Train and O&M Emissions (tons per year)			Reduction in Motor Vehicle Emissions (tons per year)			Net Change in Emissions (tons per year)		
	CO[1]	NOX[2]	VOC[3]	CO[1]	NOX[2]	VOC[3]	CO[1]	NOX[2]	VOC[3]
1	19.9	56.3	5.2	50.4	3.5	2.8	-30.5	+52.8	+2.4
2	19.9	56.5	5.3	56.1	3.9	3.2	-36.2	+52.6	+2.1
3	20.7	58.1	5.5	50.4	3.5	2.8	-29.7	+54.6	+2.7
4	20.6	58.0	5.5	56.1	3.9	3.2	-35.5	+54.1	+2.3

Notes:
[1] CO is carbon monoxide.
[2] NOX is oxides of nitrogen.
[3] VOC is volatile organic compounds.

Table 4-30
Electric Train Technology
Net Change in Emissions within Hillsborough County

Alternative	Train and O&M Emissions (tons per year)			Reduction in Motor Vehicle Emissions (tons per year)			Net Change in Emissions (tons per year)		
	CO[1]	NOX[2]	VOC[3]	CO[1]	NOX[2]	VOC[3]	CO[1]	NOX[2]	VOC[3]
5	4.8	7.6	0.4	50.4	3.5	2.8	-45.6	+4.1	-2.4
6	5.0	7.7	0.4	56.1	3.9	3.2	-51.1	+3.8	-2.8
7	5.1	8.1	0.4	50.4	3.5	2.8	-45.3	+4.6	-2.4
8	5.1	8.0	0.4	56.1	3.9	3.2	-51.0	+4.1	-2.8

Notes:
[1] CO is carbon monoxide.
[2] NOX is oxides of nitrogen.
[3] VOC is volatile organic compounds.

Summary

The following summarizes the results of the air quality evaluation:

- Alternatives associated with the gas turbine train technology (Design/Build Alternatives 1, 2, 3, and 4) would result in a net decrease in regional emissions of carbon monoxide and a net increase in regional emissions of oxides of nitrogen compared to the No-Build Alternative. The net increase in regional emissions of oxides of nitrogen is a result of the relatively high emission rate of this pollutant from gas turbine engines. A very small increase in regional emissions of volatile organic compounds is also predicted compared to the No-Build Alternative.
- Alternatives associated with the electric train technology (Design/Build Alternatives 5, 6, 7, and 8) would result in a net decrease in regional emissions of carbon monoxide and volatile organic compounds compared to the No-Build Alternative. A net increase in regional emissions of oxides of nitrogen is predicted. The increase in oxides of nitrogen is a result of the relatively high emission rate of this pollutant from power plants that produce electricity through the combustion of fossil fuels. This emissions analysis is based on use of coal as the source for power generation resulting in a worst case scenario.
- The net change in emissions for a particular train technology is similar for all alternatives utilizing that same technology.
- Although alternatives associated with the electric train technology consider more train trips, emissions from the electric train technology would be less than emissions from the gas turbine train technology. This is a result of the relatively strict controls and emission reduction measures that are employed by power plants, which would be the source of electricity for the electric train technology.

- EPA has designated Polk, Osceola, and Orange Counties as attainment areas; therefore, the General Conformity Rule is not applicable to these three counties.
- EPA has designated Hillsborough County as a maintenance area for ozone; therefore, the General Conformity Rule is applicable to Hillsborough County. Predicted increases in volatile organic compounds or oxides of nitrogen for the Design/Build Alternatives are less than the de minimis rates documented in the General Conformity Rule; therefore, a conformity determination is not required for this project.

No-Build Alternative

The No-Build Alternative would result in the net amount and proportion of regional emissions dependent on current modes of transportation.

Preferred Alternative

The Preferred Alternative would result in a net decrease in regional emissions of carbon monoxide, a net increase in emissions of oxides of nitrogen, and emissions of volatile organic compounds would remain fairly constant. The net increase in emissions of oxides of nitrogen is a result of the relatively high emission rate of this pollutant from gas turbine engines.

The *General Conformity Rule* (*40 CFR Part 93 Subpart B*) is applicable to areas that have been designated as non-attainment or maintenance with respect to the NAAQS. The EPA has designated Polk, Osceola, and Orange counties as attainment for all the NAAQS; therefore, the General Conformity Rule is not applicable to these three counties. Hillsborough County is designated as a maintenance area for ozone; therefore, the General Conformity Rule is applicable to the portion of the FHSR project that traverses this county. The net change in emissions for oxides of nitrogen or volatile organic compounds is below the 100 ton per year rate of increase stipulated in the General Conformity Rule. Therefore, a conformity determination pursuant to the General Conformity Rule is not required for the FHSR project.

4.2.3 Noise

Noise Impact Assessment for Residential Land Use

A noise impact assessment was conducted to quantify the extent of expected impacts and identify feasible mitigation options where warranted. The analysis was conducted in accordance with the procedures contained in the FRA publication, High-Speed Ground Transportation Noise and Vibration Impact Assessment[17] (Final Draft, December 1998).

Noise Impact Assessment Methodology

Noise levels for the FHSR Design/Build Alternatives 1 through 8 were projected based on the proposed gas turbine train technologies (Design/Build Alternatives 1 through 4) and electric train technologies (Design/Build Alternatives 5 through 8), in addition to the prediction model specified in the FRA guidance manual. Important factors analyzed include:

- Based on the gas turbine train technologies, the predictions assume one power car and four passenger cars with a total length of 420 ft. for the entire gas turbine train. Based on electric train technologies, the predictions assume two power cars and five passenger cars with a total length of 466 ft. for the entire electric train.
- The operating period for both the gas turbine train and electric train vehicles is expected to be between 6:00 AM and 11:00 PM. It is anticipated that the FHSR would operate with headway of approximately 1 hour throughout corridors A, B, C, and D. Along Corridor E, the headway is expected to be approximately ½ hour.
- The vehicle operating speeds are based on the velocity profiles that were provided in the proposals, with maximum operating speeds of 125 mph for the gas turbine train and 162 mph for the electric-powered train.

The following noise impacts are expected for each of the alternatives. Figures 2-7 and 2-8 display the alternatives and their corresponding alignments.

Alternative 1

For Alternative 1, detailed comparisons of the existing and future noise levels are presented in Table 4-31. This table includes results for the Category 2 receptors along all of the alignments with daytime and nighttime sensitivity to noise (e.g. residences, hotels, and hospitals). In addition to the distance to the near track and proposed train speed, the table includes the existing noise level, the projected noise level from the high speed rail, and the impact criteria for each receptor or receptor group. The table compares predicted project noise level with impact criteria. The resulting impact category is shown, along with the predicted total noise level and projected noise increase. Table 4-31 also lists the number of moderate impacts and severe impacts at each sensitive receptor location.

Table 4-31
Residential Noise Impacts for Alternative 1

Location	FHSR Survey Station	Dist to Near Track (ft.)	Speed (mph)	Exist. Noise Level[1]	Project Noise Level[1]			Impact Category	Total Noise Level[1, 2]	Noise Level Increase[1, 2]	# of Res. Impacts	
					Predicted[2]	Impact Criteria					Mod	Sev
						Imp	Sev					
Alignment E1	7672	68	110	59	58	57	63	Impact	62	2.4	1	0
Alignment E1	7673	43	110	59	61	57	63	Impact	63	3.7	6	0
Alignment E1	7683	93	112	59	65	57	63	Severe	66	6.8	0	8

Notes:
1. Noise levels are based on Ldn and are measured in dBA. Noise levels are rounded to the nearest decibel except for the increase in noise level, which is given to the nearest one-tenth decibel to provide a better resolution for assessing noise impact.
2. The reported noise levels represent the highest noise levels for each location.

Table 4-31 shows noise impacts for a total of 15 residences for Alternative 1, eight with severe impact and seven with moderate impact. All project impacts are located at single-family residential sites along Alignment E1. All of the impacted residences are located in the Taft area near Orlando, Florida. The close proximity (100 ft. or less), the train speed (125 mph), and the

track height (over 20 ft.) all contribute to the potential noise impact at the 15 residences along Alignment E1. No impacts are projected at any Category 3 (institutional) receptors.

Alternative 2

The results of the noise analysis for Alternative 2 are presented in Table 4-32, which contains the same categories of information as the table presented for Alternative 1.

Table 4-32
Residential Noise Impacts for Alternative 2

Location	FHSR Survey Station	Dist to Near Track (ft.)	Speed (mph)	Exist. Noise Level[1]	Project Noise Level[1]			Impact Category	Total Noise Level[1, 2]	Noise Level Increase[1, 2]	# of Res. Impacts	
					Predicted[2]	Impact Criteria					Mod	Sev
						Imp	Sev					
Alignment E2	4694	93	76	66	62	61	67	Impact	68	1.6	1 hotel	0
Alignment E2	5196	193	119	61	61	58	64	Impact	64	2.9	4	0

Notes:
1. Noise levels are based on Ldn and are measured in dBA. Noise levels are rounded to the nearest decibel except for the increase in noise level, which is given to the nearest one-tenth decibel to provide a better resolution for assessing noise impact.
2. The reported noise levels represent the highest noise levels for each location.

Table 4-32 shows noise impacts for a total of four residences and one hotel for Alternative 2; all with moderate impact and located along Alignment E2, which follows the Central Florida Greeneway (S.R. 417). The impacted single-family residences are located south of the Central Florida Greeneway (S.R. 417) and east of Landstar Boulevard. The impacted hotel is near the intersection of Kissimmee Vineland Road and World Center Drive. The close proximity (200 ft. or less) and the train speed (76-119 mph) contribute to the potential noise impact at all of the impacted buildings along Alignment E2. No impacts are projected at any Category 3 (institutional) receptors.

Alternative 3

The results of the noise analysis for Alternative 3 are presented in Table 4-33, which contains the same categories of information as the tables for Alternatives 1 and 2. Due to the fact that Alternatives 1 and 3 share some alignments, some of the impacted residences are the same.

Table 4-33
Residential Noise Impacts for Alternative 3

Location	FHSR Survey Station	Dist to Near Track (ft.)	Speed (mph)	Exist. Noise Level[1]	Project Noise Level[1]			Impact Category	Total Noise Level[1, 2]	Noise Level Increase[1, 2]	# of Res. Impacts	
					Predicted[2]	Impact Criteria					Mod	Sev
						Imp	Sev					
Alignment A2	1016	43	22	62	60	59	65	Impact	64	2.2	1	0
Alignment E1	7672	68	110	59	58	57	63	Impact	62	2.4	1	0
Alignment E1	7673	43	110	59	61	57	63	Impact	63	3.7	6	0
Alignment E1	7683	93	112	59	65	57	63	Severe	66	6.8	0	8

Notes:
1. Noise levels are based on Ldn and are measured in dBA. Noise levels are rounded to the nearest decibel except for the increase in noise level, which is given to the nearest one-tenth decibel to provide a better resolution for assessing noise impact.
2. The reported noise levels represent the highest noise levels for each location.

Table 4-33 shows noise impacts for a total of 16 residences for Alternative 3, eight with severe impact and eight with moderate impact. No impacts are projected at any Category 3 (institutional) receptors. One multi-family residence near the west end of the corridor, to the south of I-275, is the only building impacted in Alignment A2, located near the Tampa CBD. The close proximity to the track (less than 50 ft.) and the train speed (22 mph) are the main contributors to the potential noise impact along Alignment A2. Noise impacts are expected to affect eight residences with severe impacts and seven with moderate impacts along Alignment E1. All of the impacted residences are located in the Taft area near Orlando, Florida. The close proximity (100 ft. or less), the train speed (110-112 mph), and the track height (over 20 ft.) all contribute to the potential noise impact at the 15 residences along Alignment E1.

Alternative 4

The results of the noise analysis for Alternative 4 are presented in Table 4-34, which contains the same categories of information as the tables for the previously discussed alternatives. Due to the fact that Alternatives 2, 3, and 4 share some alignments, some of the impacted residences are the same.

Table 4-34
Residential Noise Impacts for Alternative 4

Location	FHSR Survey Station	Dist to Near Track (ft.)	Speed (mph)	Exist. Noise Level[1]	Project Noise Level[1]			Impact Category	Total Noise Level[1, 2]	Noise Level Increase[1, 2]	# of Res. Impacts	
					Predicted[2]	Impact Criteria					Mod	Sev
						Imp	Sev					
Alignment A2	1016	43	22	62	60	59	65	Impact	64	2.2	1	0
Alignment E2	4694	93	76	66	62	61	67	Impact	68	1.6	1 hotel	0
Alignment E2	5196	193	119	61	61	58	64	Impact	64	2.9	4	0

Notes:
1. Noise levels are based on Ldn and are measured in dBA. Noise levels are rounded to the nearest decibel except for the increase in noise level, which is given to the nearest one-tenth decibel to provide a better resolution for assessing noise impact.
2. The reported noise levels represent the highest noise levels for each location.

Table 4-34 shows noise impacts for a total of five residences and one hotel for Alternative 4, all of them with moderate impact. No impacts are projected at any Category 3 (institutional) receptors. One multi-family residence near the west end of the corridor, to the south of I-275 in Tampa, is the only building impacted in Alignment A2. The close proximity to the track (less than 50 ft.) and the train speed (22 mph) are the main contributors to the potentially moderate noise impact along Alignment A2. Moderate noise impacts would be expected at a total of four residences and one hotel along Alignment E2 in Orlando. The impacted single-family residences are located south of the Central Florida Greeneway (S.R. 417) and east of Landstar Boulevard. The impacted hotel is near the intersection of Kissimmee Vineland Road and World Center Drive. The close proximity (200 ft. or less) and the train speed (76-119 mph) contribute to the potential noise impact at all of the impacted buildings along Alignment E2.

Alternative 5

The results of the noise analysis for Alternative 5 are presented in Table 4-35, which contains the same categories of information as the tables for previously discussed alternatives. Due to the fact that Alternatives 5, 6, 7, and 8 use a different technology than Alternatives 1, 2, 3, and 4, the residences that are impacted would be different, even though the alignments may be the same.

Table 4-35
Residential Noise Impacts for Alternative 5

Location	FHSR Survey Station	Dist to Near Track (ft.)	Speed (mph)	Exist. Noise Level[1]	Project Noise Level[1]			Impact Category	Total Noise Level[1, 2]	Noise Level Increase[1, 2]	# of Res. Impacts	
					Predicted[2]	Impact Criteria					Mod	Sev
						Imp	Sev					
Alignment A1	6003	43	21	68	65	63	68	Impact	70	2.0	1 hotel	0
Alignment A1	6007	43	22	77	65	65	75	Impact	78	0.3	1	0
Alignment A1	6007	43	22	68	65	63	68	Impact	70	1.9	1	0
Alignment A1	6010	43	24	68	65	63	68	Impact	70	2.0	3	0
Alignment A1	6016	43	27	69	65	64	69	Impact	70	1.6	1	0
Alignment A1	6042	43	42	74	66	65	72	Impact	74	0.7	4	0
Alignment A1	6051	43	45	79	66	65	75	Impact	79	0.2	3	0
Alignment A1	6071	43	57	77	66	65	75	Impact	77	0.4	2	0
Alignment E1	7672	68	137	59	68	57	63	Severe	69	9.3	0	1
Alignment E1	7673	43	137	59	71	57	63	Severe	71	11.8	0	6
Alignment E1	7673	209	137	59	58	57	63	Impact	62	2.5	7	0
Alignment E1	7679	93	132	59	66	57	63	Severe	67	7.4	0	9
Alignment E1	7683	93	130	59	66	57	63	Severe	67	7.4	0	8
Alignment E1	7687	143	126	59	63	57	63	Impact	64	5.2	6	0

Notes:
1. Noise levels are based on Ldn and are measured in dBA. Noise levels are rounded to the nearest decibel except for the increase in noise level, which is given to the nearest one-tenth decibel to provide a better resolution for assessing noise impact.
2. The reported noise levels represent the highest noise levels for each location.

Table 4-35 shows noise impacts for a total of 52 residences for Alternative 5, 24 with severe impact and 28 with moderate impact. Moderate impact is also projected at one hotel. Impacts that are projected at Category 3 (institutional) receptors are displayed later on Table 4-33 of this report. Moderate noise impacts are expected at 15 residences and one hotel along Alignment A1 in Tampa. All of the impacted buildings are south of I-275, but none are further than the I-4/I-275 interchange. The close proximity to the track (within 50 ft.), the track height (over 30 ft.), and the train speed (21-57 mph) all contribute to the potential noise impact along Alignment A1. Along Alignment E1, severe noise impacts are expected at 24 residences and moderate noise impacts are expected at 13 residences. All of the impacted residences are located in the Taft area near Orlando. The close proximity (250 ft. or less), the train speed (126-137 mph), and the track height (over 25 ft.) all contribute to the potential noise impact at the 37 residences along Alignment E1.

Alternative 6

The results of the noise analysis for Alternative 6 are presented in Table 4-36, which contains the same categories of information as the tables for previously discussed alternatives. Due to the fact that Alternatives 5 and 6 share some alignments, some of the impacted residences are the same.

Table 4-36 shows noise impacts for a total of 102 residences for Alternative 6, 80 with moderate impact and 22 with severe impact. Moderate impact is also projected at three hotels. Impacts that are projected at Category 3 (institutional) receptors are discussed in the Noise Impact Assessment for Institutional Land Use section. The following text provides a brief discussion of the impacted Category 2 land use areas. Moderate noise impacts are expected at 15 residences and one hotel along Alignment A1 in Tampa. All of the impacted buildings are south of I-275, but none are further than the I-4/I-275 interchange. The close proximity to the track (within 50 ft.), the track height (over 30 ft.), and the train speed (21-45 mph) all contribute to the potential noise impacts along Alignment A1. The impacted sites along Alignment E2 are mostly single-family residences and apartments on the north side of the Central Florida Greeneway (S.R. 417). The locations of impacted sites extend from two hotels that have a moderate impact (near the intersection of Kissimmee Vineland Road and World Center Drive) east to Meadowwoods subdivision. The close proximity (400 ft. or less), the train speed (88-149 mph), and the track height (over 25 ft.) contribute to the potential noise impact at the 187 residences along Alignment E2.

Table 4-36
Residential Noise Impacts for Alternative 6

Location	FHSR Survey Station	Dist to Near Track (ft.)	Speed (mph)	Exist. Noise Level[1]	Project Noise Level[1]			Impact Category	Total Noise Level[1,2]	Noise Level Increase[1, 2]	# of Res. Impacts	
					Predicted[2]	Impact Criteria					Mod	Sev
						Imp	Sev					
Alignment A1	6003	43	21	68	65	63	68	Impact	70	2.0	1 hotel	0
Alignment A1	6007	43	22	77	65	65	75	Impact	78	0.3	1	0
Alignment A1	6007	43	22	68	65	63	68	Impact	70	1.9	1	0
Alignment A1	6010	43	22	68	65	63	68	Impact	70	2.0	3	0
Alignment A1	6016	43	27	69	65	64	69	Impact	70	1.6	1	0
Alignment A1	6042	43	42	74	66	65	72	Impact	74	0.7	4	0
Alignment A1	6051	43	45	79	66	65	75	Impact	79	0.2	3	0
Alignment A1	6071	43	57	77	66	65	75	Impact	77	0.4	2	0
Alignment E2	4642	143	149	63	64	60	65	Impact	67	3.4	1 hotel	0
Alignment E2	4694	93	149	66	67	61	67	Impact	69	3.4	1 hotel	0
Alignment E2	4827	118	88	61	61	58	64	Impact	64	3.1	6	0
Alignment E2	4827	143	88	64	60	60	65	Impact	65	1.6	6	0
Alignment E2	4838	106	90	65	62	61	66	Impact	67	1.7	3	0
Alignment E2	5118	118	130	67	64	62	67	Impact	69	1.9	10	0
Alignment E2	5153	181	137	58	62	57	63	Impact	63	5.2	4	0
Alignment E2	5153	268	137	53	56	54	60	Impact	58	5.0	4	0
Alignment E2	5158	143	138	59	63	57	63	Severe	65	5.6	0	4
Alignment E2	5158	268	138	54	56	55	61	Impact	58	4.5	4	0
Alignment E2	5159	143	138	60	63	58	63	Severe	65	5.4	0	2
Alignment E2	5159	318	138	54	55	55	61	Impact	58	3.9	4	0
Alignment E2	5162	306	139	53	56	55	61	Impact	58	4.3	3	0
Alignment E2	5163	131	139	60	64	58	64	Severe	66	5.3	0	6
Alignment E2	5165	268	139	54	57	55	61	Impact	59	4.3	4	0
Alignment E2	5167	93	139	62	66	59	64	Severe	67	5.9	0	6
Alignment E2	5168	268	140	55	57	55	61	Impact	59	4.1	4	0
Alignment E2	5171	93	140	61	66	58	64	Severe	67	6.3	0	4
Alignment E2	5172	318	140	53	56	54	60	Impact	57	4.4	3	0
Alignment E2	5184	306	143	56	59	56	62	Impact	61	4.4	10	0

Notes:
1. Noise levels are based on Ldn and are measured in dBA. Noise levels are rounded to the nearest decibel except for the increase in noise level, which is given to the nearest one-tenth decibel to provide a better resolution for assessing noise impact.
2. The reported noise levels represent the highest noise levels for each location.

Alternative 7

The results of the noise analysis for Alternative 7 are presented in Table 4-37, which contains the same categories of information as the tables for previously discussed alternatives. Due to the fact that Alternatives 5 and 7 share some alignments, some of the impacted residences are the same.

Table 4-37
Residential Noise Impacts for Alternative 7

Location	FHSR Survey Station	Dist to Near Track (ft.)	Speed (mph)	Exist. Noise Level[1]	Project Noise Level[1]			Impact Category	Total Noise Level[1, 2]	Noise Level Increase[1, 2]	# of Res. Impacts	
					Predicted[2]	Impact Criteria					Mod	Sev
						Imp	Sev					
Alignment A2	1016	43	22	62	65	59	65	Severe	67	4.8	0	1
Alignment E1	7672	68	137	59	68	57	63	Severe	69	9.3	0	1
Alignment E1	7673	43	137	59	71	57	63	Severe	71	11.8	0	6
Alignment E1	7673	209	137	59	58	57	63	Impact	62	2.5	7	0
Alignment E1	7679	93	132	59	66	57	63	Severe	67	7.4	0	9
Alignment E1	7683	93	130	59	66	57	63	Severe	67	7.4	0	8
Alignment E1	7687	143	126	59	63	57	63	Impact	64	5.2	6	0

Notes:
1. Noise levels are based on Ldn and are measured in dBA. Noise levels are rounded to the nearest decibel except for the increase in noise level, which is given to the nearest one-tenth decibel to provide a better resolution for assessing noise impact.
2. The reported noise levels represent the highest noise levels for each location.

Table 4-37 shows noise impacts for a total of 38 residences for Alternative 7, 25 with severe impact and 13 with moderate impact; no impacts are projected at any Category 3 (institutional) receptors. One multi-family residence near the beginning of the corridor, to the south of I-275 in Tampa, is the only building impacted in Alignment A2. The close proximity to the track (less than 50 ft.) and the train speed (22 mph) are the main contributors to the potentially severe noise impact along Alignment A2. Along Alignment E1, severe noise impacts are expected to affect 24 residences and moderate noise impacts are expected to affect 13 residences. All of the impacted residences are located in the Taft area near Orlando. The close proximity to the track (250 ft. or less), the train speed (126-137 mph), and the track height (over 25 ft.) all contribute to the potential noise impact at the 37 residences along Alignment E1.

Alternative 8

The results of the noise analysis for Alternative 8 are presented in Table 4-38, which contains the same categories of information as the tables for previously discussed alternatives. Due to the fact that Alternatives 6 and 8 share some alignments, some of the impacted residences are the same.

Table 4-38 shows noise impacts for a total of 88 residences for Alternative 8, 65 with moderate impact and 23 with severe impact; moderate impacts are also projected at 2 hotels. Impacts that are projected at Category 3 (institutional) receptors will be discussed in the Noise Impact Assessment for Institutional Land Use section. One multi-family residence near the beginning of the corridor, to the south of I-275, is the only building impacted in Alignment A2. The close proximity to the track (less than 50 ft.) and the train speed (22 mph) are the main contributors to the potentially severe noise impact along Alignment A2. The impacted sites along Alignment E2 are mostly single-family residences and apartments on the north side of the Central Florida Greeneway (S.R. 417). The locations of impacted sites extend from two hotels that have a moderate impact (near the intersection of Kissimmee Vineland Road and World Center Drive)

east to Meadowwoods subdivision. The close proximity (400 ft. or less), the train speed (88-149 mph), and the track height (over 25 ft.) contribute to the potential noise impact at the 187 residences along Alignment E2.

Table 4-38
Residential Noise Impacts for Alternative 8

Location	FHSR Survey Station	Dist to Near Track (ft.)	Speed (mph)	Exist. Noise Level[1]	Project Noise Level[1]			Impact Category	Total Noise Level[1, 2]	Noise Level Increase[1, 2]	# of Res. Impacts	
					Predicted[2]	Impact Criteria					Mod	Sev
						Imp	Sev					
Alignment A2	1016	43	22	62	65	59	65	Severe	67	4.8	0	1
Alignment E2	4642	143	149	63	64	60	65	Impact	67	3.4	1 hotel	0
Alignment E2	4694	93	149	66	67	61	67	Impact	69	3.4	1 hotel	0
Alignment E2	4827	118	88	61	61	58	64	Impact	64	3.1	6	0
Alignment E2	4827	143	88	64	60	60	65	Impact	65	1.6	6	0
Alignment E2	4838	106	90	65	62	61	66	Impact	67	1.7	3	0
Alignment E2	5118	118	130	67	64	62	67	Impact	69	1.9	10	0
Alignment E2	5153	181	137	58	62	57	63	Impact	63	5.2	4	0
Alignment E2	5153	268	137	53	56	54	60	Impact	58	5.0	4	0
Alignment E2	5158	143	138	59	63	57	63	Severe	65	5.6	0	4
Alignment E2	5158	268	138	54	56	55	61	Impact	58	4.5	4	0
Alignment E2	5159	143	138	60	63	58	63	Severe	65	5.4	0	2
Alignment E2	5159	318	138	54	55	55	61	Impact	58	3.9	4	0
Alignment E2	5162	306	139	53	56	55	61	Impact	58	4.3	3	0
Alignment E2	5163	131	139	60	64	58	64	Severe	66	5.3	0	6
Alignment E2	5165	268	139	54	57	55	61	Impact	59	4.3	4	0
Alignment E2	5167	93	139	62	66	59	64	Severe	67	5.9	0	6
Alignment E2	5168	268	140	55	57	55	61	Impact	59	4.1	4	0
Alignment E2	5171	93	140	61	66	58	64	Severe	67	6.3	0	4
Alignment E2	5172	318	140	53	56	54	60	Impact	57	4.4	3	0
Alignment E2	5184	306	143	56	59	56	62	Impact	61	4.4	10	0

Notes:
1. Noise levels are based on Ldn and are measured in dBA. Noise levels are rounded to the nearest decibel except for the increase in noise level, which is given to the nearest one-tenth decibel to provide a better resolution for assessing noise impact.
2. The reported noise levels represent the highest noise levels for each location.

Summary of Noise Impacts

Table 4-39 provides a summary of the total number of residences and hotels where noise impact is projected for each design/build alternative. Table 4-39 shows that out of the four alternatives using the gas turbine train technology, Alternative 3 will have the greatest number of residences and hotels impacted. Eight residences are projected to have moderate impact and eight residences are projected to have severe impact. Table 4-39 also shows that out of the four alternatives using the electric train technology, Alternative 6 will have the greatest number of sites impacted. Eighty residences and three hotels are projected to have moderate impact and twenty-two residences are projected to have severe impact with Alternative 6.

Table 4-39
Residential Noise Impact Summary

Proposal	Alternatives	Number of Residences Impacted		
		Moderate	Severe	Total
Gas Turbine Train	1	7	8	15
	2	4 + 1 hotel	0	4 + 1 hotel
	3	8	8	16
	4	5 + 1 hotel	0	5 + 1 hotel
Electric Train	5	28 + 1 hotel	24	52 + 1 hotel
	6	80 + 3 hotels	22	102 + 3 hotels
	7	13	25	38
	8	65 + 2 hotels	23	88 + 2 hotels

Due to differences in schedules, vertical profiles, distances from tracks, speeds of trains, numbers of power cars, lengths of trains, and numbers of passenger cars, a direct comparison cannot be made between the two technologies as proposed. In order to get a direct comparison, all variables must be made equal except for the technology itself. Moreover, there are two ways to compare the technologies: consider the train consists as proposed, even if they have different numbers of power cars and coaches; and consider the same number of power cars and coaches. Comparison is made possible using the methodology of the FRA Guidance Manual to make the necessary adjustments in the variables. Table 4-40 shows the noise level of each technology expressed in terms of Sound Exposure Level (SEL) with the same train schedule, reference distance, and reference height. Variations in the train length and train consist are made equal in one case, whereas the original proposed train consists are retained in the other. The speed of the train can make a difference, so Table 4-40 also shows the different speed regimes with the respective SEL's. The following train consist assumptions were made in calculating the SEL:

- The proposed electric train consist was two power cars, each 70 ft. in length, with an overall train length of 466 ft.
- The proposed gas turbine train consist was one power car, 70 ft. in length, with an overall train length of 420 ft.
- Comparing only the technologies, and everything else being equal, the train consist was assumed to be one power car, 70 ft. in length, with an overall train length of 440 ft.

In Table 4-40 it can be seen that all things being equal, the electric train technology has a higher SEL when speeds are below 60 mph. However, when speeds are above 60 mph, the gas turbine technology has a slightly higher SEL. When the proposed consists are compared, the electric train technology has a higher SEL when speeds are below 60 mph. However, when speeds are above 60 mph the two technologies have an SEL of 92 dBA.

Table 4-40
Comparison of SEL Noise Level with Technology and Train Consist

Differences	Technology	Speed Regime I (0-60 mph)	Speed Regime II (60-170mph)
Difference in Technology only	Gas Turbine Train	87 dBA	92 dBA
	Electric Train	89 dBA	91 dBA
Difference in Train Consist and Technology (trains as proposed)	Gas Turbine Train	87 dBA	92 dBA
	Electric Train	92 dBA	92 dBA

Table 4-41 provides a summary of the total number of projected impacts in each category for each alternative. Alternative 3 has 16 Category 2 receptors with projected impact, which is the most for any alternative using the gas turbine train technology. There will be no impact for any Category 1 or Category 3 receptors at Design/Build Alternatives 1, 2, 3, or 4. Table 4-41 also shows that Alternative 6 will have 105 Category 2 receptors and 2 parks (Category 3 receptors) with projected impact, which is the most for any alternative using the electric train technology. There will be no impact for any Category 1 receptors at Design/Build Alternatives 5, 6, 7, or 8.

Table 4-41
Evaluation Matrix
Noise Impacts (Moderate & Severe)

ALTERNATIVES	1	2	3	4	5	6	7	8
	Gas Turbine Train Technology				Electric Train Technology			
Category 1 (Buildings and/or parks)	0	0	0	0	0	0	0	0
Category 2 (Residences, hospitals, and hotels)	15	5	16	6	53	105	38	90
Category 3 (Institutional -schools, libraries, churches, active park)	0	0	0	0	1	2	0	1

Noise Comparison of Technologies on Central Florida Greeneway (S.R. 417)

In order to compare the gas turbine train and the electric train technologies, the alignment must be considered. Alignment E2, which follows the Central Florida Greeneway (S.R. 417), is the only location where the proposals for the two technologies differed in alignment. The Fluor Bombardier Team (gas turbine train) proposed an alignment in the median of the Greeneway and the Global Rail Consortium (electric train) proposed an alignment along the northern right of

way limits of the Greeneway. Table 4-42 shows a comparison of the impacts of both technologies on each of the proposed alignments along the Greeneway.

Table 4-42
Comparison of Technology Noise Impact on Alignment E2

Greeneway Alignments Proposed by	Technology	Number of Residences Impacted		
		Moderate	Severe	Total
Fluor Bombardier Team	Gas Turbine Train	4 + 1 hotel	0	4 + 1 hotel
	Electric Train	73 + 1 hotel	10	83 + 1 hotel
Global Rail Consortium	Gas Turbine Train	10 + 2 hotels	0	10 + 2 hotels
	Electric Train	65 + 2 hotels	22	87 + 2 hotels

Noise Impacts for Institutional Land Use

Institutional land use near the corridors includes parks, schools, churches, and libraries. Table 4-43 summarizes the noise impact projections at these locations, based on the planned FHSR operations and the distance to the proposed track. The distances in the table refer to either the location of the closest building, or to the closest point of activity for sites with outdoor land use. For parks where use of the land near the tracks is not well defined, the distance to the ROW line (assumed to be 25 ft.) was used to obtain a conservative estimate of noise impact.

Table 4-43
Noise Impacts for Institutional Land Use

Alternative	Location	Receptor Location	FHSR Survey Station	Dist to Near Track (ft.)	Speed (mph)	Exist. Noise Level[1]	Project Noise Level[1]			Impact Category	Total Noise Level[1, 2]	Noise Level Increase[1, 2]	# of Impacts	
							Predicted[2]	Impact Criteria					Mod	Sev
								Imp	Sev					
5	Alignment A1	Perry Harvey Sr. Park	6029	25	35	77	69	65	75	Impact	78	0.6	1 Park	0
6	Alignment A1	Perry Harvey Sr. Park	6029	25	35	77	69	65	75	Impact	78	0.6	1 Park	0
6	Alignment E2	Shingle Creek Greenway	4881	25	97	59	71	57	63	Severe	72	12.4	0	1 Park
8	Alignment E2	Shingle Creek Greenway	4881	25	97	59	71	57	63	Severe	72	12.4	0	1 Park

Notes:
1. Noise levels are based on Leq for the daytime peak train service hour and are measured in dBA. Noise levels are rounded to the nearest decibel except for the increase in noise level, which is given to the nearest one-tenth decibel to provide a better resolution for assessing noise impact.
2. The reported noise levels represent the highest noise levels for each location.

As Table 4-43 presents, Alternatives 5, 6, and 8 are the only alternatives with projected impact on institutional land uses. These alternatives consist of the electric train technology with

projected impacts on institutional land uses at two parks. The impact is due to the close proximity of the proposed track with the distance being at the closest point of activity for Perry Harvey Sr. Park. Because the Shingle Creek Greenway is undeveloped adjacent to the Central Florida Greeneway (S.R. 417), a conservative distance was used. Currently there is no public access to the Shingle Creek Greenway in the area adjacent to the proposed project. This portion is mainly undeveloped and there are no existing facilities; therefore, usage is anticipated to be low. The proposed project is not anticipated to cause a noise level increase that would substantially impair or diminish the greenway's activities, features, or attributes.

Noise Impact Mitigation

Some potential mitigation measures for reducing noise impacts from the FHSR operations are described below:

- **Noise Barriers -** This is a common approach to reducing noise impacts from surface transportation sources. The primary requirements for an effective noise barrier are: (1) the barrier must be high enough and long enough to break the line-of-sight between the sound source and the receiver; (2) the barrier must be of an impervious material with a minimum surface density of 4 lb./sq. ft.; and (3) the barrier must not have any gaps or holes between the panels or at the bottom. Because numerous materials meet these requirements, the selection of materials for noise barriers is usually dictated by aesthetics, durability, cost, and maintenance considerations. Depending on the proximity of the barrier to the tracks and on the track elevation, rail noise barriers typically range in height from 4 to 10 ft., providing noise reductions of 5 to 10 dBA.
- **Building Sound Insulation –** Sound insulation of residences and institutional buildings to improve the outdoor-to-indoor noise reduction has been widely applied around airports, but has seen limited application for rail projects. Although this approach has no effect on noise in exterior areas, it may be the best choice for sites where noise barriers are not feasible or desirable, and for buildings where indoor sensitivity is of most concern. Substantial improvements in building sound insulation (on the order of 5 to 10 dBA) can often be achieved by adding an extra layer of glazing to windows, by sealing any holes in exterior surfaces that act as sound leaks, and by providing forced ventilation and air conditioning so that windows do not need to be opened.

As discussed in Section 3.7.2, FRA requires that severe impacts be mitigated unless there are no practical means to do so. While mitigation is encouraged at the moderate impact level, the implementation of such mitigation would depend on other project-specific factors. These other factors can include the predicted increase over existing noise levels, the types and number of noise-sensitive land uses affected, existing outdoor-to-indoor sound insulation, and the cost-effectiveness of mitigating noise to more acceptable levels.

Based on the results of the noise assessment, potential mitigation has been evaluated at all locations where severe impacts were identified. The proposed mitigation measure is the construction of sound barrier walls to shield the areas where severe impact is projected. Table 4-44 indicates the approximate noise barrier locations, lengths, and side of track, as well as the number of moderate and severe impacts both with and without the noise barrier for all of the

alternatives. As shown in the table, the proposed noise barriers are expected to eliminate all of the severe impacts. Eliminating the residual moderate noise impacts would require additional and/or enhanced noise barriers, and would also require the application of building sound insulation treatments in some locations.

Table 4-44
Potential Noise Barrier Mitigation Treatments

Alternative	Alignment	Side of Track	Survey Station	Length (ft.)	# of Residences Impacts (w/o N.B.)		# of Residences Impacts (w/ N.B.)	
					Moderate	Severe	Moderate	Severe
No- Build	No mitigation required							
1	Alignment E1	North	7679-7686	700	7	8	7	0
2	No mitigation required							
3	Alignment E1	North	7679-7686	700	7	8	7	0
4	No mitigation Required							
5	Alignment E1	North	7669-7686	1700	13	24	13	0
6	Alignment E2	North	5148-5174	2600	65	22	20	0
7	Alignment A2	North	1014-1016	200	0	1	0	0
	Alignment E1	North	7669-7686	1700	13	24	13	0
8	Alignment A2	North	1014-1016	200	0	1	0	0
	Alignment E2	North	5148-5174	2600	65	22	35	0

The results in Table 4-44 indicate that the largest amount of mitigation to eliminate all of the severe impacts would occur within Alternative 8, where 2,800 ft. of sound barrier wall would be required to eliminate all severe noise impacts. The least amount of mitigation would occur within Alternative 2 or 4, where there are no severe impacts and therefore no mitigation is required.

With regard to potential noise impacts at non-residential locations, the feasibility of noise mitigation would need further evaluation. At Perry Harvey Sr. Park, the projected impact is due to the close proximity of the park to the proposed track and ROW. As the design is finalized, noise mitigation would have to be considered in more detail to determine if the benefit is warranted.

No-Build Alternative

The No-Build Alternative is not expected to result in any noise impacts from rail; however, increases in congestion and from resulting roadway expansion would increase traffic noise levels through out the project area.

The Preferred Alternative

The Preferred Alternative (Alternative 1) will moderately impact a total of 7 residences and severely impact 8 residences, as shown in Table 4-45. The proposed mitigation measure is the construction of sound barrier walls to shield the areas where severe impact is projected. With 700 ft. of sound barrier at the appropriate location, all severe noise impacts will be eliminated.

Table 4-45
Residential Noise Impacts for Preferred Alternative

Technology	Alignment	Number of Residences Impacted		
		Moderate	Severe	Total
Gas Turbine Train	Preferred Alternative	7	8	15

4.2.4 Vibration

Vibration Impact Assessment

Vibration Impact Assessment Methodology

The potential vibration impacts from the proposed FHSR Design/Build Alternatives 1 through 8 were assessed on an absolute basis using the FRA criteria based on the proposed gas turbine train technologies (Design/Build Alternatives 1 through 4) and the proposed electric train technologies (Design/Build Alternatives 5 through 8). The following factors were used in determining potential vibration impacts along the FHSR corridor:

- Vibration source levels were based on FRA-sponsored measurements previously conducted on high speed trains similar to those proposed. Measurements of Amtrak Acela operations on the northeast corridor of the United States were used to obtain the source vibration levels for the gas turbine train. Measurements of TGV operations on the TGV Nord Line in France were used to obtain source vibration levels for the electric train.
- Vibration propagation tests were conducted at 11 sites along the proposed corridors near sensitive receptors. These tests measured the response of the ground to an input force. The results of these tests were combined with the vibration source level measurements to provide projections of vibration levels from vehicles operating on the FHSR alignments.
- The vehicle operating speeds are based on the velocity profiles that were provided by the proposals submitted, with maximum operating speeds of 125 mph for the gas turbine train and 162 mph for the electric train.

For all of the design/build alternatives, the estimated RMS velocity levels (VdB re 1 micro-in./sec.) for sensitive receptors at representative distances are provided in Table 4-38 through Table 4-45. These tables summarize the results of the analysis in terms of anticipated exceedances of the FRA criteria for "infrequent events" (defined as less than 70 events per day). The tables list the locations, the civil station, the distance to the near track, and the projected train speed at each location. In addition, the predicted project vibration level and the impact criterion level are indicated, along with the number of impacts projected for each receptor or receptor group. The criteria are discussed in more detail in Section 3.7.3.

Direct Comparison of Gas Turbine Train and Electric Train Vibration

With regard to ground-borne vibration from train operations, the major contributing factors are the primary suspension, wheel condition, speed, and the weight of the vehicle. The major difference between the vibration characteristics of the electric and the gas turbine train is that the gas turbine train has a higher vibration level at lower frequencies than the electric train. This is most likely due to the difference in weight between the two vehicles; the gas turbine train's consist weighs almost twice as much as the electric train's consist. In addition, when the ground exhibits more efficient vibration propagation characteristics at low frequencies, there is a greater difference in vibration impact between the two technologies.

No-Build Alternative

The No-Build Alternative is not expected to result in any ground-borne vibration impacts.

Alternative 1

Table 4-46 indicates that there are 33 residences, 11 hotels, and 1 commercial building (considered because it has vibration sensitive equipment) with potential vibration impact under Alternative 1. There are no impacts projected at any Category 3 (institutional) receptors. A discussion of each impacted receptor group follows.

A group of four single-family residences is located within 100 ft. of the alignment as the tracks run along I-4 through Alignment A1. These residences, located south of the proposed alignment and just west of 34th Street, would experience vibration impacts.

Two groups of single-family residences located on the north side of I-4 and west of North Bethlehem Road are located within 200 ft. of the proposed Alignment C1. In addition, a group of single-family residences, located east of Branch Forbes Road and south of I-4, is within 200 ft. of the proposed alignment. These 16 residences would experience vibration impacts.

A group of hotels, multi-family residences, and apartments located in the Lake Buena Vista area of Alignment E1 is within 400 ft. of the proposed tracks. The impacted buildings are on both sides of the alignment. In the eastern section of Alignment E1, a group of single-family residences in the Taft area of Orlando is located within 125 ft. of the proposed alignment and these homes are projected to be impacted as well. In addition, a commercial building located just west of Orange Blossom Drive is projected to be impacted based on the use of vibration sensitive equipment there. In total, Alignment E1 potentially impacts 13 residences, 11 hotels, and 1 commercial building.

Table 4-46
Vibration Impacts for Alternative 1

Location	Survey Station	Dist to Near Track (ft.)	Speed (mph)	Project Vibration Level[1,2]	Vibration Impact Criterion[1]	# of Res. Impacts
Alignment A1	6140	93	68	81	80	4
Alignment C1	1980	143	122	81	80	6
Alignment C1	1986	193	122	80	80	5
Alignment C1	2058	193	123	80	80	5
Alignment E1	7124	218	93	81	80	1 hotel
Alignment E1	7131	168	94	83	80	1 hotel
Alignment E1	7134	218	94	81	80	1 hotel
Alignment E1	7137	343	94	80	80	1 hotel
Alignment E1	7109	243	92	82	80	2
Alignment E1	7104	193	91	84	80	1
Alignment E1	7117	293	92	81	80	4
Alignment E1	7147	293	95	81	80	1 hotel
Alignment E1	7152	318	96	81	80	1 hotel
Alignment E1	7170	218	98	81	80	1 hotel
Alignment E1	7183	243	99	81	80	1 hotel
Alignment E1	7194	218	100	82	80	1 hotel
Alignment E1	7203	193	101	85	80	1 hotel
Alignment E1	7274	343	107	81	80	1 hotel
Alignment E1	7530	145	92	66	65	1[3]
Alignment E1	7673	110	93	82	80	6

Notes:
1. Vibration levels are measured in VdB referenced to 1 µin/sec.
2. The reported vibration level represents the maximum vibration level for each location.
3. Commercial building that uses lasers which can be sensitive to vibration

Alternative 2

Table 4-47 indicates that there are 20 residences with potential vibration impact under Alternative 2. There are no impacts projected at any Category 3 (institutional) receptors. A discussion of each impacted receptor group follows.

A group of four single-family residences is located within 100 ft. of the alignment as the tracks run along I-4 through Alignment A1. These residences, located south of the proposed alignment and just west of 34th Street, would experience vibration impacts.

Two groups of single-family residences located on the north side of I-4 and west of North Bethlehem Road are located within 200 ft. of the proposed Alignment C1. In addition, a group of single-family residences, located east of Branch Forbes Road and south of I-4, is within 200 ft. of the proposed alignment. These 16 residences would experience vibration impacts.

Table 4-47
Vibration Impacts for Alternative 2

Location	Survey Station	Dist to Near Track (ft.)	Speed (mph)	Project Vibration Level[1,2]	Vibration Impact Criterion[1]	# of Res. Impacts
Alignment A1	6140	93	68	81	80	4
Alignment C1	1980	143	122	81	80	6
Alignment C1	1986	193	122	80	80	5
Alignment C1	2058	193	123	80	80	5

Notes:
1. Vibration levels are measured in VdB referenced to 1 µin/sec.
2. The reported vibration level represents the maximum vibration level for each location.

Alternative 3

Table 4-48 indicates that there are 29 residences, 11 hotels, and 1 commercial building (considered because it has vibration sensitive equipment) with potential vibration impact under Alternative 3. There are no impacts projected at any Category 3 (institutional) receptors. A discussion of each impacted receptor group follows.

Two groups of single-family residences located on the north side of I-4 and west of North Bethlehem Road are located within 200 ft. of the proposed Alignment C1. In addition, a group of single-family residences, located east of Branch Forbes Road and south of I-4, is within 200 ft. of the proposed alignment. These 16 residences would experience vibration impacts.

A group of hotels, multi-family residences, and apartments located in the Lake Buena Vista area of Alignment E1 is within 400 ft. of the proposed tracks. The impacted buildings are on both sides of the alignment. In the eastern section of Alignment E1, a group of single-family residences in the Taft area of Orlando, Florida, is located within 125 ft. of the proposed alignment and these homes are projected to be impacted as well. In addition, a commercial building located just west of Orange Blossom Drive is projected to be impacted based on the use of vibration sensitive equipment there. In total, Alignment E1 potentially impacts 13 residences, 11 hotels, and 1 commercial building.

Table 4-48
Vibration Impacts for Alternative 3

Location	Survey Station	Dist to Near Track (ft.)	Speed (mph)	Project Vibration Level[1,2]	Vibration Impact Criterion[1]	# of Res. Impacts
Alignment C1	1980	143	122	81	80	6
Alignment C1	1986	193	122	80	80	5
Alignment C1	2058	193	123	80	80	5
Alignment E1	7124	218	93	81	80	1 hotel
Alignment E1	7131	168	94	83	80	1 hotel
Alignment E1	7134	218	94	81	80	1 hotel
Alignment E1	7137	343	94	80	80	1 hotel
Alignment E1	7109	243	92	82	80	2
Alignment E1	7104	193	91	84	80	1
Alignment E1	7117	293	92	81	80	4
Alignment E1	7147	293	95	81	80	1 hotel
Alignment E1	7152	318	96	81	80	1 hotel
Alignment E1	7170	218	98	81	80	1 hotel
Alignment E1	7183	243	99	81	80	1 hotel
Alignment E1	7194	218	100	82	80	1 hotel
Alignment E1	7203	193	101	85	80	1 hotel
Alignment E1	7274	343	107	81	80	1 hotel
Alignment E1	7530	145	92	66	65	1[3]
Alignment E1	7673	110	93	82	80	6

Notes:
1. Vibration levels are measured in VdB referenced to 1 µin/sec.
2. The reported vibration level represents the maximum vibration level for each location.
3. Commercial building that uses lasers which can be sensitive to vibration

Alternative 4

Table 4-49 indicates that there are 16 residences with potential vibration impact under Alternative 4. There are no impacts projected at any Category 3 (institutional) receptors. A discussion of each impacted receptor group follows.

Two groups of single-family residences located on the north side of I-4 and west of North Bethlehem Road are located within 200 ft. of the proposed Alignment C1. In addition, a group of single-family residences, located east of Branch Forbes Road and south of I-4, is within 200 ft. of the proposed alignment. These 16 residences would experience vibration impacts.

Table 4-49
Vibration Impacts for Alternative 4

Location	Survey Station	Dist to Near Track (ft.)	Speed (mph)	Project Vibration Level[1,2]	Vibration Impact Criterion[1]	# of Res. Impacts
Alignment C1	1980	143	122	81	80	6
Alignment C1	1986	193	122	80	80	5
Alignment C1	2058	193	123	80	80	5

Notes:
1. Vibration levels are measured in VdB referenced to 1 µin/sec.
2. The reported vibration level represents the maximum vibration level for each location.

Alternative 5

Table 4-50 indicates that there are 7 residences, 6 hotels, and 1 commercial building (considered because it has vibration sensitive equipment) with potential vibration impact under Alternative 5. There are no impacts projected at any Category 3 (institutional) receptors. A discussion of each impacted receptor group follows.

A group of four single-family residences is located within 100 ft. of Alignment A1 as the tracks run along I-4. These residences, located south of the proposed alignment and just west of 34th Street, would experience vibration impacts.

A group of four hotels near the Celebration area on the south side of I-4, is located within 300 ft. of the proposed Alignment D1. All of these hotels would experience vibration impacts.

A group of hotels, multi-family residences, and apartments located in the Lake Buena Vista area of Alignment E1 is within 325 ft. of the proposed tracks. The impacted buildings are located on both sides of the alignment. In addition, a commercial building, located just west of Orange Blossom Drive, is projected to be impacted due to the use of vibration sensitive equipment on-site. In total, 3 residences, 2 hotels, and 1 commercial building would likely experience vibration impacts.

Table 4-50
Vibration Impacts for Alternative 5

Location	Survey Station	Dist to Near Track (ft.)	Speed (mph)	Project Vibration Level[1,2]	Vibration Impact Criterion[1]	# of Res. Impacts
Alignment A1	6140	93	91	80	80	4
Alignment D1	4470	243	162	83	80	1 hotel
Alignment D1	4534	143	162	85	80	1 hotel
Alignment D1	4536	218	162	82	80	1 hotel
Alignment D1	4540	218	162	82	80	1 hotel
Alignment E1	7131	168	162	82	80	1 hotel
Alignment E1	7109	243	162	81	80	2
Alignment E1	7104	193	162	83	80	1
Alignment E1	7203	193	162	83	80	1 hotel
Alignment E1	7530	143	120	67	65	1[3]

Notes:
1. Vibration levels are measured in VdB referenced to 1 μin/sec.
2. The reported vibration level represents the maximum vibration level for each location.
3. Commercial building that uses lasers which can be sensitive to vibration

Alternative 6

Table 4-51 indicates that there are 4 residences and 1 hotel with potential vibration impact under Alternative 6. There are no impacts projected at any Category 3 (institutional) receptors. A discussion of each impacted receptor group follows.

A group of four single-family residences is located within 100 ft. of Alignment A1 as the tracks run along I-4. These residences, located south of the proposed alignment and just west of 34th Street, would experience vibration impacts.

One hotel near the Celebration area on the south side of I-4, is located within 300 ft. of the proposed Alignment D1. This hotel would experience vibration impacts.

Table 4-51
Vibration Impacts for Alternative 6

Location	Survey Station	Dist to Near Track (ft.)	Speed (mph)	Project Vibration Level[1,2]	Vibration Impact Criterion[1]	# of Res. Impacts
Alignment A1	6140	93	91	80	80	4
Alignment D1	4470	243	162	83	80	1 hotel

Notes:
1. Vibration levels are measured in VdB referenced to 1 µin/sec.
2. The reported vibration level represents the maximum vibration level for each location.

Alternative 7

Table 4-52 indicates that there are 3 residences, 6 hotels, and 1 commercial building (considered because it has vibration sensitive equipment) with potential vibration impact under Alternative 7. There are no impacts projected at any Category 3 (institutional) receptors. A discussion of each impacted receptor group follows.

A group of four hotels near the Celebration area on the south side of I-4, is located within 300 ft. of the proposed Alignment D1. All of these hotels would experience vibration impacts.

A group of hotels, multi-family residences, and apartments located in the Lake Buena Vista area of Alignment E1 is within 325 ft. of the proposed tracks. The impacted buildings are located on both sides of the alignment. In addition, a commercial building, located just west of Orange Blossom Drive, is projected to be impacted due to the use of vibration sensitive equipment on-site. In total, 3 residences, 2 hotels, and 1 commercial building would likely experience vibration impacts.

Table 4-52
Vibration Impacts for Alternative 7

Location	Survey Station	Dist to Near Track (ft.)	Speed (mph)	Project Vibration Level[1,2]	Vibration Impact Criterion[1]	# of Res. Impacts
Alignment D1	4470	243	162	83	80	1 hotel
Alignment D1	4534	143	162	85	80	1 hotel
Alignment D1	4536	218	162	82	80	1 hotel
Alignment D1	4540	218	162	82	80	1 hotel
Alignment E1	7131	168	162	82	80	1 hotel
Alignment E1	7109	243	162	81	80	2
Alignment E1	7104	193	162	83	80	1
Alignment E1	7203	193	162	83	80	1 hotel
Alignment E1	7530	143	120	67	65	1[3]

Notes:
1. Vibration levels are measured in VdB referenced to 1 µin/sec.
2. The reported vibration level represents the maximum vibration level for each location.
3. Commercial building that uses lasers which can be sensitive to vibration

Alternative 8

Table 4-53 indicates that there is 1 hotel with potential vibration impact under Alternative 8. There are no impacts projected at any Category 3 (institutional) receptors. A discussion of the impacted receptor group follows.

One hotel near the Celebration area on the south side of I-4, is located within 300 ft. of the proposed Alignment D1. This hotel would experience vibration impacts.

Table 4-53
Vibration Impacts for Alternative 8

Location	Survey Station	Dist to Near Track (ft.)	Speed (mph)	Project Vibration Level[1,2]	Vibration Impact Criterion[1]	# of Res. Impacts
Alignment D1	4470	243	162	83	80	1 hotel

Notes:
1. Vibration levels are measured in VdB referenced to 1 µin/sec.
2. The reported vibration level represents the maximum vibration level for each location.

Summary of Ground-Borne Vibration Impacts

Table 4-54 provides a summary of the total number of residences, hotels, and commercial buildings where ground-borne vibration impact is projected for each design/build alternative. Table 4-54 shows that out of the four alternatives using the gas turbine train technology, Alternative 1 will have the greatest number of residences and hotels impacted by ground-borne vibration. Thirty-three residences, eleven hotels, and one commercial building are projected to have impact with Alternative 1. Table 4-54 also shows that out of the four alternatives using the electric train technology, Alternative 5 will have the greatest number of sites impacted. Seven

residences, six hotels, and one commercial building are projected to have impact with Alternative 5.

Table 4-54
Vibration Impact Summary

Proposal	Alternative	Number of Residences Impacted
Gas Turbine Train	1	33 + 11 hotels + 1 commercial building
	2	20
	3	29 + 11 hotels + 1 commercial building
	4	16
Electric Train	5	7 + 6 hotels + 1 commercial building
	6	4 + 1 hotel
	7	3 + 6 hotels + 1 commercial building
	8	1 hotel

Table 4-55 provides additional detail concerning the categories of impact within each alternative. Alternative 1 has 44 Category, 2 vibration impacts, and one Category 1 vibration impact, which is the most for any alternative using the gas turbine train technology. There will be no impact for any Category 3 receptors at Design/Build Alternatives 1, 2, 3, or 4. Table 4-56 also shows that Alternative 5 will have 13 Category, 2 vibration impacts, and one Category 1 vibration impact, which is the most for any alternative using the electric train technology. There will be no impact for any Category 3 receptors at Design/Build Alternatives 5, 6, 7, or 8.

Table 4-55
Evaluation Matrix
Vibration Impacts

	Alternatives							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	Gas Turbine Train Technology				**Electric Train Technology**			
Category 1 (Buildings and/or parks)	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**0**
Category 2 (Residences, hospitals, and hotels)	**44**	**20**	**40**	**16**	**13**	**5**	**9**	**1**
Category 3 (Institutional -schools, libraries, churches, active park)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Vibration Comparison of Technologies on the Greeneway

In order to compare the gas turbine train and the electric train technologies, the alignment must be considered. Alignment E2, which follows the Central Florida Greeneway (S.R. 417), is the only location where the proposals for the two technologies differed in alignment. However,

regardless of the technology or the alignment used, no vibration impacts are projected to occur in this area.

Preferred Alternative

The Preferred Alternative (Alternative 1) with the gas turbine train technology will have impact at a total of 33 residences, 11 hotels, and 1 commercial (impacts to 45 structures), as shown on Table 4-56. Forty-four of these impacts will occur at Category 2 receptors and 1 impact will occur at a Category 1 receptor, but no impacts will occur at Category 3 (institutional) receptors.

Table 4-56
Residential Vibration Impacts for Preferred Alternative

Technology	Alignment	Number of Residences Impacted
Gas Turbine Train	Preferred Alignment	33 + 11 hotels + 1 commercial building

Ground-Borne Vibration Impact Mitigation

The assessment assumes that the high speed rail vehicle wheels and track are maintained in good condition with regular wheel truing and rail grinding. Beyond this, there are several approaches to reduce ground-borne vibration from FHSR operation, as described in the following text.

- **Ballast Mats** - A ballast mat consists of a pad made of rubber or rubber-like material placed on an asphalt or concrete base with the normal ballast, ties, and rail on top. The reduction in ground-borne vibration provided by a ballast mat is strongly dependent on the frequency content of the vibration, design, and support of the mat.
- **Floating Slabs** - Floating slabs consist of thick concrete slabs supported by resilient pads on a concrete foundation; the tracks are mounted on top of the floating slab. Most successful floating slab installations are in subways, and their use for at-grade track is less common. Although floating slabs are designed to provide vibration reduction at lower frequencies than ballast mats, they are extremely expensive.
- **Property Acquisitions or Easements** - Additional options for avoiding vibration impacts (and noise impacts) are to purchase residences likely to be impacted by train operations or to acquire easements for such residences by paying the homeowners to accept the future train vibration conditions. These approaches are usually taken only in isolated cases where other mitigation options are infeasible, impractical, or too costly.

Vibration impacts that exceed FRA criteria are considered to be significant and warrant mitigation, if feasible. Table 4-57 indicates specific stations (defined as civil stations) along the alignments within the alternatives where mitigation has been recommended to reduce the vibration levels. The locations of the civil stations are noted along the centerline of the FHSR alignments in Appendices A-1 and A-2. At a minimum, mitigation would require the installation of ballast mats; therefore, the effects of ballast mats are presented in the table. Because the current analysis indicates that the ballast mats would not eliminate all of the projected impacts, more extensive mitigation may be considered. Vibration mitigation would be addressed in more

detail during final design. In particular, due to the unusually high ground vibration response measured in the 12.5 Hertz (Hz) to 20 Hz low-frequency range for the eastern portion of Alignment D1 and the western portion of Alignment E1, further analysis will be needed to confirm the validity of the projected impacts in that area. The additional analysis, conducted during final design, will consist of supplemental vibration propagation tests at sites concentrated in that area, including soil-to building transfer function measurements.

Table 4-57
Recommended Locations for Vibration Mitigation

Alternative	Alignment	Survey Station	Length (ft.)	Total Number of Impacts[1]	Total Number of Impacts[1] after Ballast Mats Installed
No-Build	**No mitigation is required**				
1	A1	6135 - 6142	700	4	0
	C1	1978 - 1982	400	6	0
	C1	1986 - 1990	400	5	0
	C1	2054 - 2062	800	5	0
	E1	7102 - 7119	1700	7	7
	E1	7121 - 7126	500	1 hotel	1 hotel
	E1	7128 - 7139	1100	3 hotels	3 hotels
	E1	7144 - 7154	1000	2 hotels	2 hotels
	E1	7167 - 7172	500	1 hotel	1 hotel
	E1	7180 - 7186	600	1 hotel	1 hotel
	E1	7191 - 7198	700	1 hotel	1 hotel
	E1	7200 - 7205	500	1 hotel	1 hotel
	E1	7272 - 7276	400	1 hotel	1 hotel
	E1	7525 - 7535	1000	1	0
	E1	7671 - 7676	500	6	0
2	A1	6135 - 6142	700	4	0
	C1	1978 - 1982	400	6	0
	C1	1986 - 1990	400	5	0
	C1	2054 - 2062	800	5	0
3	C1	1978 - 1982	400	6	0
	C1	1986 - 1990	400	5	0
	1	2054 - 2062	800	5	0
	E1	7102 - 7119	1700	7	7
	E1	7121 - 7126	500	1 hotel	1 hotel
	E1	7128 - 7139	1100	3 hotels	3 hotels
	E1	7144 - 7154	1000	2 hotels	2 hotels
	E1	7167 - 7172	500	1 hotel	1 hotel
	E1	7180 - 7186	600	1 hotel	1 hotel
	E1	7191 - 7198	700	1 hotel	1 hotel
	E1	7200 - 7205	500	1 hotel	1 hotel
	E1	7272 - 7276	400	1 hotel	1 hotel
	E1	7525 - 7535	1000	1	0
	E1	7671 - 7676	500	6	0

Table 4-57
Recommended Locations for Vibration Mitigation

Alternative	Alignment	Survey Station	Length (ft.)	Total Number of Impacts[1]	Total Number of Impacts[1] after Ballast Mats Installed
4	C1	1978 - 1982	400	6	0
	C1	1986 - 1990	400	5	0
	C1	2054 - 2062	800	5	0
5	A1	6135 - 6142	700	4	0
	D1	4469 - 4472	300	1 hotel	1 hotel
	1	4532 - 4542	1000	3 hotels	3 hotels
	E1	7102 - 7112	1000	3	3
	E1	7128 - 7133	500	1 hotel	1 hotel
	E1	7200 - 7206	600	1 hotel	1 hotel
	E1	7525 - 7535	1000	1	0
6	A1	6135 - 6142	700	4	0
	D1	4469 - 4472	300	1 hotel	1 hotel
7	D1	4469 - 4472	300	1 hotel	1 hotel
	D1	4532 - 4542	1000	3 hotels	3 hotels
	E1	7102 - 7112	1000	3	3
	E1	7128 - 7133	500	1 hotel	1 hotel
	E1	7200 - 7206	600	1 hotel	1 hotel
	E1	7525 - 7535	1000	1	0
8	D1	4469 - 4472	300	1 hotel	1 hotel

Note:
1. Residences, hotels, and commercial buildings are all considered in the total

4.2.5 Wetlands

In compliance with *Presidential Executive Order 11990* entitled *"Protection of Wetlands"* and using assessment methodology, evaluation procedures, and document preparation guidance found in the following: USDOT policy (*USDOT Order 5660.1A, Preservation of the Nations Wetlands*), dated August 24, 1978 and *Title 23, CFR, Part 777,* consideration was given to protect wetland resources. In accordance with this policy, FRA and the FHSRA evaluated the potential wetland impacts of the No-Build Alternative and the proposed FHSR Design/Build Alternatives 1 through 8.

The FHSR study team assessed the potential wetland impacts by identifying jurisdictional wetlands, identifying impacts, and developing measures to avoid, minimize, and mitigate potential impacts to the greatest extent practicable. The effort included literature and field reviews, mapping, assessment of functional values of all existing wetland habitats within the study area, and coordination with the appropriate jurisdictional agencies. An extensive assessment of wetland and environmental resources for the No-Build Alternative and Design/Build Alternatives 1 through 8 is discussed within this section.

Using the resources cited in Section 3.8.2, an inventory of wetland communities and their approximate boundaries were mapped on aerial photography. Because mapping for the Southwest Florida Water Management District (SWFWMD) and National Wetland Inventory

(NWI) is conducted at a relatively coarse level of spatial accuracy (1:24,000 scale), accuracy was increased on the wetland maps by field ground verification and aerial photo-interpretation using the 1:400 scale photography. Each wetland community was then labeled using the Florida Land Use Cover and Forms Classification System[18] (FLUCFCS) and NWI classification systems. Field verification of wetland boundaries was accomplished by implementing the State of Florida wetland delineation methodology (F.A.C. 62-340) and the USACE methodology (*Corps of Engineers Wetlands Delineation Manual).*

Field teams of environmental scientists familiar with Florida wetland communities reviewed wetland communities between September 2002 and March 2003. The teams found a wide range of wetland systems within the FHSR corridor and identified plant species composition for each wetland and adjacent upland habitats.

Based on photo-interpreted aerials and field reviews, the field team identified 1,760 wetland areas represented by 34 individual FLUCFCS categories in the study area. This represents a total of 2,401 ac. of wetland coverage. The FLUCFCS codes present within the 1,000-ft. corridor are shown in Section 3, Tables 3-26. These 34 categories fell under 10 broad wetland community types including water (FLUCFCS 500), streams and waterways (FLUCFCS 510), lakes (FLUCFCS 520), reservoirs (FLUCFCS 530), bays and estuaries (FLUCFCS 540), wetland hardwood forests (FLUCFCS 610), wetland coniferous forests (FLUCFCS 620), wetland forested mixed (FLUCFCS 630), vegetated non-forested wetlands (FLUCFCS 640), and non-vegetated wetlands (FLUCFCS 650).

A Wetland Rapid Assessment Procedure (WRAP) analysis was performed for 60 of the 69 wetlands impacted by Design/Build Alternatives 1 through 8. (Nine of the wetlands are not accessible). The WRAP analysis is used to assist in the regulatory evaluation of wetland areas. To perform the WRAP analysis, each wetland area is evaluated based upon the following criteria: wildlife utilization, wetland overstory/shrub canopy, wetland vegetative ground cover, adjacent upland support buffer field indicators of wetland hydrology, and water quality input and treatment systems. A value is determined for the existing condition and produces a final score between 0 (low quality) and 1 (high quality).

A summary of the WRAP scores for impacted wetlands by FLUCFCS category and total acreage of impact for each alignment/alternative is presented in Table 4-58. This table includes sheet numbers and alignment information for identification of wetland locations. The sheet number references are found in Appendix A.

Table 4-58
Proposed Wetland Impacts for the
FHSR Alignments/Alternatives

Sheet #	FLUCFCS	Alignment	Wetland Number	Acres	WRAP Score
Alternatives 1, 2, 5, and 6					
16	510	B1	2759705_8221027	0.49	0.38
19	630	B1	2800123_8219466	0.23	0.23
19	630	B1	2800241_8232198	0.79	0.41
Alternatives 3, 4, 7, and 8					
196	510	B2	2799508_8235102	0.71	0.38
Alternatives 1 through 8					
85	630	D1	2809487_8147442	1.42	0.17
85	630	D1	2809457_8147677	2.09	0.28
94	621	D1	2811595_8142956	2.09	0.28
96	641	D1	2811805_8142472	0.71	0.17
100	621	D1	2812882_8140419	0.10	0.11
106	631	D1	2814900_8137717	0.09	0.27
106	641	D1	2814981_8137606	0.33	0.28
110	630	D1	2816144_8136144	0.07	0.35
112	510	D1	2816537_8135373	0.15	0.55
115	510	D1	2817544_8134404	0.24	0.50
115	641	D1	2818031_8134317	1.28	0.17
110	510	D1	2816144_8136144	0.09	0.35
110	510	D1	2816272_8136023	0.14	0.55
95	621	D1	2811712_81142663	1.89	0.28
101	621	D1	8139874_2813269	0.16	0.36
106	641	D1	2814685_8137999	0.25	0.20
Alternatives 1, 3, 5, and 7					
118	510/621	E1	282515_812546	1.35	0.90
118	630	E1	281912_8133378	0.10	0.43
118	630	E1	2818551_8133429	0.52	0.49
119	510-630	E1	2819129_8133279	0.07	0.60
119	631	E1	2819255_8133145	0.26	0.18
119	640/510	E1	2819285_8133118	0.23	0.32
123	510	E1	2820467_81320	0.13	0.79
135	622	E1	2825154_8128128	0.29	0.25
137	621	E1	282516_812706	0.01	0.75
139	621	E1	282516_812556	0.41	0.75
140	510	E1	282503_812521	0.08	0.63

Table 4-58
Proposed Wetland Impacts for the
FHSR Alignments/Alternatives

Sheet #	FLUCFCS	Alignment	Wetland Number	Acres	WRAP Score
141	621	E1	2825166_8124480	0.48	0.53
144	510	E1	282516_812310	0.01	0.20
149	621	E1	2824237_8121049	0.89	0.61
152	640	E1	282338_811920	0.57	0.81
153	510	E1	2823442_8119105	0.10	0.63
153	600	E1	282339_811921	0.69	no WRAP/inaccessible
153	621	E1	2823384_8119205	0.01	no WRAP/inaccessible
184	600	E1	2823443_8119106	1.15	no WRAP/inaccessible
185	600	E1	282431_811821	0.62	no WRAP/inaccessible
139	510	E1	282518_812537	0.01	0.24
146	510	E1	2825193_8121595	0.50	0.18
146	510	E1	2825166_8122226	0.03	0.57
144	510	E1	282517_812303	0.05	0.61
119	510/630	E1	2819171_8133233	0.59	0.49
144	617	E1	282516_812303	0.07	0.89
145	617	E1	2825179_8122556	0.08	0.86
136	621	E1	282518_812721	0.14	0.47
151	621	E1	282428_812003	0.54	0.86
187	621	E1	282333_811837	1.17	0.79
183	621	E1	2823382_8119203	4.96	0.76
152	630	E1	282355_811959	0.84	0.94
Alternatives 2, 4, 6, and 8					
155	618	E2	2821296_8130335	0.23	0.31
156	630	E2	2821295_8130334	2.19	0.58
157	630	E2	2821179_813055	1.62	0.56
157	640	E2	2821191_813092	0.09	0.55
158	510	E2	2821164_8129398	0.11	0.30
158	621	E2	2821269_8129264	0.29	0.78
160	621	E2	282114_812826	0.33	0.65
164	621/510	E2	2821322_8126374	0.23	0.74
169	621	E2	282219_812402	1.54	0.64
171	621/641	E2	282206_813207	0.76	no WRAP/inaccessible
173	510	E2	282242_812265	0.69	0.30
173	600	E2	282244-812266	0.01	no WRAP
176	621	E2	282205_812024	0.44	no WRAP/inaccessible

Table 4-58
Proposed Wetland Impacts for the
FHSR Alignments/Alternatives

Sheet #	FLUCFCS	Alignment	Wetland Number	Acres	WRAP Score
178	621	E2	282201_811022	0.70	no WRAP/inaccessible
179	621	E2	282207_811850	0.00	0.44
181	510	E2	282247_811828	0.00	0.10
183	621	E2	282262_811836	0.00	no WRAP/inaccessible
180	617	E2	282245_811836	0.14	no WRAP/inaccessible

Design/Build Alternatives 1, 2, 5, and 6 have 45 wetlands within their alignments. Design/Build Alternatives 3, 4, 7, and 8 have 39 wetlands within their alignments. For the 60 wetland areas evaluated, the WRAP scores ranged from 0.10 to 0.90. The average WRAP score for all FLUCFCS categories (of impacted wetlands) is 0.48. The low WRAP scores indicate that most of the wetlands within the alignments have either been previously impacted or are of very poor quality. The only concentrations of high scores are found in Alignment E2 (Design/Build Alternatives 2, 4, 6, and 8) reflecting the high quality wetlands along the Central Florida Greeneway (S.R. 417). Most of the wetlands within the alignments are located within the median of the existing roadways or are adjacent to major transportation corridors.

While Table 4-59 focused on WRAP score (quality of the wetlands impacted), Table 4-60 summarizes the quantity of impacts by each design/build alternative. The summary Table 4-61 indicates both quantity and quality of impacts.

Table 4-59
Wetland Impact Analysis Matrix

FLUCFCS	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)
510	3.37	2.34	3.59	2.56	2.1	1.91	2.32	2.13
600	4.8	2.48	4.8	2.48	0.91	2.48	0.91	2.48
617	2.5	0.14	2.5	0.14	0.15	0.14	0.15	0.14
618	0	0.23	0	0.23	0	0.23	0	0.23
621	12.82	9.52	12.82	9.52	15.58	7.49	15.58	7.49
622	0.29	0	0.29	0	0.29	0	0.29	0
630	6.07	7.23	5.05	6.21	0.607	5.07	5.05	4.05
631	0.26	0	0.26	0	0.26	0	0.26	0
640	0.64	4.09	0.64	4.09	1.12	3.44	1.12	3.44
641	2.56	2.56	2.56	2.56	2.36	2.56	2.56	2.56
510/621	1.35	0.21	1.35	0.21	1.35	0.21	1.35	0.21
510/630	1.55	0	1.55	0	0.66	0	0.66	0
621/641	0	0.76	0	0.76	0	0.76	0	0.76
640/510	0.23	0	0.23	0	0.23	0	0.23	0

Table 4-59
Wetland Impact Analysis Matrix

FLUCFCS	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 8
	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)	Wetland Area Impacted (ac)
500	0.19	1.33	0.19	1.33	0	0.12	0	0.12
530	0.42	0	0.42	0	0	0	0	0
610	2.69	0	2.69	0	0	0	0	0
621/640	0.29	0.44	0.29	0.44	0	0	0	0
Total	**40.03**	**31.33**	**39.23**	**30.53**	**25.62**	**24.41**	**30.48**	**23.61**

Table 4-60
Evaluation Matrix
Natural Environment Impacts (Acres)

	Alternatives							
	1	2	3	4	5	6	7	8
Total Wetland Impacts	**40**	**31.3**	**39.2**	**30.5**	**25.6**	**24.4**	**30.5**	**23.6**
High Quality Wetlands	**11**	**2**	**11**	**2**	**11**	**2**	**11**	**2**

As Table 4-60 shows, the overall low number of wetland impacts in a project of approximately 93 mi. reflects the conceptual design goal of minimizing wetland impacts. The majority of wetlands are located in the alignment near Orlando at the I-4/Bee Line Expressway (S.R. 528) Interchange and the Orlando International Airport.

Alternative 1 (gas turbine train) has the most cumulative impacts and Alternative 3 (gas turbine train) has second greatest amount of impacts. These impacts reflect two factors: the large amount of wetlands within Alignment E1 (along I-4 and the I-4/Bee Line Expressway [S.R. 528] Interchange), as well as the impacts of the proposed gas turbine train alternatives operating within the ROW along the north side of the Central Florida Greeneway (S.R. 417).

Alternative 5, 6, and 8 have the least amount of impacts. This is a result of fewer impacts of the electric train to the wetlands required for the maintenance facilities near the Orlando International Airport.

FRA and FHSRA are considering a full range of mitigation options in the development of this project to avoid long-term and short-term adverse impacts to wetland resources and to avoid new construction in wetlands, wherever there is a practicable alternative. Options for mitigating the loss of wetlands would include mitigation banking, upland and/or wetland preservation, and wetland restoration, enhancement, and creation.

Wetland impacts, which would result from the construction of FHSR, are proposed to be mitigated pursuant to S. 373.4137 F.S. (Senate Bill 1986) to satisfy all mitigation requirements of Part IV, Chapter 373, F.S. and 33 U.S.C.s 1344. Under this statute, transportation improvement mitigation can be achieved through regional long range planning, rather than a project-by-project basis. The mitigation is carried out by either the FDEP or the Water Management Districts (WMD). Under S. 373.4137 F.S., mitigation of FHSR wetland impacts will be implemented through the FDEP. Each WMD has developed a regional wetland mitigation plan to address the estimated mitigation needs on an annual basis to be approved by the Florida State Legislature. The WMD will then provide wetland mitigation for specific project impacts through a corresponding mitigation project within the overall approved regional mitigation plan. The FHSRA will provide funding to the WMD for implementation of such mitigation projects. An emphasis will be placed on attempting to provide in-kind mitigation in the same local basin and in accordance with the appropriate mitigation ratios.

Under Florida Statute 373.4138, which specifically addresses FHSR, any mitigation requirements and associated costs shall be determined by negotiation between the FDEP and the FDOT, but if agreement on mitigation cost cannot be reached, the project may proceed at the rates determined according to guidance established in the statute.

No-Build Alternative

A No-Build Alternative would result in no wetland impacts. However as congestion increases and roadway improvements are required, there would be wetland impacts from roadway reconstruction.

Preferred Alternative

The Preferred Alternative (Alternative 1) will result in 40.03 ac. of wetland impacts resulting from the gas turbine train technology, of which, 11 ac. are considered high quality wetlands. Wetland impacts, which would result from the construction of FHSR, are proposed to be mitigated pursuant to S. 373.4137 F.S. (Senate Bill 1986) to satisfy all mitigation requirements of Part IV, Chapter 373, F.S. and 33 U.S.C.s 1344.

4.2.6 Aquatic Preserves

Aquatic Preserves are identified and boundaries are mapped in Part 2, Chapter 19 of the FDOT Project Development & Environment Manual[19]. A review of the FHSR study area indicates there are no aquatic preserves within the FHSR project limits, as defined in the manual.

4.2.7 Water Quality Impact Evaluation

The FHSR study team completed a Water Quality Impact Evaluation (WQIE) for this project. The WQIE determines the surface water and ground water impacts from the proposed FHSR.

Design/Build Alternatives

The FHSR Design/Build Alternatives 1 through 8 would be located primarily within the I-4 median and/or CSX Railroad ROW. Approximately 46 mi. of the railway would be elevated; the remaining portion would be grade-separated via retaining walls or other measures. The existing I-4 median and CSX Railroad ROW proposed for the railway consist mainly of grassed median, drainage systems, and wetlands.

Where the alignment is elevated, runoff from the deck would need to be collected via scuppers or a drainage collection system and discharged to the existing median or an existing stormwater system. The total runoff would not be affected if existing drainage patterns are maintained; however, it is likely that rainfall, currently infiltrating into a specific median area in the existing condition, may drain to a different location in the proposed condition. In such a case, the increased runoff would need to be accounted for in stormwater management facilities or other means. Runoff from the deck would require treatment, as the train is a potential source of pollutant loading.

Where the rail alignment is grade-separated, the railway would be atop open gravel, and additional impervious areas would result from the support poles and outside barrier walls; however, the fill associated with the railway would impact existing drainage patterns. Runoff from interstate lanes that drain to the median in the existing condition would need to be collected by barrier wall inlets or other means in the proposed condition. The railway itself would need to be drained with an underdrain system or other means. Both the barrier wall inlets and underdrain systems would tie into existing systems, and increased discharge at these locations would need to be accounted for. As in the elevated case, runoff from the tracks would require treatment, as the train is a potential source of pollution.

The project lies within the jurisdictions of the SWFWMD, the SFWMD, and the St. John's River Water Management District (SJRWMD). The water quality criteria associated with each agency would apply to the portion of the project within the respective district limits. The FDEP would administer the project water quality requirements.

This project is also located within the boundaries of the Floridan Aquifer and Biscayne Aquifer recharge and streamflow zones. Aquifer recharge impacts associated with this project would be minimal to none. Much of Florida, including central Florida and the FHSR corridors, is underlain by limestone that is susceptible to dissolution (karst) processes. In some areas, karst processes can dissolve sufficient portions of limestone to cause sinkholes and other surface depressions. In addition, the more porous limestone can create direct pathways for surface contaminants to enter the aquifer. Because there are few reported or observed sinkholes or other features indicative of a karst environment in the vicinity of the proposed railway corridor, karst conditions are unlikely to be an issue.

The FHSR Design/Build Alternatives 1 through 8 include seven major watersheds: Tampa Bay, Hillsborough River, Palm River, Alafia River, Peace River, Withlacoochee River, and Kissimmee River. Within these watersheds, the alternatives cross several riverine systems, including Baker Creek, Pemberton Creek, Itchepackesassa Creek, Davenport Creek, Reedy

Creek, and Bonnet Creek. All of these are FDEP Class III waters. None of these, or other project surface water receptors, are classified as Outstanding Florida Waters (OFW), Wild and Scenic Rivers, Aquatic Preserves, or Coastal Barrier Resources. To protect present and future most beneficial uses of the waters, water quality criteria have been established for each classification. The FHSR must meet criteria, which are located in rules 62-302.500 and 62-302.530 of the *Florida Administrative Code (F.A.C.)*. A completed WQIE checklist and specific WMD water quality criteria are attached (Appendix B). Please refer to the checklist for additional information.

No-Build Alternative

The No-Build alternative does not require any changes to the existing and proposed roadway drainage systems.

Preferred Alternative

The Preferred Alternative falls within the jurisdictions of the SWFWMD, the SFWMD, and the SJRWMD. The water quality criteria associated with each agency would apply to the portion of the project within the respective district limits. The FDEP would administer the project water quality requirements. The FHSR must meet criteria, which are located in rules 62-302.500 and 62-302.530 of the *F.A.C.*

4.2.8 Outstanding Florida Waters

Based on a review of the *F.A.C., Chapter 17-302.700, Outstanding Florida Waters (OFW)*, the Econlockhatchee River System and Tributaries are listed as OFW. The Econlockhatchee River System and Tributaries are located in the northeast Orlando area, approximately 9 mi. from Orlando. The OFW designation requires a higher emphasis of minimizing direct wetland impacts and higher water quality treatment standards than would be required for other wetland systems. This OFW designation also provides special protection for the water body due to its ecological and recreational significance. The proposed project does not impact the Econlockhatchee River System or its Tributaries; therefore, there are no OFW impacts.

4.2.9 Contamination

No-Build Alternative

No hazardous materials or petroleum sites would be impacted or cleanup required if the FHSR is not constructed.

Design/Build Alternatives

The FRA and FHSRA prepared two separate Contamination Screening Evaluation Reports (CSERs) in order to determine which sites pose a potential negative environmental consequence based on contamination associated with the proposed construction of the FHSR. The reports are summarized here and references are provided at the end of this section for more detailed review.

Risk rankings were assigned after reviewing data obtained from on-site reviews of the parcels, historical land use, hazardous materials, petroleum regulatory site lists, and other pertinent information. The preliminary assessment of impacts was developed following evaluation of the current project design and the availability of information regarding ROW needs.

Based upon the findings of the survey to date, 19 sites have been identified for potential contamination within the vicinity of Design/Build Alternatives 1 through 8. The sites, located along these alternatives, have the potential to involve petroleum contamination or hazardous materials as defined by FDEP. All sites were evaluated to determine risk potential and risk ratings were assigned to each site based upon field reviews, land use, historical tenancy evaluations, and regulatory agency research. The potential contamination sites within Design/Build Alternatives 1 through 8 are shown on the Concept Plans in Appendix A and Figure 4-4, and span from Hillsborough County through Orange County. Potential contamination sites are listed by alternative from west to east and north to south. The risk rating for each of the sites is also indicated as defined in Section 3.7.8.

Alternatives 1 and 5

Seven potentially contaminated sites are located within Design/Build Alternatives 1 and 5 and shown on Figure 4-4. The alignment in which they are located is also indicated on Table 4-61. Two sites are potential petroleum contamination sites; five sites are potential hazardous material sites and are listed in Table 4-61.

Table 4-61
Potential Hazardous Material Sites for Alternatives 1 and 5

Site Number	Alignment	Potential Contamination Facility	Type of Potential Contamination	Risk Rating
1	A1	Clorox	Hazardous materials	High
2	B1	Florida Chemical	Hazardous materials	High
3	C1	Taylor Road Landfill	Hazardous materials	High
4	C1	Carpenter Company	Hazardous materials	High
5	D1	Furman Landfill	Hazardous materials	High
6	E1	Speedway	Petroleum	High
7	E1	Central Florida Pipeline	Petroleum	High

Alternatives 2 and 6

Five potentially hazardous material contaminated sites (noted in Table 4-62) are located within Design/Build Alternatives 2 and 6 and shown on Figure 4-4. The alignment in which they are located is also indicated on the table. No potentially petroleum contaminated sites were identified within these alternatives.

Table 4-62
Potential Hazardous Material Sites for Alternatives 2 and 6

Site Number	Alignment	Potential Contamination Facility	Type of Potential Contamination	Risk Rating
1	A1	Clorox	Hazardous materials	High
2	B1	Florida Chemical	Hazardous materials	High
3	C1	Taylor Road Landfill	Hazardous materials	High
4	C1	Carpenter Company	Hazardous materials	High
5	D1	Furman Landfill	Hazardous materials	High

Alternatives 3 and 7

Seventeen potentially contaminated sites are located within Design/Build Alternatives 3 and 7 and shown on Figure 4-4. The alignment in which they are located is also indicated in Table 4-63. Four sites are potential petroleum contamination sites, 10 sites are potential hazardous material sites, and three sites are a combination of both hazardous materials and petroleum contamination issues.

Table 4-63
Potential Hazardous Material Sites Alternatives 3 and 7

Site Number	Alignment	Potential Contamination Facility	Type of Potential Contamination	Risk Rating
3	C1	Taylor Road Landfill	Hazardous materials	High
4	C1	Carpenter Company	Hazardous materials	High
5	D1	Furman Landfill	Hazardous materials	High
6	E1	Speedway	Petroleum	High
7	E1	Central Florida Pipeline	Petroleum	High
8	A2	Peoples Gas Systems	Hazardous materials	High
9	A2	Adamo Drive	Petroleum/ Hazardous	High
10	A2	Central Florida Pipeline	Petroleum	High
11	A2	Radiant Food Store	Petroleum	High
12	A2	Brenntag Mid South	Petroleum/ Hazardous	Medium
13	B2	CSX Transportation – Uceta Yard	Petroleum/ Hazardous	High
14	B2	Florida Steel	Hazardous materials	High
15	B2	Alaric Area Groundwater Plume	Hazardous materials	High
16	B2	Helena Chemical	Hazardous materials	High
17	B2	Stauffer Chemical	Hazardous materials	High
18	B2	Reeves Southeast Galvanizing	Hazardous materials	High
19	B2	Peak Oil/Bay Drum	Hazardous materials	High

Alternatives 4 and 8

Fifteen potentially contaminated sites are located within Design/Build Alternatives 4 and 8 and shown on Table 4-64 and Figure 4-4. The alignment in which they are located is also indicated in the table. Two sites are potential petroleum contamination sites, 10 sites are potential hazardous material sites, and three sites are a combination of both hazardous materials and petroleum contamination issues.

Table 4-64
Potential Hazardous Material Sites Alternatives 4 and 8

Site Number	Alignment	Potential Contamination Facility	Type of Potential Contamination	Risk Rating
3	C1	Taylor Road Landfill	Hazardous materials	High
4	C1	Carpenter Company	Hazardous materials	High
5	D1	Furman Landfill	Hazardous materials	High
8	A2	Peoples Gas Systems	Hazardous materials	High
9	A2	Adamo Drive	Petroleum/ Hazardous	High
10	A2	Central Florida Pipeline	Petroleum	High
11	A2	Radiant Food Store	Petroleum	High
12	A2	Brenntag Mid South	Petroleum/ Hazardous	Medium
13	B2	CSX Transportation – Uceta Yard	Petroleum/ Hazardous	High
14	B2	Florida Steel	Hazardous materials	High
15	B2	Alaric Area Groundwater Plume	Hazardous materials	High
16	B2	Helena Chemical	Hazardous materials	High
17	B2	Stauffer Chemical	Hazardous materials	High
18	B2	Reeves Southeast Galvanizing	Hazardous materials	High
19	B2	Peak Oil/Bay Drum	Hazardous materials	High

Stations/Maintenance Facilities

No potentially contaminated sites are associated with the proposed Tampa station, Lakeland stations, Disney station, OCCC station, or the Orlando International Airport station locations.

In addition, no potentially contaminated sites are associated with either of the two proposed maintenance yard locations.

Table 4-65 summarizes potential high ranked hazardous materials and petroleum impacts for each Design/Build Alternative 1 through 8.

Table 4-65
Impact Evaluation Matrix
Potential Contamination Sites

	Alternatives							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Potential Petroleum Sites	2	0	7	5	2	0	7	5
Potential Hazardous Materials Sites	5	5	12	12	5	5	12	12

The number of high and medium ranking sites varies by alternative from a total of five sites (Alternatives 2 and 6) to 19 sites (Alternatives 3 and 7). Most of these sites occur near or along the former and existing CSX tracks. Generally the greater the number of high or median risk sites, the greater the final cleanup costs.

Preferred Alternative

The Preferred Alternative contains five potentially hazardous material contaminated sites and two potentially petroleum contaminated sites. There are no potentially contaminated sites associated with the preferred station locations and maintenance yard.

The sites identified will be investigated further prior to any construction. Investigative work will include visual inspection, monitoring of ongoing cleanups, and possible subsurface investigations. At known contamination sites, estimated areas of contamination will be marked on design drawings. Prior to construction, any necessary cleanup plans will be developed. Actual cleanup will take place during construction, if feasible. Special provisions for handling unexpected contamination discovered during construction will be included in the construction plans package.

4.2.10 Wild and Scenic Rivers

The Loxahatchee, Myakka, and Wekiva are the only Wild and Scenic Rivers listed in Florida under *F.A.C. Chapter 62-302.700 (9)(j)*. None of the three rivers are in or near the project limits. A review of the Southeastern Rivers Inventory was also conducted. There are no rivers listed on the Southeastern Rivers Inventory within or near the project limits. The Hillsborough River, Tampa Bypass Canal, Reedy Creek, Shingle Creek, Boggy Creek, and Bonnet Creek are not listed in the National Park Service Southeastern Rivers Inventory; therefore, the coordination requirement for the Wild and Scenic Rivers Act does not apply to this project.

4.2.11 Floodplain and Floodway Impact Evaluation

In accordance with *Executive Order 11988 "Floodplain Management"*, USDOT Order *5650.2 and Chapter 23, CFR 650A*, the FHSR Design/Build Alternatives 1 through 8 were evaluated for

possible impacts to floodplains and floodways. Federal Emergency Management Agency (FEMA) Flood Insurance Maps (FIRM) were used to estimate floodplain impacts. FEMA FIRMs and FEMA Flood Insurance Studies (FIS) were used to estimate floodway impacts. Floodplain and floodway impacts were determined by assuming a railway corridor 44 to 60 ft. wide and multiplying this width by the FEMA FIRM Zone A and B areas crossed by the FHSR alignments within the alternatives.

The floodplain and floodway impacts estimated are conservative as much of I-4 and the associated median is likely above the 100-year floodplain shown on FEMA FIRM maps. In addition, areas of the railway that are elevated would be out of the FEMA designated floodplains and floodways and impacts would be substantially less than estimated. Subsequent to final design, during which impacts would be minimized, floodplain and floodway impacts would again be determined.

Table 4-66 summarizes the location of floodplain and floodway impacts by alignment and the alternatives that contain those alignments. More significant floodplain and floodway impacts occur in Alignments D1, E1, and E2. In Alignment D1, floodplain impacts are primarily associated with the FHSR crossing over Itchepackesassa and Davenport Creeks. Table 4-67 provides an overview of the anticipated impacts to floodplains and floodways for each of the Design/Build Alternatives 1 through 8. The impacts range from 54.5 ac. to a high of 61 ac.

Table 4-66
Potentially Impacted Floodplains and Floodways

Alignment	Floodplain impacted (ac.)	Floodway Impacted (ac.)	Alternative
A1	0.32	0	1, 2, 5, and 6
A2	2.85	0	3, 4, 7, and 8
B1	0.9	0	1, 2, 5, and 6
B2	2.53	0	3, 4, 7, and 8
C1	6.94	0.34	All
D1	28.96	2.68	All
E1	19.76	6.43	1,3, 5, and 7
E2	17.42	3.45	2, 4, 6, and 8

Table 4-67
Summary of Potentially Impacted Floodplains and Floodways

	Alternatives							
	1	2	3	4	5	6	7	8
Base Floodplain Encroachment (ac.)	**56.88**	**54.54**	**61.04**	**58.70**	**56.88**	**54.54**	**61.04**	**58.70**
Base Floodway Encroachment (ac.)	**9.45**	**6.47**	**9.45**	**6.47**	**9.45**	**6.47**	**9.45**	**6.47**

No-Build Alternative

The No-Build Alternative would not impact any floodways or floodplains; however, future construction of planned transportation improvements in this corridor would require floodplain mitigation within the alignment identified for the FHSR.

Preferred Alternative

The Preferred Alternative would impact approximately 56.88 ac. of floodplain and approximately 9.45 ac. of floodway. Subsequent to final design, during which impacts would be minimized, floodplain and floodway impacts would again be calculated and the amount of mitigation would be determined. Coordination with the WMDs will identify areas appropriate for mitigation of the volumetric impacts of the preferred alignment that will not increase or significantly change the flood elevations and/or limits.

4.2.12 Coastal Zone Consistency

The FHSR Design/Build Alternatives are not located near or on barrier islands or coastal areas. Based on information contained in the DEIS and comments provided by the reviewing agencies, the Florida State Clearinghouse, through the FDEP, has determined that the project is consistent with the Florida Coastal Management Program (FCMP) in a letter dated June 3, 2002 (Appendix B). The Florida State Clearinghouse, through FDEP, was provided the opportunity to review project documentation to verify consistency with the FCMP throughout the PD&E Study.

4.2.13 Coastal Barrier Resources

A review of the Coastal Barrier Resource Maps described in Part 2, Chapter 26 of the FDOT Project Development and Environment Manual indicates there are no coastal barrier resource units within the FHSR project limits.

4.2.14 Wildlife and Habitat

In accordance with *Section 7(c) of the Endangered Species Act of 1973* (as amended), the project study area and its alternative alignments have been evaluated for the potential presence of

federally protected plant and animal species. The study also evaluated the occurrence of plant and animal species protected under the *Florida Endangered and Threatened Species Act* (Ch. 372.072 F.S.). A literature search and field evaluations were conducted, and coordination and consultation has been initiated with all regulatory and governing agencies, including U.S. Fish and Wildlife Service (USFWS), the Florida Fish and Wildlife Conservation Commission (FFWCC), and the National Marine Fisheries Service (NMFS). Several data sources were reviewed to determine occurrence and potential occurrence of state and federally protected plant and animal species within the study area. Information sources and databases utilized for this study include the following:

- Florida Natural Areas Inventory (FNAI) county occurrences database
- Previous PD&E Studies of the I-4 Corridor (1994 and 2002)
- State Managed Databases:
  - WMD Land Use Mapping (GIS)
  - Eagle Nest Locations
  - Breeding Atlas of Herons and Their Allies (GIS)
  - Natural Resources Conservation Service (NRCS) Soil Survey for Hillsborough, Polk, Osceola, and Orange counties

The study limits are defined as 500 ft. from the centerline of the proposed FHSR design/build alternatives. Because of the project length, vehicular evaluations were conducted whenever possible, particularly within existing ROWs. Pedestrian evaluations were conducted in areas non-accessible to vehicles. The length of the corridor made it essential to utilize existing databases, knowledge of habitat types, and biologists familiar with the project area to focus the field evaluations in areas most likely to support protected species.

Two teams of biologists performed field evaluations of the project corridors during the months of February and March 2003. Species-specific surveys were not conducted during this study because no areas were identified that would require detailed surveys for determining the occurrence of species, such as the red-cockaded woodpecker or Florida scrub jay. Moreover, species-specific surveys were conducted recently on previous studies (I-4 PD&E Studies) and additional detailed surveys within the same areas would be redundant. Field evaluations produced direct observations of two federally listed plant species, and four state-protected and one federally-protected wildlife species. Table 4-68 presents the potentially occurring protected species for this project along with their status designations. Several species observed during field evaluations include the American alligator, gopher tortoise, Florida pine snake, Southeastern American kestrel, and the Florida sandhill crane. Two federally-protected plant species were observed: scrub plum and Lewton's milkwort.

Table 4-68
Potentially Occurring Listed Wildlife Species

Scientific Name	Common Name	Federal Status	State Status	Hillsborough	Polk	Osceola	Orange
AMPHIBIANS							
Rana capito	Gopher frog		SSC	X	X	X	X
REPTILES							
Alligator mississippiensis	American alligator	T(S/A)	SSC	X	X	X	X
Drymarchon corais couperi	Eastern indigo snake	T	T	X	X	X	X
Gopherus polyphemus	Gopher tortoise		SSC	X	X	X	X
Neoseps reynoldsi	Sand skink	T	T		X	X	X
Pituophis melanoleucus mugitus	Florida pine snake		SSC	X	X	X	X
BIRDS							
Ajaia ajaja	roseate spoonbill		SSC	X	X		X
Aphelocoma coerulescens	Florida scrub-jay	T	T	X	X	X	X
Athene cunicularia floridana	Florida burrowing owl		SSC	X	X	X	X
Egretta caerulea	little blue heron		SSC	X	X	X	X
Egretta thula	Snowy egret		SSC	X	X	X	X
Egretta tricolor	tricolored heron		SSC	X	X	X	X
Eudocimus albus	white ibis		SSC	X	X	X	X
Falco sparverius paulus	Southeastern American kestrel		T	X	X	X	X
Grus canadensis pratensis	Florida sandhill crane		T	X	X	X	X
Haliaeetus leucocephalus	bald eagle	T	T	X	X	X	X
Mycteria americana	wood stork	E	E	X	X	X	X
MAMMALS							
Felis concolor coryi	Florida panther	E	E	X		X	
Ursus americanus floridanus	Florida black bear		T		X	X	X
Podomys floridanus	Florida mouse		SSC	X	X	X	X
Trichechus manatus	Florida manatee	E	E				
Sciurus niger shermani	Sherman's fox squirrel		SSC	X	X	X	X
PLANTS							
Adiantum tenerum	Brittle maidenhair fern		E	X			
Asclepias curtissii	Curtiss' milkweed		E	X	X	X	X
Asplenium auritum	auricled spleenwort		E	X			

Table 4-68
Potentially Occurring Listed Wildlife Species

Scientific Name	Common Name	Federal Status	State Status	Hillsborough	Polk	Osceola	Orange
Bonamia grandiflora	Florida bonamia	T	E	X	X	X	X
Calamintha ashei	Ashe's savory		T		X		X
Cheiroglossa palmata	hand fern		E	X	X		X
Chionanthus pygmaeus	Pygmy fringe tree	E	E	X	X	X	
Chrysopsis floridana	Florida golden aster	E	E	X			
Cladonia perforata	perforate reindeer lichen	E	E		X		
Clitoria fragrans	Pigeon-wing	T	E		X		X
Conradina brevifolia	short-leaved rosemary	E	E		X	X	
Conradina grandiflora	large-flowered rosemary		E			X	X
Crotalaria avonensis	Avon Park rabbit-bells	E	E		X		
Deeringothamnus pulchellus	beautiful pawpaw	E	E				X
Dicerandra frutescens	Scrub mint	E	E		X		
Drosera intermedia	Spoon-leaved sundew		T		X		
Eriogonum longifolium var gnaphalifolium	Scrub buckwheat	T	E			X	X
Eryngium cuneifolium	Wedge-leaved button-snakeroot	E	E		X		
Glandularia tampensis	Tampa vervain		E				X
Hartwrightia floridana	Hartwrightia		T		X		
Hypericum cumulicola	Highlands scrub hypericum	E	E		X		
Hypericum edisonianum	Edison's ascyrum		E		X		
Illicium parviflorum	star anise		E		X		X
Lechea cernua	nodding pinweed		T	X	X	X	X
Lechea divaricata	pine pinweed		E	X	X		
Liatris ohlingerae	Florida blazing star	E	E		X		
Lindera subcoriacea	bog spicebush		E				X
Lupinus westianus var aridorum	Scrub lupine	E	E		X	X	X
Matelea floridana	Florida spiny-pod		E		X		X
Monotropa hypopithys	Pinesap		E				X
Nemastylis floridana	fall-flowering ixia		E		X	X	X
Nolina atopocarpa	Florida beargrass		T			X	X
Nolina brittoniana	Britton's beargrass	E	E		X	X	X
Panicum abscissum	cutthroat grass		E		X	X	
Paronychia chartacea ssp chartacea	Paper-like nailwort	T	E		X	X	X
Peperomia humilis	terrestrial peperomia		E				X
Platanthera integra	Yellow fringeless orchid		E		X	X	X

Table 4-68
Potentially Occurring Listed Wildlife Species

Scientific Name	Common Name	Federal Status	State Status	Hillsborough	Polk	Osceola	Orange
Polygala lewtonii	Lewton's polygala	E	E		X	X	X
Polygonella basiramia	hairy jointweed	E	E		X		
Polygonella myriophylla	Small's jointweed	E	E		X	X	X
Prunus geniculata	Scrub plum	E	E	X	X	X	X
Pteroglossaspis ecristata	wild coco		T		X	X	X
Salix floridana	Florida willow		E		X		X
Schwalbea americana	Chaffseed	E	E	X			
Stylisma abdita	Scrub stylisma		E		X		X
Triphora latifolia	Broad-leaved nodding-caps		E	X			
Warea amplexifolia	clasping warea	E	E		X	X	X
Warea carteri	Carter's warea	E	E		X		
Zephyranthes simpsonii	rain lily		T	X	X	X	X
Ziziphus celata	Scrub ziziphus	E	E		X		

X Species known to occur in county

FEDERAL STATUS
E Endangered: species in danger of extinction throughout all or a significant portion of its range.
T Threatened: species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
E(S/A) Endangered due to similarity of appearance to a species which is federally listed such that enforcement personnel have difficulty in attempting to differentiate between the listed and unlisted species.
T(S/A) Threatened due to similarity of appearance (see above).

STATE STATUS
E Endangered: species, subspecies, or isolated population so few or depleted in number or so restricted in range that it is in imminent danger of extinction.
T Threatened: species, subspecies, or isolated population facing a very high risk of extinction in the future.
SSC Species of Special Concern is a species, subspecies, or isolated population that is facing a moderate risk of extinction in the future

In addition to the species observed, there is a potential for the eastern indigo snake, sand skink, gopher frog, Florida panther, Florida mouse, Sherman's fox squirrel, manatee, Florida black bear, Florida scrub jay, Florida burrowing owl, bald eagle, and wood stork to occur within the project limits.

Table 4-69 summarizes the results of these evaluations, as well as evaluations performed during other studies. This table identifies species observations and potential species habitat by county, FHSR alignment, and design/build alternative. Detailed location information is provided through cross-referencing the Concept Plan sheet numbers given in this table to the plans located in Appendix A, which identify potential occurrence (based on species habitat requirements) and actual observation areas by species.

In general, the vast majority of species observed or potentially occurring were recorded outside the main area of impact. Where the FHSR is located within existing roadway medians, impacts to natural communities and protected species is almost negligible. Maintenance and station facilities have been proposed for areas outside of any roadway median; therefore, at these locations, some natural communities supporting protected species may be affected.

Protected species involvement is addressed by FHSR alignments and alternatives in the following sections. Table 4-69 presents a summary of the protected species evaluation.

Amphibians and Reptiles

A total of six species of protected reptiles and amphibians may occur, or have suitable habitat, within the FHSR study area. These include the American alligator, Eastern indigo snake, gopher tortoise, sand skink, Florida pine snake, and gopher frog.

American Alligator

An alligator was observed only once in Alignment E1, Design/Build Alternatives 1, 3, 5, and 7 in Orange County. This species can occur in any wetland system, including ditches, throughout the study area. Although some wetland systems may be affected by the proposed project, required compensation for wetland impacts would offset any effects to alligator habitat. Therefore, the FHSR project would have "no effect" on the American alligator.

Eastern Indigo Snake

The Eastern indigo snake may occur in almost any habitat at any time, and therefore may be affected by the FHSR construction in all of the alignments within Design/Build Alternatives 1 through 8. Special construction precautions would be implemented to minimize harm to this species. During final design and permitting, further coordination with the USFWS would occur to determine if a federal Incidental Take Permit (ITP) would be needed. This process was discussed with Mr. Jeff Weller, during the September 5, 2002, meeting with the USFWS, as a potential alternative to protect the indigo snake. Considering these efforts, the proposed FHSR project "may affect, but is not likely to adversely affect" the Eastern indigo snake.

Table 4-69
Protected Species Evaluation Summary

Scientific Name	Common Name	Observed	Other Evidence	Suitable Habitat	County	Alignments	Alternatives	Plan Sheet	Comments
Amphibians and Reptiles									
Alligator missipiensis	American alligator	Y	N	Y	Orange	E1	1, 3, 5, 7	164	
Drymarchon corias couperi	Eastern indigo snake	N	N	Y	All		All alternatives		Assume presence in any natural systems of the study area.
Gopherus polyphemus	gopher tortoise	Y	Y	Y	Hillsborough	C1	All alternatives	26-27	
Gopherus polyphemus	gopher tortoise	Y	N	Y	Hillsborough	C1	All alternatives	45	
Gopherus polyphemus	gopher tortoise	N	Y	Y	Hillsborough	C1	All alternatives	35-36	
Gopherus polyphemus	gopher tortoise	N	N	Y	Hillsborough	B2	2, 4, 6, 8	199	
Gopherus polyphemus	gopher tortoise	N	N	Y	Hillsborough	C1	All alternatives	35	
Gopherus polyphemus	gopher tortoise	Y	N	Y	Polk	D1	All alternatives	79, 105, 106, 87	
Gopherus polyphemus	gopher tortoise	Y	Y	Y	Polk	D1	All alternatives	107	
Gopherus polyphemus	gopher tortoise	N	N	Y	Polk		All alternatives	57, 58, 69-71, 74-77, 79-86, 97-100, 102, 103, 106, 107	
Gopherus polyphemus	gopher tortoise	N	Y	Y	Polk	D1	All alternatives	65, 84, 85, 93, 102, 104, 105	
Gopherus polyphemus	gopher tortoise	Y	N	Y	Osceola	D1,E1	All alternatives	108-115	
Gopherus polyphemus	gopher tortoise	N	N	Y	Osceola	D1, E1	All alternatives	108-122	
Gopherus polyphemus	gopher tortoise	Y	N	Y	Orange	E1, E2	All alternatives	130, 131, 177-180	
Gopherus polyphemus	gopher tortoise	N	N	Y	Orange	E1, E2	All alternatives	124-142, 152-154	
Neoseps reynoldsi	sand skink	Y	Y	Y	Polk	D1	All alternatives	105	Skinks located during surveys for I-4 expansion (pond site) in spring 2000
Neoseps reynoldsi	sand skink	N	N	Y	Osceola	E1,E2	All alternatives	113-114	Potential habitat identified

Table 4-69
Protected Species Evaluation Summary

Scientific Name	Common Name	Observed	Other Evidence	Suitable Habitat	County	Alignments	Alternatives	Plan Sheet	Comments
Pituophis melanleucus mugitus	Florida pine snake	Y	N	Y	Polk	D1	All alternatives	105, 106	
Pituophis melanleucus mugitus	Florida pine snake	N	N	Y	Polk	D1	All alternatives	95, 106, 107	
Rana capita	gopher frog	N	N	Y	Polk	D1	All alternatives	74-77, 86, 87, 97-99, 106-108	
Birds									
Aphelecoma courelescens	Florida scrub jay	Y	Y	Y	Polk	D1	All alternatives	107, 108	Birds documented previously (I-4 expansion studies in 1994 and 2000). Jays cross I-4.
Athene cunicularia	Florida burrowing owl	N	N	Y	Polk	D1	All alternatives	57, 58, 69-71, 74-77, 79-87, 95, 97-99, 102-107	
Falco sparverius paulus	Southeastern American kestrel	Y	N	Y	Hillsborough	C1	All alternatives	35, 36	
Falco sparverius paulus	Southeastern American kestrel	N	N	Y	Hillsborough	C1	All alternatives	32, 43-45, 49	
Falco sparverius paulus	Southeastern American kestrel	N	Y	Y	Polk	D1	All alternatives	87	
Falco sparverius paulus	Southeastern American kestrel	N	N	Y	Polk	D1	All alternatives	73-77, 79, 80, 86, 89, 91, 92, 95, 97-101, 106, 107	
Falco sparverius paulus	Southeastern American kestrel	N	N	Y	Osceola	D1	All alternatives	110-111	
Grus canadensis pratensis	Florida sandhill crane	Y	Y	Y	Hillsborough	C1	All alternatives	49	
Grus canadensis pratensis	Florida sandhill crane	Y	N	Y	Hillsborough	C1	All alternatives	46	
Grus canadensis pratensis	Florida sandhill crane	N	N	Y	Hillsborough	B1, C1	All alternatives	14, 15, 25-27, 53	
Grus canadensis pratensis	Florida sandhill crane	Y	N	Y	Polk	D1	All alternatives	74-76, 79, 80, 100	
Grus canadensis pratensis	Florida sandhill crane	N	N	Y	Polk	D1	All alternatives	57, 58, 69-71, 73-78, 81-84, 87-89, 95-99, 106, 107	
Grus canadensis	Florida sandhill	Y	Y	Y	Orange	E1	1, 3, 5, 7	130-132,	

Table 4-69
Protected Species Evaluation Summary

Scientific Name	Common Name	Observed	Other Evidence	Suitable Habitat	County	Alignments	Alternatives	Plan Sheet	Comments
pratensis	crane							137, 141, 143, 146-148, 151	
Haliaeetus leucocephalus	bald eagle	N	Y	Y	Polk	D1	All alternatives	68	Eagles abandoned nest because the tree is dead; osprey observed in tree, not nest.
Mycteria americana	wood stork	N	N	Y	All		All alternatives		Species may forage in any wetland system, including ditches, throughout the study area
Mammals									
Felis concolor coryi	Florida panther			N	Hillsborough	B1		20	Roadkilled cat (UCFP51) was recorded on I-4 March 10, 2003 by the FFWCC.
Felis concolor coryi	Florida panther	N/A	Y	N	Osceola/ Orange	D1	All alternatives	Not known	
Podomys floridana	Florida mouse	N	Y	Y	Polk	D1	All alternatives	86, 87, 106-108	
Podomys floridana	Florida mouse	N	N	Y	Polk	D1	All alternatives	107	
Podomys floridana	Florida mouse	Y	N	Y	Orange	E1	1, 3, 5, 7	130, 131	
Podomys floridana	Florida mouse	N	N	Y	Orange	E2	All alternatives	123-138, 152-154	
Sciurus niger shermani	Sherman's fox squirrel	N	N	Y	Hillsborough	C1	All alternatives	43, 44, 46, 49, 53	
Sciurus niger shermani	Sherman's fox squirrel	N	N	Y	Polk	D1	All alternatives	74-77, 95, 97, 101, 102, 106, 107, 108	
Sciurus niger shermani	Sherman's fox squirrel	N	N	Y	Osceola	E1, E2	All alternatives	110, 111	
Plants									
Polygala lewtonii	Lewton's milkwort	Y	N	Y	Polk	D1	All alternatives	105, 106	
Prunus geniculata	Scrub plum	Y	N	Y	Polk	D1	All alternatives	105	Scrub plum located during surveys for I-4 expansion (pond site) in spring 2000

Gopher Tortoise, Florida Mouse, and Gopher Frog

Aside from creating a shelter for its own protection, the gopher tortoise burrow provides shelter for the protected Florida mouse and gopher frog, as well. Evidence of gopher tortoise occurrence, direct observations, or suitable habitat was identified within Alignments B2, C1, D1, E1, and E2. Because of this, all proposed design/build alternatives have the potential to affect these three species. To avoid adverse affects to the gopher tortoise, an ITP would be acquired from the FFWCC prior to any construction activity in areas were tortoises are known to occur. Although the permit is issued for the gopher tortoise, the permitting process provides protection for the Florida mouse and gopher frog. Through this effort, the proposed project "may affect, but is not likely to adversely affect" the gopher tortoise, Florida mouse, and gopher frog.

Sand Skink

This lizard occurs exclusively along Florida's Central Ridge System in xeric scrub habitat, or areas that were historically scrub, but converted to other uses such as pasture. During field evaluations, sand skink habitat was identified in Alignment E1 and E2 within Osceola County only. Under a previous study (spring 2000) that evaluated proposed stormwater management sites for the I-4 expansion in Polk County, sand skinks were observed in Alignment D1 (Polk County) at the southeastern quadrant of the U.S. 27 interchange. Based upon the identification of sand skink habitat within Alignments D1, E1 and E2, surveys will be conducted during the design/build phase and prior to permitting. The surveys will be conducted, in potentially suitable habitat, between March 1st and May 15th in accordance with the USFWS' draft protocol. Further coordination with the USFWS will take place prior to the initiation of the surveys and to coordinate any potential impacts during the design/build phase of the FHSR project. The proposed project "may affect, but is not likely to adversely affect" the sand skink.

Florida Pine Snake

During field evaluations, one pine snake was observed and other suitable habitat was identified within Alignment D1 along I-4 in Polk County. None of the proposed design/build alternatives would impact these areas; therefore, the proposed project would have "no effect" on the Florida pine snake.

Birds

A total of six species of birds have been identified to occur, or have suitable habitat within the FHSR study area. These include the Florida scrub jay, Florida burrowing owl, Southeastern American kestrel, Florida sandhill crane, bald eagle, and wood stork.

Florida Scrub Jay

Recent PD&E studies of the I-4 corridor in Polk County within Alignment D1 recorded scrub jays that utilize habitat areas on either side of the interstate at the crossing of C.R. 54. The FDOT has committed to providing mitigation for potential impacts to the scrub jay associated with the proposed expansion of I-4. The FDOT Highlands County mitigation bank would be

used to accomplish this mitigation. Because the FDOT would provide mitigation for impacts to scrub jay habitat and no additional habitat occurs along any of the proposed design/build alternatives, the FHSR project would have "no effect" on the Florida scrub jay.

Florida Burrowing Owl

Suitable burrowing owl habitat has been identified in Polk County, outside of the I-4 ROW, but no owl or evidence of occurrence was located along Alignment D1 within any of the proposed design/build alternatives. Because the FHSR project is planned to be within the I-4 median in Polk County, the project would have "no effect" on the Florida burrowing owl.

Southeastern American Kestrel

Kestrels are a small species of falcon that occur throughout much of North America. Suitable habitat for the kestrel was reported within Hillsborough, Polk, and Osceola counties (Alignments C1 and D1) along the I-4 ROW. Some of these areas also supported potential nest sites (cavity tree), although no birds were recorded nesting. A kestrel was observed in Hillsborough County within Alignment C1, but it could not be confirmed if this bird was the protected Southeastern American subspecies or the more northern, non-protected migratory American kestrel, which occurs in Florida during this period (February and March).

Impacts to kestrel habitat would only occur through the removal of an active nest site. It is not anticipated that suitable kestrel habitat or potential nest sites would be impacted by any of the proposed FHSR Design/Build alternatives. Therefore, the FHSR project would have "no effect" on the Southeastern American kestrel.

Florida Sandhill Crane

Florida sandhill crane habitat is abundant along all of the proposed alignments for the FHSR Design/Build alternatives, especially in Hillsborough and Polk County, with some suitable habitat areas in Orange County. Cranes were also observed in all three counties, with active nesting recorded from within the study area in Hillsborough County. Disruption of an active nest is illegal; therefore, nest sites are protected from construction activities. To eliminate any adverse affect to suitable nesting habitat proximal to any proposed construction, those areas would be surveyed during the breeding season (January – June) to determine nesting activity. If nesting is observed, the FFWCC would be contacted for further instruction on how to proceed with construction. By following this procedure, the proposed project "may affect, but is not likely to adversely affect" the Florida sandhill crane.

Bald Eagle

Protecting eagles from construction projects requires that certain activities be restricted within the Secondary and Primary Protection Zones (SPZ and PPZ, respectively) of the nest tree. The PPZ limit is set at a distance 750 ft. out from the nest tree, while the SPZ limit is set at a distance of 1,500 ft. Allowable activities in the PPZ are more restrictive than activities allowed within the SPZ. Both zones limit constructions activities.

The FFWCC manages a database of known eagle nest locations for the entire state. A review of this data identified several nests within 1 mi. of the FHSR study area. Nearly all of these nests are greater than 1,500 ft. from any of the proposed alignments for FHSR design/build alternatives, except for nest PO-50 in Alignment D1, Polk County, which is less than 300 ft. from the I-4 southern ROW limit. Several field reviews of this nest tree determined that it is inactive because the tree has died. No eagles were observed in the nest vicinity during several site visits. According to federal eagle protection guidelines, a nest tree is still provided protection up to five years after the last use by eagles. Because this nest was active last nesting season (2002/2003), the nest tree is still provided protection by the USFWS, but its current condition indicates that it is not a viable site. The USFWS would be contacted during the remainder of this study to discuss the viability of this nest site. If the nest site is considered viable, then standard construction precautions would be implemented to assure the nest and any nesting activity would be protected from construction. Also, prior to construction, the selected FHSR alternative would be re-evaluated to determine if any new nests have been established in proximity to the construction corridor. Considering these efforts, the proposed project "may affect, but is not likely to adversely affect" the bald eagle.

Wood Stork

The wood stork nests in colonies, typically in swamps that are proximal to seasonally isolated wetlands. These colony sites may also be used for roosting during the non-nesting season, resulting in year-round use by the wood stork. The USFWS has recently implemented changes to its wood stork colony protection guidelines. These new guidelines state that impacts to appropriate wetland systems within an 18.6-mi. radius of a colony may directly affect colony productivity. The radius area, known as the Core Foraging Area (CFA), is defined as the distance storks may fly from the colony to capture prey for their young. According to the new guidelines, appropriate wetlands that are impacted within the CFA must be mitigated within that same CFA.

No colonies or wood stork roosts were identified within the study area during surveys. However, the FFWCC maintains a colony location database, which reports seven active wood stork colonies within 18.6 mi. of the project corridor in Hillsborough (three), Polk (three) and Orange (one) counties. These colony locations would affect all of the proposed FHSR Design/Build Alternatives. Table 4-70 presents colony location data in relation to the FHSR project study area.

Table 4-70
Wood Stork Colonies within 18.6 Miles
(Core Foraging Area) of the Proposed Corridors

County	Colony Number	Township	Range	Quarter Section	Number Of Individuals	Distance To Closest Alignment(Miles)
Hillsborough	611310	27S	19E	SW03	33	11.79
Hillsborough	615105	30S	22E	NE16	60	10.76
Hillsborough	615333	Key	Key	Key	30	7.44
Polk	612316	28S	24E	SE32	90	5.66
Polk	616114	30S	23E	SW01	90	10.29
Polk	616117	29S	25E	SE09	20	12.17
Orange	612320	22S	31E	NE20	40	11.31

During the permitting phase of final design, a more comprehensive determination of wetland involvement would be developed. During this time, impacts to CFA wetlands would be quantified. Coordination with the USFWS would continue to assure that appropriate mitigation would be provided for impacts to these CFAs. With these efforts, the proposed project "may affect, but is not likely to adversely affect" the wood stork.

Protected Wading Birds

The snowy egret, little blue heron, tricolored heron, white ibis, and roseate spoonbill are protected as State Species of Concern (SSC). During the breeding season, these birds also nest in aggregations known as colonies. The state provides specific protection to wading bird colonies in order to prevent disturbances in nesting productivity. These species also rely primarily on wetland systems, including ditches, as foraging habitat.

The FFWCC maintains a database of wading bird colony locations. This data was evaluated to determine potential involvement with the project. No wading bird colonies were located in the project vicinity during the field evaluations, nor were any identified in the project vicinity when the database was reviewed. Moreover, no protected wading birds were observed during the field evaluations.

Because no colonies occur proximal to any of the FHSR alignments within the proposed design/build alternatives, none would be disrupted by the construction and operation of the FHSR. Additionally, although wetlands would be impacted by construction, required wetland mitigation would compensate for impacts to foraging habitat. Therefore, the FHSR project "may affect, but is not likely to adversely affect" state protected wading bird species.

Mammals

Five species of protected mammals have been identified to occur, or have suitable habitat within the FHSR study area. These include the Florida panther, Florida mouse, Sherman's fox squirrel, manatee, and the Florida black bear.

Florida Panther

The USFWS recognizes viable habitat for this species as occurring only in extreme southwest Florida; however, some panthers have been dispersing northward recently. A radio-collared panther (cat 62) crossed I-4 near the Osceola/Orange County line (Alignments E1 and E2) in March 2000, which is an area shared by all the proposed design/build alternatives. On March 10, 2003, while attempting to cross I-4 in Hillsborough County, a male panther was killed by a vehicle 0.25 mi. east of the I-75 interchange (Alignment C1). Although both crossings of I-4 raise concerns about the possibility of panthers attempting to cross this roadway in the future, the FHSR project should not inhibit any possible future crossings of I-4 or any other roadway associated with this project because the railway would be elevated. Moreover, the wildlife agencies do not consider any part of the proposed FHSR alignments as panther habitat. In fact, the March 2003 crossing occurred in a highly developed part of Hillsborough County with little natural area or prey availability.

Although vehicle-caused mortality may raise concerns for panthers crossing I-4 in the future, the proposed FHSR design would not increase this concern because it would be elevated. Moreover, the USFWS does not consider any areas along the proposed FHSR Design/Build alternatives as important to the future existence of the panther. Therefore, the proposed project would have "no effect" on the Florida panther.

Sherman's Fox Squirrel

No Sherman's fox squirrels were observed during the field evaluations, but suitable habitat is located within Alignments C1, D1, E1, and E2 of the proposed FHSR Design/Build Alternatives 1 through 8 (Hillsborough, Polk and Osceola counties). The FFWCC prohibits the removal of active fox squirrel nests. No suitable fox squirrel nesting habitat occurs within any roadway median or ROW, or railroad ROW; therefore, surveys for nest sites would occur only at impact areas outside of any existing transportation ROW. In an effort to minimize or eliminate any adverse affects to the fox squirrel, areas supporting suitable habitat outside of existing transportation ROWs would be surveyed for nests just prior to construction in those areas. If an active nest is located during these surveys, the FFWCC would be contacted for guidance on assuring no adverse effect. Therefore, the proposed FHSR project "may affect, but is not likely to adversely affect" the Sherman's fox squirrel.

Manatee

Impacts to the manatee could occur through the construction of bridges over waterways utilized by the manatee. The only waterway within the study area that is known to support the manatee is the Tampa Bypass Canal located in Alignments B1 and B2 in Hillsborough County. Water

control structures, however, are located downstream of the proposed crossing for the alignments, preventing manatees from reaching the project study area. Therefore, the proposed project would have "no effect" on the manatee.

Florida Black Bear

In the Green Swamp, a large wetland ecosystem with a southern boundary adjacent to I-4 in eastern Hillsborough and Polk counties (Alignments C1 and D1), a small black bear population occurs. The FFWCC does not recognize this population as viable due to its size. The FFWCC focuses bear management strategies on eight other, more substantial populations, which occur throughout Florida. Furthermore, the FFWCC recognizes several bear Strategic Habitat Conservation Areas (SHCA) throughout the state and has prioritized land acquisition to secure these areas for bear conservation. No black bear SHCA are identified in the vicinity of any of the proposed FHSR Design/Build alternatives. Additionally, no black bears, or evidence of their occurrence, were observed during field evaluations. Therefore, the proposed project would have "no effect" on the Florida black bear.

Protected Plants

The FNAI database identified 50 plant species that may occur in all four counties of this study. State and federal law protects 24 of these plants, while the remaining 26 are protected by state law only. Results of the current field evaluation and those conducted for the FDOT I-4 PD&E Study (pond site study) located two federally endangered plant species. In the same area that supports the only known sand skink population of this study, scrub plum was documented. Also in Polk County (Alignment D1), Lewton's milkwort was observed. These two areas, however, would not be impacted by any of the proposed FHSR Design/Build Alternatives. Therefore, the proposed project would have "no effect" on protected plant species.

Design/Build Alternatives

As discussed in the previous subsections, the proposed FHSR design/build alternatives potential impact to protected animals, plants or their habitat are identified.

No-Build Alternative

Under the No-Build Alternative, protected species would not be impacted, and no plant or animal habitat would be removed by construction of the FHSR.

Preferred Alternative

The Preferred Alternative will have "no effect" on the following species: American alligator, Florida pine snake, Florida scrub jay, Florida burrowing owl, Southeastern American kestrel, Florida panther, manatee, Florida black bear, and protected plant species. The Preferred Alternative "may effect, but is not likely to adversely effect" the following species: Eastern indigo snake, gopher tortoise, Florida mouse, gopher frog, sand skink, Florida sandhill crane, bald eagle, wood stork, state protected wading bird species, and Sherman's fox squirrel. As part

of mitigation commitments, FHSRA will continue to coordinate with USFWS, the WMDs, and FFWCC to develop design and construction methods to avoid and minimize impacts to these species.

4.2.15 Farmlands

In accordance with *7 CFR Part 658*, the Comprehensive Plans and Future Land Use Maps for Hillsborough, Polk, Osceola, and Orange counties; the cities of Tampa, Plant City, Lakeland, and Orlando; and the Reedy Creek Improvement District were reviewed as part of the farmlands assessment process. Land uses in the vicinity of the proposed FHSR Design/Build Alternatives 1 through 8, station locations, and maintenance facilities include mixed use, commercial, industrial, all densities of residential, and rural/agricultural. Coordination with the NRCS was initiated in April 2003. The NRCS requested a letter be submitted, along with the farmlands conversion form, in order for the NRCS to give concurrence that no farmlands (including prime or unique) as defined by *7 CFR Part 658* are located in the project vicinity. The letter and the farmlands conversion form were mailed to the NRCS on April 17, 2003. In a letter dated April 25, 2003, the NRCS concurred that, ". . . there is no prime or unique farmland which would impact this proposed project." A copy of the letter is included in Appendix B.

There are no farmlands, as defined by *7 CFR Part 658,* located in the project vicinity. Therefore, the provisions of the *Farmland Protection Act of 1984* do not apply to this project.

4.2.16 Energy

This section describes the net energy resource consumption estimated for the analysis year 2010 for each of the proposed design/build alternatives. The net energy consumption represents the total estimated direct annual energy consumption of each alternative for train propulsion, station operation, and system maintenance, less the reduction in motor fuel consumption from the estimated reduction in VMT on Florida's highways. Indirect energy (e.g., energy expended by the initial construction activities or the energy content of the vehicles or infrastructure) is not included in these estimates. Fuel consumption rates were not adjusted for localized changes in congestion, so it is possible that some relatively small additional fuels savings might occur. The majority of the travelers diverted to the FHSR are longer-distance travelers from automobiles; therefore, savings from overall highway VMT reduction should represent most of the fuel savings.

The estimates are discussed in separate subsections for train propulsion, highway travel, and O&M.

Energy Methodology

For the gas turbine train, Alternatives 1 through 4, the propulsion energy (gallons of diesel fuel) was based on information provided in the proposal, as discussed in the Vehicle Emissions subsection, with minor adjustments for alignment length. For the electric train, Alternatives 5 through 8, the electric energy required for train propulsion was estimated by simulating train operation for Alternative 6, with mileage-based adjustments for the other alternatives. To derive

energy requirements at the generating station, a power factor of 0.91 was assumed, as well as transmission and distribution losses of 8 percent. The estimates of the effective heat equivalent of the power electric power required assumed a thermal efficiency of 45 percent at the generating station. Power requirements for mileage adjustments were made on the basis of per-mile energy consumption for 100-mph operation on tangent track. Overall allowances of 17.8 percent and 10.5 percent, in addition to the energy requirements for revenue train service, were made for non-revenue train movement and train idle hours for the gas turbine and electric trains, respectively.

Highway energy savings were limited to automobile passenger travel and, therefore, are expressed in gallons of gasoline. Energy requirements were estimated based on 25 VMT per gallon for the trips being diverted to FHSR, and at 20 VMT per gallon for the auto access portion of trips using FHSR.

Energy requirements for O&M were made from unit consumption rates of electricity for station operation and system maintenance for Alternatives 2 (gas turbine train) and 6 (electric train), and making mileage- and station-related adjustments for the other alternatives. Quantities (station and platform areas, route-miles, and track-miles) for the year 2010 were derived from information submitted by the proposers.

Energy estimates are expressed in millions of British Thermal Units (MBTUs) per year. One MBTU is the energy equivalent of 1.05506×10^9 joules (SI) or 25,200 grams of oil equivalent (often used by European energy agencies).

Train Propulsion Energy

The energy estimates for train propulsion in Table 4-71 include all energy necessary to propel the trains and operate on-board amenities and equipment (i.e., ”hotel power”), both for revenue service and for all other train operation, including standing in the terminals between scheduled trips, yard moves, and equipment moves.

Direct propulsion energy requirements for the fossil-fueled gas turbine train are estimated to be considerably greater than for the electric train alternatives. When thermal losses for power generation are included, this difference is less pronounced, but still substantial. It should be borne in mind that the electric train alternatives provide about 25 percent more service (in terms of train-miles) than the gas turbine alternatives. On a train-mile basis, the total heat energy required per train-mile for the gas turbine is estimated to be about three times that for the electric train.

Table 4-71
Summary of Estimated Train Propulsion Energy Consumption for the Year 2010

	Alternatives							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Electricity (GWH)[1]	0.000	0.000	0.000	0.000	30.628	29.665	31.076	30.114
Diesel Fuel (thousands of gallons)	4,094	4,029	4,146	4,080	0	0	0	0
MBTU[2] excluding thermal losses from generation	540,540	531,828	547,272	538,560	104,507	101,221	106,035	102,753
MBTU including thermal losses from generation[3]	540,540	531,828	547,272	538,560	232,237	224,935	235,634	228,340

Notes:
1 Gigawatt hours (millions of KWH) at the generating station
2 Diesel fuel converted at 132,000 British Thermal Units (BTU) per gallon; electricity at 3412 BTU per kilowatt hour (KWH).
3 Thermal efficiency of 45 percent assumed for electric power generation

Highway Energy Consumption

The diversion of highway travelers to FHSR is estimated to cause a net decrease in gasoline consumption on Florida's highways, as indicated in Table 4-72. Decreases are indicated in parentheses. The estimated gasoline savings for the "Bee Line" Alternatives (1, 3, 5, and 7) are higher than for the "Greeneway" Alternatives (2, 4, 6, and 8).

Table 4-72
Summary of Estimated Highway Energy Consumption Change for the Year 2010

	Alternatives							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
'Rider' VMT at 25 mpg (millions)	(25.751)	(20.673)	(25.751)	(20.673)	(25.751)	(20.673)	(25.751)	(20.673)
'Access' VMT at 20 mpg (millions)	4.670	4.352	4.670	4.352	4.670	4.352	4.670	4.352
Gasoline (thousands of gallons)	(796.5)	(609.3)	(796.5)	(609.3)	(796.5)	(609.3)	(796.5)	(609.3)
MBTU[1]	(90,403)	(69,156)	(90,403)	(69,156)	(90,403)	(69,156)	(90,403)	(69,156)

Notes:
1 Gasoline converted at 113,500 BTU per gallon.

Operations and Maintenance (O&M) Energy Consumption

The O&M estimates include all direct project requirements, other than train propulsion energy, which is described in the subsection Train Propulsion Energy. These estimates (including thermal losses for electric power generation) are shown in Table 4-73 for the following general categories:

- Station operations, including: station Heating, Ventilation, and Air Conditioning (HVAC) (electric) and lighting and parking lot illumination. The difference in energy consumption from station operations is due entirely to differences in the proposed stations proposed by the gas turbine and electric train alternatives. The stations proposed for the gas turbine alternatives are relatively small; platforms are relatively narrow and only a modest amount of station parking is provided. The stations proposed for the electric train alternatives provide 1.5-2 times as much space per passenger in the stations, almost three times as much on platforms, and about 2.5 times as much parking capacity.
- Maintenance of equipment (MOE), including operation of the central maintenance facility and train washing operations. The difference between the gas turbine and electric train alternatives here is due to the significantly larger maintenance facility proposed by the electric train alternatives (170,000 vs. 115,000 sq. ft.).
- Maintenance of way (MOW), consisting chiefly of fuels for ROW security patrols and transport of crews, material, and equipment to wayside sites. The requirement for the electric train alternatives is higher because of the need to maintain the overhead traction power supply system, and because of the higher-capacity full double-track configuration of the electric train alternatives.

Overall, energy requirements for O&M are to be about twice as high for the electric alternatives as for the gas turbine alternatives. This is primarily a result of higher capacity 'built in' to the electric train alternatives, in the form of larger stations and maintenance facilities.

Table 4-73
Summary of Estimated O&M Energy Consumption (MBTU per year)

	Alternatives							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Electricity (GWH) excluding thermal losses	5.779	5.311	5.779	5.311	12.043	10.717	12.043	10.717
Gasoline (thousands of gallons)	43.1	42.6	43.8	43.2	58.7	57.9	59.6	58.8
Station Operation MBTU (including thermal losses)	20,946	17,391	20,946	17,391	57,563	47,510	57,563	47,510
MOE MBTU (including thermal losses)	22,876	22,876	22,876	22,876	33,757	33,757	33,757	33,757
MOW MBTU (including thermal losses)	4,896	4,830	4,967	4,901	6,666	6,576	6,763	6,673
Total MBTU (including thermal losses)	48,718	45,098	48,789	45,169	97,986	87,844	98,082	87,940

Total Energy Consumption

Table 4-74 presents the energy subtotals from the preceding subsections and combines them into a project net total for each of the design/build alternatives. The estimated change in net energy consumption for 2010, including thermal losses for electric power generation, ranges between 239,820 and 514,574 MBTUs, with the electric train alternatives' net consumption being considerably lower than the gas turbine train alternatives'. The total change is a very small fraction (less than $1/20^{th}$ of one percent) of Florida's total energy consumption for surface transportation (all non-military vehicle operation on highways, railroads, and fixed-guideway public transportation), which is estimated to reach one quadrillion BTUs (i.e., 1,000,000,000 MBTU) by 2010.

Table 4-74
Summary of Estimated Net Energy Consumption (Change from 2010 No-Build in MBTU), including thermal losses for electric power generation

	Alternatives							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Propulsion	540,540	531,828	547,272	538,560	232,237	224,935	235,634	228,340
Highway	(90,403)	(69,156)	(90,403)	(69,156)	(90,403)	(69,156)	(90,403)	(69,156)
Operations	48,718	45,098	48,789	45,169	97,986	87,844	98,082	87,949
TOTAL	498,855	507,770	505,658	514,574	239,820	243,623	243,314	247,124

No-Build Alternative

Under the No-Build Alternative, no additional energy needs would be required for the propulsion or operations of the train due to the construction of the FHSR. The net decrease in gasoline consumption on Florida's highways of 90,403 MBTU would also not occur with the No-Build Alternative.

Preferred Alternative

The Preferred Alternative would result in a net increase of energy consumption by 498,855 MBTU, accounting for the propulsion and operation of the FHSR as well as the reduction of gasoline consumption by diverting automobile ridership.

4.2.17 Utilities

The locations of major utilities within the FHSR study area were assessed by contacting all of the utility companies with existing facilities in the study area. To determine what facilities exist within the project limits, all utilities were provided with sets of aerial maps of the study area for identifying the location of existing and planned facilities. All information received from the various utility companies is located in the project file. Major utilities were determined to be those utilities that could influence the location and design of the FHSR project. The utility companies and the types of utilities located within proposed Design/Build Alternatives 1 through 8, station locations, and maintenance facilities are identified in Table 4-75.

The proposed FHSR design/build alternatives may require the relocation of some of the existing utilities. The majority of the existing utilities cross the FHSR alignments and would require provision of adequate depth beneath the tracks or vertical clearance over the tracks to accommodate for appropriate utility lines and equipment. Coordination with all affected utilities would be completed during final design.

Table 4-75
Utilities within Alternatives 1 through 8

Utility	Address	City	State	Zip	Type
ACSI Network Technology	4181 E. Lake Meadow Lane P.O. Box 307	Hernando	FL	34442	Telecommunications
Adelphia	1202 Tech Blvd. Suite 205	Tampa	FL	33619	Television
Adelphia Business Solutions	Two Harbour Place 302 Knights Run Ave. Suite 1025	Tampa	FL	33602	Telecommunications
Adelphia Cable Communications of Orlando	4305 Vineland Road Suite G-2	Orlando	FL	32811	Television
AT&T, C/O PEA	5422 Carrier Dr., Suite 203	Orlando	FL	32819	Telecommunications
BellSouth of Orlando	5100 Steyr St.	Orlando	FL	32819-9522	Telecommunications

Table 4-75
Utilities within Alternatives 1 through 8

Utility	Address	City	State	Zip	Type
Broadwing Communications	1122 Capitol of Texas Highway South	Austin	TX	78746	Telecommunications
Broadwing Communications	5915 S. Rio Grande Ave. Suite 200	Orlando	FL	32809	Telecommunications
Business Telecom	4300 Six Forks Road	Raleigh	NC	37609	Telecommunications
Central Florida Gas	1705 7th Street S.W.	Winter Haven	FL	33880	Gas
Central Florida Pipeline	2101 Gaty Dr.	Tampa	FL	33605	Gas
City Of Auburndale	P.O. Box 186	Auburndale	FL	33823	Municipality
City of Davenport	P.O. Box 125	Davenport	FL	33836	Municipality
City of Haines City	P.O. Box 1507	Haines City	FL	33845	Municipality
City of Kissimmee Dept. of Water Resources	101 North Church St.	Kissimmee	FL	34741-5054	Water
City of Lake Alfred	155 East Pomelo St.	Lake Alfred	FL	33850	Municipality
City of Lakeland Electric & Fiber	501 E. Lemon St.	Lakeland	FL	33801	Power
City of Lakeland - Water Department	501 E. Lemon Street MC-A33	Lakeland	FL	33801	Water
City of Lakeland Gas	501 E. Lemon St.	Lakeland	FL	33801	Gas
City of Orlando Bureau of Wastewater	5100 L.B. McLeod Rd.	Orlando	FL	32811	Sewer
City of Plant City Engineering Division	302 W. Reynolds St.	Plant City	FL	33566	Municipality
City of Tampa Dept. of Sanitary Sewers	306 E. Jackson St. 6N	Tampa	FL	33602	Sewer
City of Tampa Water Department	306 E. Jackson St., 5E	Tampa	FL	33602	Water
Colorado Boxed Beef Company	P.O. Box 899	Winter Haven	FL	33882	Rail
Cutrale Citrus Juices USA, Inc.	602 Mckean St.	Auburndale	FL	33821	Rail
E.Spire Communications	400 N. Tampa St. Suite 900	Tampa	FL	33602	Telecommunications
Epik Communications	3501 Quadrangle Blvd	Orlando	FL	32817	Telecommunications
FL Governmental Utilities Authority	614 N. Wymore Rd.	Winter Park	FL	32789	Water
Florida Gas Transmission Lakeland	1544 N. Combee Rd.	Lakeland	FL	33801	Gas
Florida Gas Transmission Lines Orlando	7990 Steer Lake Rd.	Orlando	FL	32835	Gas
Florida Gas Trasmission	601 South Lake Destiny Dr., Suite 450	Maitland	FL	32751	Gas
Florida Power Corp.	3250 Bonnet Creek Rd. P.O. Box 10000	Lake Buena Vista	FL	32830	Power
Florida Water Services Intercession City	P.O. Box 609520	Orlando	FL	32860	Water
Florida Water Services Windsong					Water
FPL FiberNet	FN-GO 9250 W. Flagler St.	Miami	FL	33174	Telecommunications

Table 4-75
Utilities within Alternatives 1 through 8

Utility	Address	City	State	Zip	Type
Frontier Communications International	435 W. Commercial St.	E. Rochester	NY	14445	Telecommunications
Hillsborough County Water	601 E. Kennedy Blvd. 19th Floor	Tampa	FL	33602	Water
Intermedia Communications of FL, Inc.	4200 W. Cypress Suite 680	Tampa	FL	33609	Telecommunications
Kissimmee Utility Authority	1701 West Carroll St.	Kissimmee	FL	34741	Municipality
Level 3 Communications	1025 El Dorado Ave 13C04	Broomfield	CO	80021	Telecommunications
MCI Worldcom	69 W. Concord St.	Orlando	FL	32801	Telecommunications
Orange County Utilities Engineering	109 E. Church St. Suite 300	Orlando	FL	32817	Municipality
Orlando Orange County Expressway Authority Fiber	525 S. Magnolia Ave.	Orlando	FL	32801	Telecommunications
Orlando Utilities Commission	500 South Orange Ave.	Orlando	FL	32802	Municipality
Polk County Utilities	305 N. Jackson Ave. P.O. Box 2019	Bartow	FL	33831	Municipality
Progress Telecom	362 13th Ave. South	St. Petersburg	FL	33701	Telecommunications
Sprint Florida	33 N. Main St.	Winter Garden	FL	34787	Telecommunications
Tampa Bay Water	2535 Landmark Dr Suite 211	Clearwater	FL	33761	Water
Tampa Electric Company	P.O. Box 111	Tampa	FL	33601	Power
TECO / People Gas	1400 Channelside Drive	Tampa	FL	33605	Gas
Teleport Communications Group/ ATT Local Services	6015 Benjamin Road Suite 306	Tampa	FL	33634	Telecommunications
Time Warner Communications	525 Grand Regency Blvd.	Brandon	FL	33510-3933	Television
Time Warner Communications	844 Maguire Road	Ocoee	FL	34761	Television
Verizon Florida, Inc.	10402 N. 56th St.	Temple Terrace	FL	33617	Telecommunications
Vista United Telephone Company	751 Back Stage Lane	Lake Buena Vista	FL	32830-1000	Telecommunications
Walt Disney Dig Permitting					Telecommunications
Williams Communications, LLC	One Technology Center. Mail Drop TC-11A	Tulsa	OK	74121-2064	Telecommunications

No-Build Alternative

Under the No-Build Alternative, no utilities would be disrupted or relocated.

Preferred Alternative

The Preferred Alternative would require the relocation of some of the existing utilities. The majority of the existing utilities cross the Preferred Alternative and would require provision of adequate depth beneath the tracks or vertical clearance over the tracks to accommodate for appropriate utility lines and equipment. Coordination with all affected utilities would be completed during final design.

4.3 TRANSPORTATION IMPACTS

4.3.1 Impacts to Freight Rail Operations

This section discusses the potential impacts to freight rail operations by the proposed FHSR stations and O&M facilities in Design/Build Alternatives 1 through 8.

Design/Build Alternatives 1, 2, 5, and 6

Design/Build Alternatives 1, 2, 5, and 6 begin in downtown Tampa and follow I-275 until reaching the I-4 interchange. From there, Design/Build Alternatives 1 and 5 follow I-4 into Orange County traveling along the Bee Line Expressway (S.R. 528) and Design/Build Alternatives 2 and 6 follow I-4 into Orange County traveling along the Central Florida Greeneway (S.R. 417) with the terminus at the Orlando International Airport. Because the alternatives follow I-4, the Bee Line Expressway (S.R. 528), and the Central Florida Greeneway (S.R. 417), there are no impacts to freight rail operations from the proposed rail lines, station locations, or maintenance facilities.

Design/Build Alternatives 3, 4, 7, and 8

Design/Build Alternatives 3, 4, 7, and 8 begin in the Tampa CBD and are parallel to the former CSX A-line until near the Uceta Yard where they run parallel to existing CSX freight lines until west of I-75. From I-75, the alternatives are located in the I-75 median until they reach I-4 where they run into the I-4 median. The alternatives are elevated above the existing CSX rail lines and are not expected to impact the CSX Uceta Yard or its operation or freight service.

Coordination with CSX Railroad Company, the freight operator within the FHSR corridors, identified the following issues:

- FHSR should be constructed on separate dedicated track with no interference with freight operations.

- The dedicated FHSR track should be grade-separated at high speeds with at-grade crossings permitted at lower speeds.

- CSX would sell ROW unnecessary for a two-track freight system and would not be adverse to realignment of their freight tracks to provide clearance for two FHSR tracks. The cost for track realignment would be borne by the FHSRA.

- Adequate separation between freight and passenger services would be required, plus the consideration of potential barrier system between the two operations.

This coordination resulted in the identification of the existing CSX ROW for operation of the FHSR. Any proposed FHSR alignment would require the purchase of additional ROW. The realignment of freight tracks, in order to utilize more of the existing CSX ROW, was determined to be financially unfeasible due to maintaining a two-track freight system and the minimal ROW that would become available by this potential realignment.

No-Build Alternative

The No-Build Alternative would have no effect on freight rail operations.

Preferred Alternative

The Preferred Alternative is Design/Build Alternative 1, which begins in downtown Tampa and follow I-275 until reaching the I-4 interchange. From there, it follows I-4 into Orange County traveling along the Bee Line Expressway (S.R. 528) with the terminus at the Orlando International Airport. Because the alternative follows I-4 and the Bee Line Expressway (S.R. 528), there are no impacts on freight rail operations.

4.3.2 Impacts to Highway Operations

The highway traffic demand within the proposed design/build alternatives in Tampa and Orlando is forecasted to increase in the opening year 2008. This increase in traffic would be associated with population growth, tourism, and land use development, and not with an increase in traffic due to FHSR. The FHSR line would be elevated over the roadway network in a major portion of the alternatives. Therefore, FHSR would not disrupt the operation of the roadway systems in Design/Build Alternatives 1 through 4 or Design/Build Alternatives 5 through 8, as discussed in the following paragraphs.

Design/Build Alternatives 1, 2, 5, and 6

These design/build alternatives traverse from downtown Tampa, then northeast along I-4 to Orlando. Alternatives 1 and 5 follow the Bee Line Expressway (S.R. 528) east to Taft/Vineland Road, then to Boggy Creek Road and the Orlando International Airport.

The traffic demand forecasted through the Tampa CBD exceeds an Annual Average Daily Traffic (AADT) of 170,000 vehicles per day (vpd) for I-275 and an AADT of 140,000 vpd for I-4. Although I-4 will be 6-laned through the Tampa CBD, it will remain deficient with LOS F. Vehicle trips using the interstate system to access the station in downtown Tampa would add to this deficiency.

With Alternatives 1 and 2, Laurel Street, located at the Tampa multi-modal station, would be closed between Florida Avenue and Marion Street to accommodate the rail tracks. The closing

of Laurel Street would not significantly impact traffic circulation. There is a network of collector streets and arterials surrounding the station to provide adequate circulation and access. Traffic on the surrounding local roadway network would increase, however, as a result of the vehicle trips attracted by the station. With Alternatives 5 and 6, Laurel Street would remain open.

I-4, through eastern Hillsborough County, will also be deficient as the AADT ranges from 110,000 vpd to 140,000 vpd. The interstate is forecasted to operate within acceptable conditions throughout Polk County, from Lakeland to south of Celebration. The traffic demand forecasts on I-4 in this area ranges between an AADT of 60,000 vpd to 100,000 vpd.

A station is proposed in Lakeland, with two possible sites being considered. One site is proposed north of I-4, near the Polk County Parkway. Swindell Road and Alderman Road would serve the station. These roadways and intersections would be impacted by vehicle trips attracted by the station. The other station in Lakeland is proposed northwest of I-4 and bordered by Kathleen Road (S.R. 539) and Griffin Road. These facilities are 4-lane collectors, which provide much needed travel routes between the urbanized area and suburban Lakeland. These facilities cross I-4 and would remain operational. These roadways and intersections would be impacted by vehicle trips attracted by this proposed station.

The LOS on I-4 is forecasted to be deficient through Osceola and south Orange County. The traffic demand forecasts range in AADT from 140,000 vpd to 180,000 vpd. Vehicle trips using the interstate and expressway systems to access the surrounding stations would add to this deficiency.

A station is proposed at Walt Disney World, west of I-4 between Osceola Parkway and U.S. 192. A platform would be located in the median of I-4 and a pedestrian flyover to the station would be constructed northwest over the westbound lanes of I-4 in order to link the station to a vacant parcel within Walt Disney World. This vacant parcel would then be developed into a transit stop and parking facility in order to access the FHSR station. The median of I-4 would also be reconstructed. There is no current access to the proposed station site. A new roadway approximately ½ mi. in length would need to be constructed to connect the parking area to the existing roadway network.

Along the Bee Line Expressway (S.R. 528), the traffic forecasts range from an AADT of 62,000 vpd to 64,000 vpd. This facility has reserve capacity and is expected to operate at an acceptable condition with the vehicle trips accessing the OCCC station.

The Canadian Court Intermodal Center (CCIC), proposed in the northeast corner of International Drive and the Bee Line Expressway (S.R. 528), would serve as a coordination and transfer center for multiple modes of transportation. A FHSR station is proposed at this facility. The station location, referred to as the OCCC station, would have direct access to International Drive. Extensive planning and committed roadway improvements for the CCIC project would add new roadway connections, improve operation to the area, and provide an integrated roadway network.

A maintenance facility is proposed off Boggy Creek Road between Tradeport Drive and Wetherbee Road or off of Airport Boulevard (South Access Road) near Wetherbee Road. The facility employees would generate some additional traffic; however, this would only be a minor impact to the local roadways because there is excess capacity on local roads.

Airport Boulevard is the primary artery to the multi-modal station located at the Orlando International Airport. The station would be integrated within the airport expansion to serve its multi-modal demand. A roadway system would be constructed at the airport, serving the station, as well as the airport terminal. The roadway system would stem from Airport Boulevard.

Alternatives 2 and 6 are similar to Alternatives 1 and 5 with the exception of utilization of the Central Florida Greeneway (S.R. 417) corridor, instead of the Bee Line Expressway (S.R. 528) corridor. Furthermore, the OCCC station at International Drive is not proposed with this alternative.

The travel demand forecasts for the Central Florida Greeneway (S.R. 417) range from an AADT of 34,000 vpd to 39,000 vpd. This facility has reserve capacity and is not impacted by FHSR vehicle trips traveling to the airport station.

The maintenance facility for Alternatives 2 and 6 is proposed near Airport Boulevard (South Access Road) and Wetherbee Road. The facility employees would generate few vehicle trips, resulting in only minor impact to the roadways.

Design/Build Alternatives 3, 4, 7, and 8

These alternatives are similar to Design/Build Alternatives 1, 2, 5, and 6 except in Tampa, where the corridor crosses through northern downtown to Adamo Drive and runs parallel to the Lee Roy Selmon Expressway. The alternatives continue eastward crossing to Broadway Avenue and continuing northeast to I-75. The alternatives continue north along I-75, then east along I-4 to Lakeland and Orlando. The alternatives would be elevated and would not interrupt roadway traffic. The station locations and maintenance facilities are the same as the previously described alternatives.

The travel demand forecasted for Adamo Drive ranges from an AADT of 27,000 vpd to 32,000 vpd with LOS C. The travel demand forecasted for the Lee Roy Selmon Expressway ranges from an AADT of 54,000 vpd to 59,000 vpd with LOS B/C. On Broadway Avenue, the AADT ranges from 5,000 vpd to 14,000 vpd with LOS B/C. The AADT on I-75 is forecasted at 103,000 vpd with LOS D. These facilities have reserve capacity and are expected to operate at acceptable conditions.

Although these alternatives avoid the I-275 and I-4 interchange, vehicle trips would utilize these facilities to access the downtown Tampa station. Impacts to the surrounding roadway network in Tampa would remain the same as discussed in Design/Build Alternatives 1, 2, 5, and 6. As with Alternatives 5 and 6, Laurel Street would remain open for Alternatives 7 and 8.

Diversion

The FHSR system would divert vehicle traffic from the interstate system, primarily from the I-4 corridor. Annual ridership for the FHSR was forecasted for 2010 within the study corridor. It is projected that 11 percent of the 4.5 million people that annually travel between Tampa and Orlando would be diverted to FHSR. In addition, 9 percent of the 3.4 million people that annually travel between Tampa and Lakeland, as well as 9 percent of the 3 million people that annually travel between Lakeland and Orlando, would also be diverted to FHSR.

The ridership forecasts show a reduction in the number of vehicles annually traveling on I-4 by over 750,000, based on an average of 1.4 persons per vehicle. However, this reduction would not be sufficient to significantly improve the LOS on I-4, as many segments of the roadway would still be over capacity. Further details on the diversion and candidate passengers can be found in the ridership study.

No-Build Alternative

Under the No-Build Alternative, no diversion to FHSR would occur. The absence of the diversion, which would occur under the design/build alternatives primarily on I-4 means congestion on I-4 would occur sooner. As a result, LOS would decrease sooner and the "Ultimate improvements" to I-4 would be needed earlier. The need for more immediate improvements would also occur on the Central Florida Greeneway (S.R. 417) and the Bee Line Expressway (S.R. 528).

Preferred Alternative

The Preferred Alternative is Alternative 1. Impacts to existing highway operations would be the closure of Laurel Street at the multi-modal station in downtown Tampa. A new roadway approximately ½ mi. in length would need to be constructed to connect the Walt Disney World station to the existing roadway network.

4.3.3 Ridership and Revenue

In July 2002, the FHSRA initiated investment grade ridership studies for the first phase of the FHSR project, from St. Petersburg to Orlando. The ridership study consists of four separate reports and various addenda that were issued by the FHSRA. These are:

- Summary Report (Tampa - Orlando) November 20, 2002
- Supplemental Materials November 22, 2002
- Operating Plan November 22, 2002
- Summary Report (St. Petersburg - Tampa) December 16, 2002

All four reports are included as Appendix W to the FHSRA's RFP to design, build, operate, and maintain Part 1 of the first phase of the project (i.e., Tampa to Orlando). This section summarizes the key assumptions and findings from the ridership reports. The proposals submitted for Design/Build Alternatives 1 through 4 (gas turbine train) and 5 through 8 (electric

train) both stated their ridership estimates were more conservative than those used in the FHSRA reports. Ridership revenues, not passenger estimates, are included in the two proposals. The proposals contained different operational plans as discussed in Section 2 of this FEIS.

Forecasting Process

The ridership forecasts are characterized by the FHSR as investment grade with respect to accuracy, reliability, and credibility. To meet the criteria of an investment grade, the scope of work was developed in consultation with a steering committee specifically formed to review this work and based on criteria established by the High Speed Ground Transportation Association. The criteria used to prepare these estimates include:

- Two independent opinions of ridership and revenue prepared by experienced, unbiased demand forecasting consultants.
- A peer review process using independent experts to review forecasting assumptions and procedures.
- Current surveys designed to measure characteristics of existing demand in the corridor and trip maker's attitudes and perceptions of the proposed new travel mode.
- A critical assessment of economic growth projections that are used to estimate the overall increase in travel demand.
- Adoption of conservative assumptions regarding factors affecting FHSR usage.
- Alternative model estimates (sensitivity testing) intended to quantify the impacts of different assumptions of key forecasting inputs on forecast results.
- Anticipation of "ramp-up" effects (gradual behavior change) in response to the availability of a new travel mode.
- Emphasis on near term forecasts.

Ridership Revenue Estimates

The intercity travel market between Tampa and Orlando is estimated to be 50 million trips per year. Of this total market, the candidate market (travelers in the corridor who would consider FHSR as an alternative) was estimated by the two consultants to range from 15.6 to 16.2 million trips per year in 2010. FHSR system ridership estimates for the Tampa to Orlando corridor, for intercity travel and airport access travel, are summarized in Table 4-76. This table includes ridership and revenue for both choice and captive markets in the FHSR corridor.

Design/Build Alternatives

Neither technology included ridership estimates in their proposals. Both technologies did provide revenue estimates and stated their assumptions regarding the FHSRA ridership estimates, as shown in Table 4-76.

The ridership revenues used in the gas turbine train proposal (Design/Build Alternatives 1 through 4) were adjusted based on the sensitivity analyses furnished in the FHSRA's ridership study. These adjustments were made to account for longer travel times, increased train

frequency and operating hours, higher fares, and fare increases keeping pace with inflation (2.7 percent per year).

The electric train proposal (Design/Build Alternatives 5 through 8) used conservative fare box revenues that were developed by the team based on the FHSRA's forecasts. For each of the market segments (i.e., choice and captive) and origins, a series of discount factors were developed and applied. Depending on route and market segment, these discount factors ranged from 68 to 80 percent of the FHSRA's choice and captive ridership.

Table 4-76
2010 Tampa-Orlando Ridership and Revenue Estimates

Route/Market	Annual Ridership	Annual Revenue[3]	Operating Cost
The Bee Line Expressway (S.R. 528)			$26.2 - $36.8 million[4]
Choice[1] Market	1.9 to 2.3 million	$32.9 to $35.4 million	
Captive[2] Market	0.5 million	$6.3 million	
Total	2.4 to 2.8 million	$39.3 to $41.8 million	
The Central Florida Greeneway (S.R. 417)			
Choice Market	1.7 to 1.9 million	$27.9 to $29.9 million	
Captive Market	2.1 million	$26.3 million	
Total	3.8 to 4.1 million	$54.2 t $56.0 million	

1. The choice market is that segment of the market using the corridor and diverting to FHSR based upon an independent decision of price and time competitiveness among the available modes of transportation.
2. Captive markets from the International Drive and Disney areas are estimated based on survey data. The actual value of these markets is dependent on negotiations with entities and providers currently serving these markets. The estimates of captive markets in this table assume Disney will agree to offer this ridership to the FHSR operator only if the Central Florida Greeneway (S.R. 417) alignment is selected.
3. Annual revenues are 2002 $'s.
4. Operating costs are from the FSHRA 2002 Report to the Legislature.

Key Inputs and Assumptions

Key inputs and assumptions were used in the ridership and revenue forecasts to describe the existing transportation system, socio-economic growth, station access, and rail service characteristics. Characteristics of the existing transportation system were expanded into the travel surveys and to describe competitive modes. These include:

- Highway traffic and class counts conducted continuously during the highway intercept study.
- Historic and seasonal traffic counts from FDOT data.
- Existing and future highway travel times based on FDOT urban area models with adjustments based on travel times studies conducted as part of the ridership study.
- Existing air travel in the corridor based on Federal Aviation Administration (FAA) records.
- Highway travel costs (excluding value of time) include the actual tolls paid and $0.36 per mi. for business travelers or $0.12 for non-business travelers.

Socio-Economic Growth Factors

Socio-economic growth factors were used for expanding the existing market to estimate the future travel market size in 2010 and 2025. These forecasts were taken from MPO forecasts, which were compared and found to be consistent with the forecasts prepared by the University of Florida Bureau of Economic and Business Research (BEBR).

- Population in the corridor is expected to increase 33 percent between 2002 and 2025, or 1.4 percent per year.
- Employment in the corridor is expected to increase 46 percent from 2002 to 2025, or an average of 2 percent per year.
- Hotel room growth in the corridor is expected to increase 83 percent from 2002 to 2025, or an average of 3.6 percent per year.
- Orlando International Airport passenger traffic is expected to increase from 27.1 million in 2002 to 34.8 million in 2010. These estimates of airport traffic are taken from the most recent forecasts prepared by the airport for bond financing purposes.

Station Access

Two alternative alignments were evaluated in the Orlando area studies. One of these alternatives uses the Central Florida Greeneway (S.R. 417) route from I-4 to the Orlando International Airport. The second uses the Bee Line Expressway (S.R. 528) route.

Stations along the Tampa to Orlando segment of the project were evaluated at downtown Tampa, Lakeland, Disney, the proposed Orange County Multi-modal Center, and at the Orlando International Airport. Station access characteristics were developed for each of these stations that describe access time and cost assumptions.

- Daily parking costs range from $2 to $6 per day depending on location.
- Public transportation was assumed to be free of charge to/from the OCCC / International Drive area and to/from Walt Disney World resorts and hotels. The public transportation cost for all other station locations ranged from $1.00 to $1.25 per trip.
- Station service areas were generally defined as a 5-mi. radius around each station.
- Walk times, while in the station (i.e., from curb to platform), were 10 minutes entering the station and 5 minutes exiting the station. At the Orlando International Airport, additional time was added to represent travel on the people mover and randomly arriving passenger traffic.

Rail Service Characteristics

The rails service inputs and assumptions describe key aspects of a base case operating plan that was used in the preparation of the ridership estimates. These characteristics include speed, frequency (the number of trains), and fares.

- Average speed used in the base case analysis is 113 mph based upon 150 mph technology.
- Intercity rail frequency is 14 round trip trains over a 16-hour operating day (i.e., 6 AM to 10 PM).
- Orlando area shuttle service provides 8 additional round trips per day.
- Full fares for intercity travel range from $10 (Orlando International Airport to the OCCC) to $32 (Orlando International Airport to St. Petersburg).
- Discount fares for commuters (requiring advance purchase) range from $3.25 to $11.25 per trip.
- Average travel time from Orlando to Tampa (non-stop) is 45 minutes in the base case (150 mph technology) based on an average running speed of 113 mph. Higher and lower travel times were examined as part of sensitivity analyses.
- Taxi fares ranged from $3.00 to $3.25 for the first mi. of travel and $1.75 per mi. thereafter.

4.3.4 Impact to Other Travel Modes

The impacts of the FHSR proposed Design/Build Alternatives 1 through 8 to other travel modes are determined by factors such as route, destination, cost, time, and convenience. Other modes of travel include Amtrak service, Greyhound bus, airline service, and taxi and shuttle services to and from attractions within the area of the No-Build and proposed FHSR Design/Build Alternatives 1 through 8. All travel modes are consistent throughout Design/Build Alternatives 1 through 8 and a description of the travel modes are provided below.

Amtrak

For Amtrak service, the overall operation of its passenger rail services would be affected only for the destinations that terminate in Orlando or Tampa. This would primarily affect Amtrak's bus service provided to patrons traveling between Tampa, Lakeland, and Orlando. The primary reason this route would be affected is due to the savings in cost and time that FHSR service would provide over that of Amtrak.

In Orlando, the impact could be lessened due to a door-to-door service offered by Amtrak. For those travelers ending their stop at the Orlando terminal, Amtrak offers a van service to area attractions and hotels. There is a one-way fee determined by the drop-off or pick-up location.

Travelers going beyond the Orlando or Tampa stop would presumably remain with the bus service provided by Amtrak to avoid unnecessary connections needed to transfer from a train or bus terminal. For Amtrak routes served outside the proposed FHSR Design/Build alternatives, no impacts are anticipated.

Greyhound Bus

Greyhound bus services are likely to experience similar impacts as Amtrak. Because Greyhound has a similar route and destination stops as those offered by Amtrak between Tampa and

Orlando, Greyhound bus would likely be impacted for the same reasons, savings of time and cost.

Air Travel

Air travel between Tampa and Orlando is currently served by one round trip per day departing Tampa in mid-morning and returning in the early evening. The scheduled flight between the two cities is approximately 45 minutes. However, additional time for check-in and travel to the Orlando destination from the airport, make the total trip approximately 2 hours and 45 minutes. With round trip fares ranging from $145 to $270 and lengthy estimated travel time, air travel between Tampa and Orlando is not considered to be a comparable alternative to either road or rail travel.

Taxi and Shuttle Service

The cruise industry in the Port of Tampa is growing and it provides shuttle service to and from the Tampa International Airport. Because there is no FHSR station location proposed at Tampa International Airport, little impact would be seen in the taxi and shuttle service between the airport and the cruise ships located at the Port of Tampa.

Taxi service is not likely to be competition for FHSR as the user of taxi services generally has a specific destination in mind. Shuttle services maybe impacted if FHSR destinations are the same as shuttle destinations. Shuttle services with "captive" riders or those provided transportation as part of their travel package would only be impacted if the vendor chooses to use FHSR.

No-Build Alternative

If the FHSR is not built, air service and Amtrak would continue to function at current levels, however increased congestion would likely require more travel time for bus, taxi and shuttle services.

Preferred Alternative

The Preferred Alternative would affect the Amtrak and Greyhound bus services between Tampa and Orlando due to a potential savings in cost and travel time resulting in diversion of passengers to FHSR. No impacts to other travel modes are anticipated with the Preferred Alternative. Additional local bus, taxi and/or shuttle service will likely be required at proposed stations.

4.3.5 Station Access and Traffic Impacts

The proposed stations associated with the Design/Build Alternatives 1 through 8 in Tampa, Lakeland, and Orlando would attract vehicle trips on the surrounding roadway network. Passengers would arrive at or depart from the stations by automobile and utilize the stations' parking or rental car return facilities. Other passengers would be dropped off or picked up in

automobiles, taxicabs, charter buses, or by local transit services. These impacts result from residents and tourists traveling on the FHSR system.

Tampa Station

At the station proposed as part of Design/Build Alternatives 1, 2, 3, and 4 (gas turbine train), automobile access to the curbside location by private vehicles and taxicabs is proposed on Scott Street between Tampa Street and Florida Avenue. Bus and streetcar access is proposed into the center of the multi-modal station on Franklin Street, located between Tampa Street and Florida Avenue. Parking is proposed on site north of Fortune Street between Florida Avenue and Marion Street.

At the station proposed as part of Design/Build Alternatives 5, 6, 7, and 8 (electric train) access to the station is from Laurel Street between Tampa Street and Morgan Street. Parking is proposed on-site south of Scott Street between Tampa Street and Morgan Street.

For all design/build alternatives, a number of roadways and intersections in the Tampa CBD would experience an increase in vehicle trips as a result of the Tampa station. Specifically, the roadways are Tampa Street, Florida Avenue, Marion Street, Morgan Street, Fortune Street, and Scott Street. The expressways that would experience an increase in vehicle trips are I-275, I-4, and the Lee Roy Selmon Expressway, along with their associated downtown interchanges. The percent increase in traffic on the expressways would be minor compared with the percent increase associated with population growth and tourism.

Lakeland Station

Two possible sites are being considered for the station in Lakeland. All of the Design/Build Alternatives 1 through 8 proposed a station located at the Polk County Parkway. This site has access from Swindell Road and Alderman Road. The access is proposed for all modes of vehicle travel. On-site parking is also proposed. Roadway and intersection impacts are anticipated primarily on Swindell Road and Alderman Road. I-4 and the Polk County Parkway would experience some increase in vehicle trips, along with the I-4 interchanges with County Line Road and the Polk County Parkway.

None of the design/build alternatives propose the use of the alternate site proposed as a viable site by FHSR at Kathleen Road and I-4 in Lakeland. At this site, access would occur from Kathleen Road and Griffin Road. Roadway and intersection impacts are anticipated primarily on Kathleen Road and Griffin Road. I-4 and the Polk County Parkway would also experience some increase in vehicle trips, along with the I-4 interchanges with Kathleen Road and the Polk County Parkway. The percent increase in traffic on the expressways in Lakeland would be minor compared with the percent increase associated with population growth and tourism.

Disney Station

A station is proposed at Disney on I-4, between Osceola Parkway and U.S. 192. There is no current access to the proposed station. A new roadway would be constructed to connect the site

to the existing roadway network. The expressways and associated interchanges that would experience a traffic increase are I-4, U.S. 192, and the Osceola Parkway. The station site proposed in the Disney World area for Design/Build Alternatives 1-8, is located in the median of I-4 with parking located on the north side of I-4.

Convention Center Station

The OCCC station is proposed in the northeast corner of International Drive and the Bee Line Expressway (S.R. 528). The station would coordinate and transfer passengers with the Canadian Court Intermodal Center, which connects to International Drive by way of Canadian Court. These two roadways would be impacted by the station traffic. Orange County has planned and committed extensive roadway improvements for the CCIC project that would add new roadway connections and improve operation to the area. The expressways and associated interchanges that would experience an increase in traffic are the Bee Line Expressway (S.R. 528) and I-4.

Orlando International Airport Station

For all design/build alternatives, automobile access to the Orlando International Airport station is proposed from Airport Boulevard, by way of Boggy Creek Road and the Central Florida Greeneway (S.R. 417). This access is proposed for all modes of vehicle travel with parking proposed on site. Access to the station is shared with access to the expanded airport terminal. The roadways and intersections impacted by the station are Airport Boulevard and Boggy Creek Road. The Central Florida Greeneway (S.R. 417) would experience an increase in vehicle trips, along with the interchange with Boggy Creek Road.

Maintenance Facility

Design/Build Alternatives 1, 3, 5, and 7 include proposed maintenance sites off of Airport Boulevard (South Access Road) and Wetherbee Road or a proposed site off of Boggy Creek Road. Access to the facility is proposed from Wetherbee Road. Design/Build Alternatives 2, 4, 6, and 8 include a proposed site at Airport Boulevard (South Access Road) and Wetherbee Road only. Traffic impacts to the surrounding roadways would be minor based on the projected low number of employees at the maintenance facility.

No-Build Alternative

The No-Build Alternative would result in no need for new train stations, avoiding any additional traffic accessing the stations from local highway networks, additional bus, taxi and/or shuttle service or local permits and/or approvals for station construction.

Preferred Alternative

The Preferred Alternative would locate stations and facilities with local traffic impacts per the following description:

- Tampa Station – located between Tampa Street and Morgan Street from west to east and between Fortune Street and Scott Street from south to north. Access for the station would require the closing of Laurel Street between Florida Avenue and Marion Street to accommodate the rail tracks. The closing of Laurel Street would not significantly impact traffic circulation. There is a network of collector streets and arterials surrounding the station to provide adequate circulation and access.

- Lakeland Station – northwest quadrant of the Polk Parkway and I-4 interchange. The station would have access from Swindell Road and Alderman Road. The access is proposed for all modes of vehicle travel with on-site parking. Roadway and intersection impacts are anticipated primarily on Swindell Road and Alderman Road.

- OCCC Station – northeast corner of International Drive and the Bee Line Expressway (S.R. 528). The station would coordinate and transfer passengers with the Canadian Court Intermodal Center, which connects to International Drive by way of Canadian Court.

- Disney Station – located either in the median or north of I-4 between U.S. 192 and the Osceola Parkway. A new roadway would be constructed to connect the site to the existing roadway network.

- Orlando International Airport – located at the future South Terminal expansion with access integrated with airport transportation operations from Airport Boulevard via Boggy Creek Road and the Central Florida Greeneway (S.R. 417).

- Maintenance Facility – located near Boggy Creek Road and Wetherbee Road, south of the airport. Traffic impacts to the surrounding roads would be minor.

4.4 CONSTRUCTION IMPACTS

4.4.1 Design/Build Alternatives

Construction activities for the FHSR build alternatives may have short-term air quality, noise, vibration, water quality, traffic flow, and visual effects for those residents and travelers within the immediate vicinity of the project. All of the construction impacts would be of short duration in any given location because the construction would proceed in a scheduled sequence along the chosen alternative.

The air quality impact would be temporary and primarily in the form of emissions from diesel-powered construction equipment and dust from embankment and haul road areas. Air pollution associated with the creation of airborne particles would be effectively controlled through the use

of watering or the application of other controlled materials in accordance with the FDOT's Standard Specifications for Road and Bridge Construction[20].

Noise and vibration effects would be from the heavy equipment movement and construction activities, such as pile-driving and vibratory compaction of embankments. Noise control measures would include those contained in FDOT's Standard Specifications for Road and Bridge Construction. Specific noise level problems that may arise during construction of the project would be addressed by the FHSRA's Construction Engineer.

Water quality effects resulting from erosion and sedimentation would be controlled in accordance with FDOT's Standard Specifications for Road and Bridge Construction and through the use of Best Management Practices.

The amount of mitigation required for floodway and floodplain impacts will not be determined until later in the EIS process when MOAs are developed with the FDOT and the OOCEA regarding existing and future compensation and treatment locations.

Maintenance of traffic along the abutting and intersecting roadways and the sequence of construction would be planned and scheduled to minimize traffic delays throughout the project. Signs would be used as appropriate to provide notice of road closures and other pertinent information to the traveling public. The local news media would be notified in advance of road closings and other construction-related activities in order to provide information to motorists and residents to minimize inconvenience to the community. All provisions of the FDOT's Standard Specifications for Road and Bridge Construction would be followed.

Construction of the railroad track and associated structures requires excavation of unsuitable material (muck), placement of embankments, and use of materials, such as limerock and concrete. Demucking is anticipated at most of the wetland sites and would be controlled by Section 120 of the FDOT's Standard Specifications for Road and Bridge Construction. Disposal of unsuitable materials would be on-site in detention areas or off-site. The removal of debris would be in accordance with local and state regulatory agencies permitting this operation. The contractor is responsible for his or her methods of controlling pollution on haul roads, in borrow pits, in other material pits, and in areas used for disposal of waste materials from the project. Temporary erosion control features, as specified in the FDOT's Standard Specifications for Road and Bridge Construction, Section 104, would consist of temporary grassing, sodding, mulching, sandbagging, slope drains, sediment basins, sediment checks, artificial coverings, and berms.

4.4.2 No-Build Alternative

The No-build Alternative would not result in any of the short term construction activities described above. Roadway congestion would require roadway improvements in a shorter timeframe resulting in similar impacts to FHSR.

4.4.3 Preferred Alternative

Impacts may result to residents and travelers in the immediate vicinity of the project due to the construction of the Preferred Alternative; however, they would be of short duration in any given location since the construction would proceed in a scheduled sequence. All construction will be conducted in accordance with the FDOT's Standard Specifications for Road and Bridge Construction as described in Section 4.4.1.

4.5 THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES AND MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Environmental impacts associated with the FHSR Design/Build Alternatives would result in short- and long-term impacts, some positive and some negative, but all similar in kind and magnitude. All significant short- and long-term environmental impacts identified during the development of all of the FHSR Design/Build alternatives are quantified in light of: (1) avoidance, (2) minimization, and (3) compensation for unavoidable negative impacts on resources. Impacts to wetlands, wildlife, air quality, noise, water quality, farmland, historic land use, archaeological land use, and societal resources were quantified. These analyses included an evaluation of secondary and cumulative impacts.

The development of each design/build alternative is based on planning that considers transportation needs within the context of present and future land use. The evaluation of the short-term impacts of all alternatives and the use of resources, coupled with environmentally sound design and construction best management practices (cited elsewhere is this document), result in the enhancement of the long-term productivity of the FHSR corridor, as well as the region.

In summary, the long-term enhancement that is the result of FHSR would occur at the expense of short-term construction impacts on nearby residents and businesses. These short-term effects would include localized noise, air pollution, and water pollution, in addition to roadway traffic delays. Based on the commitments to be made during this EIS process and specifications included in construction contracts, any long-term impacts would be mitigated.

Short-term employment gains during construction, as well as long-term employment opportunities as described in Section 4.1.3 of this report, would result from a FHSR system. The FHSR is consistent with the maintenance and enhancement of long-term productivity at the local, regional, state, and national level.

4.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irretrievable resources that would be committed to this project include the land needed to construct FHSR. However, most of this land within Alignments A1, B1, C1, D1, E1, and E2 is located within the ROW of existing roadways. Within Alignments A1, B1, C1, and D1, the land is located within the median of I-4. Within Alignment E1, most of the FHSR ROW needed is located on the north side of the Florida Turnpike and the Bee Line Expressway (S.R. 528) and

within the existing Taft/Vineland ROW. Within Alignment E2, most of the ROW is located on the north side of the Central Florida Greeneway (S.R. 417) ROW or on Orlando International Airport vacant land.

All of the land within existing roadway ROW has been disturbed in the construction of that facility. The existing natural systems are not of high quality within the medians and on the shoulders of the roads where much of FHSR would be located. The ROW to be used by FHSR within each facility is generally earmarked for future roadway expansion. Construction of FHSR is not an irretrievable commitment because that land could be converted into another use in the future, if necessary. At present, however, there is no reason to believe such a conversion would ever be necessary or desirable.

Fossil fuels, labor, and highway construction materials such as steel, cement, aggregate, and bituminous material would also be expended. In addition, large amounts of labor and natural resources are used in the fabrication and preparation of construction materials that are not retrievable. These resources are not in short supply, and their use would not have an adverse effect upon continued availability of these resources.

The residents and travelers in the area would benefit from the commitment of these resources by the improved quality and capacity of the transportation system. The improved transportation system would improve accessibility, safety, and air quality to offset the commitment of resources.

4.7 SUMMARY OF IMPACTS AND MITIGATION

4.7.1 Evaluation Matrix

The evaluation matrix summarizes the quantifiable impacts of the proposed FHSR Design/Build Alternatives 1 through 8 discussed in Section 4. The matrix provides an assessment of impacts for each alternative, providing the opportunity to effectively evaluate the consequences of each alternative. See Table 4-77 for the matrix. The No-Build Alternative would not affect the resources listed in Table 4-77. The Preferred Alternative (Alternative 1) is highlighted in Table 4-77.

Design/Build Alternatives 1 through 4 represent the four alignment combinations with the gas turbine train technology. Design/Build Alternatives 5 through 8 represent the four alignment combinations with the electric train technology. Figure 2-8 in Section 2 displays the alternatives and Figure 2-11 in Section 2 displays the Preferred Alternative.

Wetlands

Total wetland impacts vary from 40 ac. in Alternative 1 to 23.6 ac. in Alternative 8. The majority of the impacts are disturbed wetlands of poor quality located in the median and ditches within the ROW of I-4, I-75, the Central Florida Greeneway (S.R. 417), and the Bee Line Expressway (S.R. 528). Lesser quality wetlands also occur along the CSX tracks. High quality wetlands, which generally result in greater mitigation requirements, are impacted the greatest in

Alternatives 1, 3, 5, and 7. These wetlands primarily occur on undeveloped land along I-4 and the Bee Line Expressway (S.R. 528).

The Preferred Alternative (Alternative 1) will result in 40.03 ac. of wetland impacts, of which 11 areas are considered high quality wetlands. Wetland impacts, which would result from the construction of FHSR, are proposed to be mitigated pursuant to S. 373.4137 F.S. (Senate Bill 1986) to satisfy all mitigation requirements of Part IV, Chapter 373, F.S. and 33 U.S.C.s 1344.

Wildlife and Habitat

There are 17 federal and state protected species that have the potential or are known to occur within the FHSR study area. Six of those species are reptiles and amphibians, six are birds, three are mammals, and the remaining two are plants. The evaluation matrix indicates which design/build alternatives have the greatest number of potential sites. All of the design/build alternatives have potential sites because of their crossing the undeveloped areas near the Green Swamp in Alignments C1 and D1. Alternatives 2, 4, 6, and 8 have the most potential sites as they also include the additional ROW on the north side of the Central Florida Greeneway (S.R. 417).

The Preferred Alternative will have "no effect" on the following species: American alligator, Florida pine snake, Florida scrub jay, Florida burrowing owl, Southeastern American kestrel, Florida panther, manatee, Florida black bear, and protected plant species. The Preferred Alternative "may effect, but is not likely to adversely effect" the following species: Eastern indigo snake, gopher tortoise, Florida mouse, gopher frog, sand skink, Florida sandhill crane, bald eagle, wood stork, state protected wading bird species, and Sherman's fox squirrel. As part of mitigation commitments, FHSRA will continue to coordinate with USFWS, the WMDs, and FFWCC to develop design and construction methods to avoid and minimize impacts to these species.

Floodplains and Floodways

Impacts to floodplains vary minimally from the lowest impact of 54.5 ac. for Alternatives 2 and 6 to 61 ac. for Alternatives 3 and 7. Floodway impacts are minimal with the lowest impacts for Alternatives 2, 4, 6, and 8, and only 3 additional ac. for the rest of the alternatives. The majority of the floodway impacts are along I-4 in western Hillsborough County (Pemberton Creek), and between the Central Florida Greeneway (S.R. 417) and Orlando International Airport (Boggy Creek).

The Preferred Alternative would impact approximately 56.88 ac. of floodplain and approximately 9.45 ac. of floodway. Subsequent to final design, during which impacts would be minimized, floodplain and floodway impacts would again be calculated and the amount and type of mitigation would be determined.

Table 4-77
Design/Build Alternatives
Impact Evaluation Matrix
(Preferred Alternative Highlighted)

	Alternatives							
	1	2	3	4	5	6	7	8
NATURAL ENVIRONMENT IMPACTS (AC.)								
Total Wetland Impacts (AC.)	40	31.3	39.2	30.5	25.6	24.4	30.5	23.6
High Quality Wetlands (AC.)	11	2	11	2	11	2	11	2
Protected Species Sites	9	15	10	16	9	15	10	16
FLOODPLAIN AND FLOODWAY (AC.)								
Base Floodplain Encroachment	56.88	54.54	61.04	58.70	56.88	54.54	61.04	58.70
Base Floodway Encroachment	9.45	6.47	9.45	6.47	9.45	6.47	9.45	6.47
CONTAMINATION SITES (RANKED H)								
Potential Petroleum Sites	2	0	7	5	2	0	7	5
Potential Hazardous Materials Sites	5	5	12	12	5	5	12	12
SECTION 4(f) IMPACTS								
Recreation Facilities	1	1	0	0	1	1	0	0
Historic/Archaeological Sites	0	0	2	2	0	0	2	2
COMMUNITY SERVICES								
Schools	8	12	5	9	8	12	5	9
Community Facilities	10	9	6	5	10	9	6	5
Parks & Recreation	5	7	5	6	5	7	5	6
Cemeteries	4	6	6	6	4	6	6	6
Churches	15	16	12	13	15	16	12	13
NOISE IMPACTS (MODERATE & SEVERE)								
Category 1 (Buildings and/or parks)	0	0	0	0	0	0	0	0
Category 2 (Residences, hospitals, and hotels)	15	5	16	6	53	105	38	90
Category 3 (Institutional – schools, libraries, churches, active park)	0	0	0	0	1	2	0	1
VIBRATION IMPACTS								
Category 1 (Buildings and/or parks)	1	0	1	0	1	0	1	0
Category 2 (Residences, hospitals, and hotels)	44	20	40	16	13	5	9	1
Category 3 (Institutional – schools, libraries, churches, active park)	0	0	0	0	0	0	0	0
AIR QUALITY EMISSIONS (Net Change in Tons/Year)								
CO	-101.7	-64.7	-100.9	-63.8	-152.0	-114.3	-151.8	-114.1
NOX	+189.0	+188.2	+191.4	+190.6	+23.3	+24.1	+23.7	+24.5
VOC	+8.9	+10.6	+9.2	+10.9	-8.1	-6.1	-8.1	-6.1
ENERGY CONSUMPTION (Change from 2010 No-Build)								
Millions BTU	498,855	507,770	505,658	514,574	239,820	243,623	243,314	247,124
SECTION 106 IMPACTS								
Historic Sites	5	5	7	7	5	5	7	7
Archaeological Sites	0	0	0	0	0	0	0	0
RELOCATIONS								
Residential	3	3	0	0	3	3	0	0
Business	3	8	15	23	3	8	15	23
COST								
ROW (Non-public)	$118M	$149M	$150M	$181M	$101M	$128M	$134M	$161M
Infrastructure	$1,900M	$2,033M	$1,881M	$2,015M	$2,177M	$2,306M	$2,154M	$2,284M
Mitigation	$30M	$30M	$30M	$30M	$30M	$30M	$30M	$30M
TOTAL COST	$2.048B	$2.212B	$2.061B	$2.226B	$2.308B	$2.464B	$2.318B	$2.476B

Contamination Sites

Impacts to hazardous materials sites are minimal within the alternatives, which include the CSX tracks (Alternatives 3, 4, 7, and 8). Design/Build Alternatives 3, 4, 7, and 8 have the highest impact at 12 sites. The other alternatives each impact five or fewer sites.

The Preferred Alternative contains five potentially hazardous material contaminated sites and two potentially petroleum contaminated sites. There are no potentially contaminated sites associated with the preferred station locations and maintenance yard. The sites will be investigated further prior to any construction. Prior to construction, any necessary cleanup plans will be developed. Actual cleanup will take place during construction, if feasible.

Section 4 (f) Sites

The number of Section 4(f) sites impacted varies by alternative. Design/Build Alternatives 1, 2, 5, and 6 have one potential Section 4 (f) site, as they require 0.184 ac. from the Perry Harvey Sr. Park. Design/Build Alternatives 3, 4, 7, and 8 impact two historic sites; the St. Paul AME Church, which is NRHP-eligible, and Union Station, which is NRHP-listed.

The Preferred Alternative would result in the acquisition of 0.184 ac. from Perry Harvey Sr. Park. The Section 4(f) process is documented in Section 5 of this report.

Community Services

All of the design/build alternatives have a range of 34 to 50 different facilities within a quarter mi. of the FHSR alternative alignments; however, with the exception of acquisition of ROW from Perry Harvey Sr. Park for Design/Build Alternatives 1, 2, 5, and 6, no community services are acquired as the result of construction of any of Design/Build Alternatives 1 through 8. The majority of facilities within a quarter mile of the alternatives are churches.

The Preferred Alternative would require acquisition of ROW from Perry Harvey Sr. Park as previously discussed. No other community services would be acquired.

Noise Impacts

Noise impacts occur primarily in Category 2, residential areas, particularly with the electric train in Alternatives 6 and 8 with 105 and 90 sites impacted, respectively. Alternatives 6 and 8 are located on the north side of the Central Florida Greeneway (S.R. 417) closer to the Hunter's Creek residences. Alternatives 5 and 7, also with the electric train, have 53 and 38 sites impacted, respectively. These impacts to residences occur along the Bee Line Expressway (S.R. 528).

The Preferred Alternative would have 15 Category 2 noise impacts. The proposed mitigation measure is the construction of sound barrier walls to shield the areas where severe impact is projected. With 700 ft. of sound barrier, all severe noise impacts will be eliminated.

Vibration Impacts

The most significant vibration impacts are for Alternatives 1 through 4; the highest impacts are the result of the technology (gas turbine) within the Tampa CBD. The number of sites impacted in Alternatives 1, 2, 3, and 4 were as follows: 44, 20, 40, and 16, respectively.

The Preferred Alternative would have vibration impacts at a total of 44 residences (Category 2 receptors) and 1 Category 1 receptor. The Preferred Alternative would have no impacts at Category 3 (institutional) receptors. At a minimum, mitigation will require the installation of ballast mats near the impact sites; however, because the current analysis indicates that the ballast mats would not eliminate all of the projected impacts, more extensive mitigation will be considered. Vibration mitigation would be addressed in more detail during final design.

Air Quality

There will be no overall negative impact to regional air quality with any of the design/build alternatives, as regulated under the EPA's rules for clean air standards. However, there are differences in air emissions between the alternatives due to train technology. There is very little difference in emissions between alternatives with the same technology.

All alternatives result in CO emissions reductions because auto travel is diverted to trains. CO emissions reductions are slightly lower with the gas turbine trains, which also emit CO. VOCs also increase slightly with gas turbine trains. NOX also increase with this technology because gas turbine engines have a relatively high rate of NOX emissions. Thus, Design/Build Alternatives 1 through 4 (gas turbine train) show a substantial decrease in CO emissions, a slight increase in VOCs, and a substantial increase in NOX emissions.

The electric train technology (Design/Build Alternatives 5 through 8) results in a net decrease in CO and VOC emissions. NOX emissions increase because of the relative high emission rate of this pollutant from power plants that produce electricity from fossil fuel combustion.

The Preferred Alternative would result in a net decrease in regional emissions of CO and a net increase in emissions of NOX. Regional emissions of VOCs would increase with the gas turbine engines.

Energy

All of the design/build alternatives result in increased energy consumption compared to the No-Build Alternative. However, energy requirements for fossil fuel consumption for the gas turbine engines (Alternatives 1 through 4) are substantially higher than the fossil fuel required to generate electricity for the electric trains (Alternatives 5 through 8). Highway energy consumption decreases for all alternatives because of diverted automobile ridership. Additional energy required for operating and maintaining an additional station at the OCCC (Design/Build Alternatives 1, 3, 5, and 7) is reflected in the analysis of estimated energy consumption.

The estimated change in net energy consumption for 2010, including thermal losses for electric power generation, ranges between 239,820 and 514,574 MBTU, with the electric train alternatives net consumption being considerably lower than the gas turbine train alternatives. The total change is a negligible fraction of Florida's total energy consumption for surface (all non-military vehicle operation on highways, railroads, and fixed-guideway public transportation) transportation, which is estimated to reach one quadrillion BTUs (i.e., 1,000,000,000 MBTU) by 2010.

The Preferred Alternative, compared to the No-Build Alternative, would result in an increased energy consumption estimated at 498,855 MBTU.

Section 106 Impacts

All of the potential Section 106 impacts occur to historic structures near the Tampa CBD. Alternatives 1, 2, 5, and 6 each impact five historic resources, one of which is the Ybor City NHLD, where there is a direct taking of two contributing historic structures. The other four historic resources only have proximity impacts. Alternatives 3, 4, 7, and 8 each impact nine structures, one is a direct taking and eight are proximity impacts.

The Preferred Alternative would have impacts to five historic resources; however, through Section 106 coordination with the SHPO, conditions have been established so these impacts will result in no adverse effect. The Preferred Alternative would require property from two contributing historic structures within the Ybor City NHLD, which have already been included in a MOA for the TIS project. Therefore, no additional impacts to the NHLD will result from the Preferred Alternative. Proximity impacts could occur at four other sites but would be minimized or avoided based on conditions developed during the Section 106 coordination. No archeological resources would be affected.

Relocations

The greatest number of residential relocations required is 3, which are associated with Alternatives 1, 2, 5, and 6. The three structures are near I-4 at 12th Avenue in Tampa. Alternatives 3, 4, 7, and 8 do not require any relocation of residential structures.

The greatest number of business relocations, 23, occurs with Design/Build Alternatives 4 and 8. The majority of all business relocations occur in two areas: where the alignment transitions from I-4 toward the Central Florida Greeneway (S.R. 417) and within the Tampa CBD as it travels towards the CSX tracks. Alternatives 3 and 7 have 15 business relocations, while Alternatives 2 and 6 have 8.

The Preferred Alternative would require three residential relocations located in two structures near I-4 and 12th Avenue in the Ybor City area. It would also require three business relocations including the City of Tampa Recreation Department, the former Hillsborough County Sheriff's Office and Jail Complex, and a bail bondsman.

Total Cost for Construction

Total costs vary between $2.048 and $2.476 billion, with Alternative 1 having the lowest cost and Alternative 8 having the highest cost. The difference between the two alternatives is $4.26 million.

The Preferred Alternative gas turbine train technology cost is $2.048 billion.

4.7.2 Required Permits and Review Agencies

In order to proceed into the design phase, the FHSRA would determine the permit requirements in consultation with relevant state and federal agencies. The USACE, FDEP, SWFWMD, SFWMD, and SJRWMD regulate wetlands within the project area. Pursuant to the Operating Agreement between the FDEP and the WMDs, the FDEP will be conducting the review of the Environmental Resource Permit (ERP) application for this project. The USFWS, EPA, NMFS, and the FFWCC review and comment on federal and state wetland permit applications. It is currently anticipated that the following permits would be required for this project:

Permit	Issuing Agency
Environmental Resource Permit (ERP)	WMD/FDEP
Section 404 Dredge and Fill Permit	USACE
National Pollutant Discharge Elimination System Permit (NPDES)	FDEP

The complexity of the permitting process depends greatly on the degree of the impact to jurisdictional wetland areas. The WMDs require an ERP when construction of any project results in the creation of a water management system or in impacts to "Waters of the State" or isolated wetlands. An Individual Permit (and wetland mitigation) would be required with mitigation for wetland impacts because impacts would be greater than 1 ac.

For the USACE, an Individual Permit would also be required. An Individual Permit requires compliance with Section 404(b)(1) guidelines of the Clean Water Act, including verification that all impacts have first been avoided to the greatest extent possible, that unavoidable impacts have been minimized to the greatest extent possible, and that unavoidable impacts have been mitigated in the form of wetlands creation, restoration, preservation, and/or enhancement.

Any project which results in the clearing of 5 or more ac. of land would require a NPDES permit from the FDEP, pursuant to *40 CFR Parts 122, 124*. In association with this permit, a Storm Water Pollution Prevention Plan (SWPPP) would be required and implemented during the construction of the project by implementing such measures as Best Management Practices (BMPs). The primary function of the NPDES requirements is to assure that sediment and erosion control during construction of the project takes place.

All stations and maintenance operation sites would require building permits from the governing jurisdictions. Once the application(s) are submitted, the permitting process period may range from 30 to 240 days.

4.8 REFERENCES/NOTES

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