Final Report

Multimodal Data Inventory Evaluation to Improve FDOT's Roadway Classification Inventory

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Florida Department of Transportation

Joel Worrell, Project Manager

Robin Birdsong, Project Manager

Prepared by

Sara Hendricks, PI

Martin Catalá, Co-PI

Center for Urban Transportation Research

University of South Florida

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Metric Conversion

Approximate Conversions to SI* Units

Symbol	When You Know	Multiply By	To Find	Symbol
Length				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
Area				
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2

Approximate Conversions from SI* Units

Symbol	When You Know	Multiply By	To Find	Symbol
Length				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
Area				
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	Square kilometers	0.386	square miles	mi^2

*SI is the symbol for the International System of Units.

Metric Conversion Factors from Federal Highway Administration

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16. Abstract

As the Florida Department of Transportation's (FDOT) work advances the development of a multimodal system for the State of Florida, the Transportation Data & Analytics (TDA) Office anticipates that the development of new modes, including the Shared Use Nonmotorized (SUN) Trail network, will soon outpace current FDOT data inventory systems and practices. The aim of this research was to investigate acceptable inventory methods based on FDOT data accuracy requirements and available technology to create more efficient, scalable, and acceptable data inventory management standards. The objectives of this research were to determine a methodology of inventory of SUN Trail assets and identify an efficient data management design for hardware/software investment. The research investigated existing FDOT roadway and SUN Trail inventory methods and transportation data inventory methods of other state, regional, and local agencies. Findings included recommendations for SUN Trail features and characteristics data to be collected to support management of the life cycle of trail assets and performance measurement. Twelve identified data inventory methods were evaluated. Recommendations for inventory process and methods by responsible FDOT office were developed. The results of this research can be used as a basis to support future implementation of a SUN Trail characteristics inventory that may support stakeholder data needs.

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Executive Summary

As the Florida Department of Transportation's (FDOT) work advances the development of a multimodal system for the State of Florida, the Transportation Data & Analytics (TDA) Office anticipates that the development of new modes, including the Shared Use Nonmotorized (SUN) Trail network, will soon outpace the current FDOT Roadway Characteristics Inventory (RCI) system and practices.

The aim of this research was to investigate acceptable inventory methods based on FDOT data accuracy requirements and available technology to create more efficient, scalable, and acceptable data inventory management standards, as applied to the growing SUN Trail network. The objectives of this research were to determine a methodology of inventory of SUN Trail assets and identify an efficient data management design for hardware/software investment.

Researchers did not find a state department of transportation (DOT) with a comparable statewide continuous nonmotorized shared use path system that also is being inventoried as part of its road inventory system. Some DOTs, such as Montana Department of Transportation (MDT), collect data on shared use paths that are parallel to the roadway. Most DOTs that were contacted do not collect data on shared use paths. In some states, such as California and Colorado, trail inventories, including paved paths, are conducted by the state parks systems. Examples of the use of mobile mapping systems were documented. These data collection efforts were designed to collect some or all data needed for an entire inventory.

Many DOTs are relying on partnerships to share data relating to bicycle and pedestrian facilities, including shared use paths, trails, bike lanes, and sidewalks. Inventories that are attempts to create a common template for collecting trail and shared use path data from multiple trail inventory sources have encountered challenges. These include obtaining data from other entities in a timely manner, especially if the data sharing requires any labor to first reformat the data or do data entry.

The most basic field inventory methods of driving the roadway and measuring characteristics with measuring wheel continue to be used. The recording of continuous digital camera images taken while driving along the roadway can be combined with Global Positioning System (GPS) and inertial measurement unit (IMU) technology to document the location characteristics relative to the roadway centerline.

Most state DOTs indicated that they require and use multiple methods of roadway data collection, as no one method is best for collection of all data. This finding is confirmed by the literature review. Research literature and the vendor that collects roadway asset data for the Tennessee Department of Transportation using Light Detection and Ranging (LiDAR) recommend to first identify needed data before selecting a method of data collection.

This research project also developed recommendations for features and characteristics data to collect for the SUN Trail. It is recommended that FDOT should consider prioritizing how tracking of historical SUN Trail alignments may occur through RCI and GIS. Safety, utilization, and connectivity characteristics support key performance metrics identified for the SUN Trail network, based upon input from Central Office and the Districts. Data to support these metrics were identified in addition to data establishing SUN Trail location characteristics, ADA accessibility compliance, and to support trail maintenance.

For the data supporting each recommended characteristic, it was determined whether the characteristic requires a measurement or an observation in the field (as opposed to data that can be found in office documents). For those characteristics requiring measurement, the accuracy requirement was determined, based upon existing RCI accuracy standards. Height measurements and their accuracy requirements also were identified because methods for measuring height are more limited. It also was determined whether there may be any line-of-sight issue relative to the method of measurement. For example, depending upon the dimension, this might rule out certain measurement methods, such as aerial imagery, ground-based photogrammetry, and LiDAR. Twelve inventory methods were evaluated against accuracy standards and other criteria.

The use of a mobile mapping system to inventory the SUN Trail network, by itself, may generate more data than can be used, for too great a cost, and for no added safety risk reduction. However, use of mobile mapping systems for the SUN Trail does make sense if FDOT decides to invest in mobile mapping systems for its highway inventory. Combining the additional SUN Trail mileage with the roadway inventory would possibly result in a smaller unit cost per mile. The fixed costs of the equipment and mobilization is generally the same, whether more or less miles of facility are being inventoried.

The results of this research can be used as a basis to support future implementation of a SUN Trail characteristics inventory that may support stakeholder data needs. The recommendations for SUN Trail features and characteristics and recommendations for the inventory process, as well as methods to collect the data, will result in the collection of business and geographical intelligence to manage and track the life cycle of the transportation project, support justification for future infrastructure investments, and establish data governance of transportation facilities and assets.

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List of Abbreviations and Acronyms

AADBT	Annual Average Daily Bicycle Traffic
AADPT	Annual Average Daily Pedestrian Traffic
AADNT	Annual Average Daily Nonmotorized Traffic
AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ACS	American Community Survey
ADA	Americans with Disabilities Act
APL	Approved Products List
ARNOLD	All Road Network of Linear Referenced Data
ATV	All-Terrain Vehicle
BLOS	Bicycle Level of Service
BMP	Beginning Milepoint
CADD	Computer-aided Design and Drawing
CARS	Crash Analysis Reporting System
CCD	Charge-coupled Device Cameras
CMOS	Complementary Metal-Oxide Semiconductor Camera
CORS	Continuously Operating Reference Stations
COTS	Commercial off the Shelf
CIGP	County Incentive Grant Program
CIM	Civil Integrated Management
DART	Data Analysis and Reporting for Transportation
DEM	Digital Elevation Model
DGN	File extension for Computer-aided Design and Drawing file format
DMI	Distance Measuring Instrument
DOQQ	Digital Ortho Quarter Quads
DOW	Day of week
DSA	District Statistics Administrator
EDMS	Electronic Data Management System
ELTS	Enhanced Level of Traffic Stress
EMP	End Milepoint
ERP	Electronic Review Process
Esri	Environmental Systems Research Institute (formerly ESRI)
EST	Environmental Screening Tool
ETAT	Environmental Technical Advisory Team
ETDM	Efficient Transportation Decision Making
FCDOP	Florida County Digital Orthoimagery Program
FDE	Fundamental Data Elements
FDEM	Florida Division of Emergency Management
FDEP	Florida Department of Environmental Protection
FDM	FDOT Design Manual
FDOR	Florida Department of Revenue
FGTS	Florida Greenways and Trails System

FMS	Financial Management System
FPRN	Florida Permanent Reference Network
FSC	Functional Steering Committee
FTP	Florida Transportation Plan
GIRD	General Interest Roadway Data
GIS	Geographic Information Systems
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HAWK	High Intensity Activated Crosswalk (beacon)
HERS	Highway Economic Requirements System
HPMS	Highway Performance Monitoring System
HSIP	Highway Safety Improvement Program
IMS	Information Management System
IMU	Inertial Measuring Unit
IRAIS	Integrated Roadway and Asset Identification System Project
JPA	Joint Participation Agreement
KML	Keyhole Markup Language
LAP	Local Agency Program
LGCP	Local Government Comprehensive Plan
LiDAR	Light Detection and Ranging
LOS	Level of Service
LRS	Linear Referencing System
LRTP	Long Range Transportation Plan
LTS	Level of Traffic Stress
MIRE	Model Inventory of Required Elements
MMOA	Maintenance Memorandum of Agreement
MMS	Maintenance Management System
MMV	Mobile Mapping Vehicle
MPO	Metropolitan Planning Organization
MRP	Maintenance Rating Program
MSRP	Manufacturer's Suggested Retail Price
NAIP	National Agriculture Imagery Program
NASA	National Aeronautics and Space Administration
NBN	National Bicycle Network
NEPA	National Environmental Policy Act
NHS	National Highway System
NMSDR	Nonmotorized Statewide Data Repository
NMTMP	Nonmotorized Traffic Monitoring Program
OEM	Original Equipment Manufacturer
OGT	Office of Greenways and Trails, Division of Recreation and Parks, FDEP
OGTC	Office of Greenways and Trails Council
PAS	Permit Application System
PB	Performance Based
PD&E	Project Development & Environment

PHB	Pedestrian Hybrid Beacon
PLEMO	Planning and Environmental Management Office
PROWAG	Public Right-of-Way Accessibility Guidelines
PSSP	Project Solve SharePoint
PSR	Programming Summary Report
PTMS	Portable Traffic Monitoring Site
QC/QA	Quality Control/Quality Assurance
QL1	Quality Level 1 (data as it relates to LiDAR)
RCI	Roadway Characteristics Inventory
RITA	Roadway Inventory Tracking Application
ROADS	Reliable Organized and Accurate Data Sharing
RTP	Recreational Trail Program
RWMS	Right of Way Management System
3R	Resurfacing, Restoration, Rehabilitation
RITA	Roadway Inventory Tracking Application
ROW	Right of Way
SADT	Seasonal Average Daily Traffic
SCOP	Small County Outreach Program
SCORP	State Comprehensive Outdoor Recreation Plan
SCRAP	Small County Road Assistance Program
SHS	State Highway System
SIS	Strategic Intermodal System
SIT	Strategic Investment Tool
SLD	Straight-Line Diagram
SR	State Route
STIP	Statewide Transportation Improvement Program
STTF	State Transportation Trust Fund
SWFWMD	Southwest Florida Water Management District
SUN	Shared Use Nonmotorized
TCI	Traffic Characteristics Inventory
TDA	Transportation Data and Analytics Office (FDOT, formerly TranStat)
TIGER	Topologically Integrated Geographic Encoding and Referencing
TLWR	“Wheels on the Road” dedicated state funding for SUN Trail
TMAS	Traffic Monitoring Analysis System
TMG	Traffic Monitoring Guide
TPO	Transportation Planning Organization
TRIP	Transportation Regional Incentive Program
TTMS	Telemetered Traffic Monitoring Site
UAV	Unmanned Aerial Vehicle
UAS	Unmanned Aircraft System
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
V/U/D	View/Update/Delete screen in iView
WPA	Work Program Administration

Chapter 1 Introduction

FDOT's mission is to provide a safe transportation system that ensures the mobility of people and goods, enhances economic prosperity, and preserves the quality of the environment and communities. Under the authority of Section 334.044, Florida Statutes (F.S.), the Florida Department of Transportation (FDOT) is to encourage and promote the development of multimodal transportation alternatives.

Advancing the state's commitment to improving mobility, the Florida Legislature passed measures in 2014 and 2015 to fund and develop multi-use trails. Specifically, Section 339.81, F.S. established the Florida Shared Use Nonmotorized (SUN) Trail program. The SUN Trail program provides funding for the development of a statewide system of paved multi-use trails (SUN Trail network) for bicyclists and pedestrians, physically separated from vehicular traffic.

Section 335.065, F.S. authorizes FDOT to use the State Transportation Trust Fund to develop a statewide system of nonmotorized, paved trails for bicyclists and pedestrians. This system is a component of the Florida Greenways and Trails System (FGTS) Plan, created pursuant to Chapter 260, F.S., Florida Greenways and Trails Act. The Florida Department of Environmental Protection Office of Greenways and Trails (OGT) oversees implementation of the FGTS Plan. The FGTS Plan establishes Florida's vision for a statewide trail network. It includes existing, planned, and conceptual trails on both land and water. The FGTS Plan includes illustrated, mapped networks. The adopted FGTS Priority Land Trail Network, modified by removal of corridors not envisioned as paved trails, is the starting point for determining SUN Trail program eligibility. The FGTS Plan is linked to the Florida Transportation Plan 2060. OGT has developed FGTS maps and a GIS database.

SUN Trail funded projects will improve multi-modal connectivity by closing gaps between existing multi-use trails in the SUN Trail network. By enhancing infrastructure and increasing the reliability of all modes of Florida's transportation system, the implementation of the SUN Trail network has the ability to reduce incidents involving vulnerable road users and enhance safety (FDOT 2019a).

1.1 Roadway Characteristics Inventory

FDOT must be able to plan and develop projects with accurate information. Managing multimodal data and information for the life cycle of transportation assets fulfills FDOT's information management strategies of FDOT responsibility. Under Section 334.048, F.S., FDOT is required to ensure accountability and that monitoring systems are fully integrated to provide useful information to assess program performance. Asset and inventory data systems enable performance measurement to determine transportation service quantity, quality, accessibility, and utilization. A majority of data resides in the Roadway Characteristics Inventory (RCI) Enterprise Application that was built to fulfill federal and state data reporting requirements and performs as a one stop shop for data and information on travel ways.

RCI's importance is due to its storage of field- and office-collected data that are integrated into numerous FDOT database management systems through unique identification keys. Data that are stored in RCI include over 80 transportation system features, with underlying characteristics. A majority of these features and characteristics is coded with driven and recorded milepoint data provided by the field data collectors from eight FDOT districts. This method has been the accepted practice for over 30 years. Internal and external data stakeholders rely on the clearinghouse of roadway information and it is the single source for the creation of data products that FDOT provides to them. The RCI was expanded to inventory rail, bike, pedestrian, and trail data; however, FDOT has not applied the same inventory method to the other modes of transportation due to concerns of safety and costs.

1.2 Problem Statement

In order for FDOT to be able to immediately plan and develop projects with accurate information, there must be a strategy to organize the variety of data. Information requires effective technology, investment in optimal data collection methods, and development of efficient data management systems. Encouraging and promoting the development of multimodal transportation alternatives will depend on an enhanced capacity to collect and manage a growing range of transportation data from different sources. FDOT Transportation Data and Analytics Office anticipates that the development of Florida's multimodal system to move people and goods, including the development of new modes, such as the SUN Trail, will soon outpace current FDOT data inventory systems and practices.

The increasing abilities and requirements of linear referencing systems has created an opportunity for FDOT to further investigate strategizing new inventory methods around the field of Geographic Information Systems (GIS) to capture data from multimodal transportation networks. FDOT requires an inventory system to contain business and geographical intelligence to manage and track the life cycle of the transportation project, support justification for future infrastructure investments, and establish data governance of transportation facilities and assets. The extensiveness of the existing and potential trails system, its relationship to the existing state highway system and rail systems, the many existing and potential data sources, and the many entities involved in planning, ownership, management and performance measurement suggest the need for more efficient multimodal inventory methods and taxonomy.

1.3 Project Purpose and Goal

The purpose of this research project was to investigate acceptable inventory methods based on FDOT data accuracy requirements and available technology to create more efficient, scalable, and acceptable data inventory management standards. The research focus on the SUN Trail transportation network and assets provides a structure for future data inventory development for other modes of travel such as bicycle, pedestrian, and emerging autonomous vehicles. This focus will include evaluation and measurement of the efforts involved to sustain the current inventory method and recommend an approach with investment options.

FDOT expects that this research will provide a basis to support future implementation of a SUN Trail characteristics inventory that may support stakeholder data needs.

1.4 Research Objectives

There are two objectives of this research.

1. Determine methodology for inventory of SUN Trail assets.
2. Identify an efficient data management design for hardware/software investment.

To accomplish the objectives, this project developed recommendations for FDOT to consider for enhancing current inventory systems to support safety improvement plans, enable reliable Work Program economic impact analysis, and manage the transportation project data life cycle more effectively through accurate data analysis. The recommendations in this report aim to streamline a data collection and data management process that Central Office could implement for all district staff and programs.

1.5 Research Approach

The research team evaluated the existing data inventory methods used by the Districts, by assessing documentation, data, applications, and processes related to the inventory system. The research team met with Central Office staff to evaluate the systems and processes as part of this study. Multiple small group conversations solicited input from representatives of different internal offices within FDOT, regarding inventory methods that reside mainly in FDOT Central Office and the Florida Department of Environmental Protection, Office of Greenways and Trails. Throughout the project, periodic telephone conferences took place with the FDOT Project Managers.

Researchers traveled to each District for further interviews, with follow-up telephone meetings, to glean detailed information about the existing roadway inventory processes and to identify SUN Trail Program data needs of FDOT. This included investigating the needs for both Central Office and the District Offices. The identification of data needs was based upon processes and standards for trail planning, development, construction and maintenance. Additional discussions were held with Office of Greenways and Trails staff to better understand the initial development of data pertaining to the Florida Greenways and Trails System's Priority Land Trail Network. Based upon input from the Districts, researchers shared preliminary recommended SUN Trail features and characteristics at the FDOT Transportation Data Workshop in September 2018, and shared a draft describing these recommendations with the District Trail Coordinators. A list of FDOT staff who were involved in these discussions is included in Table 5-1 before the listing of References.

Researchers also investigated inventory systems of other state DOTs, and regional and local entities. Based upon a literature review, those inventory frameworks were described by purpose, expectation, required resources, technology used, manpower estimates, effort, and investment. Follow up phone conversations were held to obtain further information. A list of contacts from other agencies is included in Table 5-2 before the listing of References.

Based upon the existing inventory system and follow-up discussions with the FDOT Project Managers and FDOT District staff, SUN Trail data needs were identified for FDOT to carry out the Transportation Project Life Cycle Inventory Management. Other available inventory methods and technology options also were identified. Recommendations were developed for an inventory system framework for the SUN Trail network.

1.6 Research Deliverables

In addition to this Final Report, the research deliverables included Technical Memorandum #1, containing an examination of current 'as-is' Roadway Data Inventory methods and SUN Trail Inventory methods and their respective processes and products. A detailed report included a description of the roles and responsibilities of the offices, manpower involvement, a matrix of estimated investment costs, and a diagrammed process chart examining the steps involved to collect data, manage data, develop data products, and coordinate updates/maintenance.

Technical Memorandum #2 contained a description of trail planning, development, and maintenance processes, a prioritized listing of trail data elements, and recommendations for augmenting FDOT's existing inventory system to accommodate trails. A matrix of required trail data elements was devised, which constitutes the requirements for FDOT Transportation Project Life Cycle Inventory Management. Technical Memorandum #3 contained the identification and description of available inventory methods that are currently in practice, with investment estimates. A matrix of FDOT data needs and requirements was combined with the available inventory and technology options. Technical Memorandum #4 detailed a recommended technical framework, based upon elements from the earlier tasks. The framework included an estimated investment cost for FDOT to consider. The framework included recommended improvements based upon current inventory methods diagrammed in a visual workflow process. The diagram shows the current processes outlined with possible upgrades and changes that incorporates the inventory of the SUN Trail network segments. Other products consuming this information included Web mapping applications, shapefiles, and Straight-Line-Diagrams.

This Final Report contains a brief summary of the main findings regarding the existing RCI process and methods. It also contains proposed SUN Trail features and characteristics for inclusion in the RCI. Appendix A contains a series of matrices that list and organize the proposed SUN Trail features and characteristics in different categories. Table A-1 is a Master Matrix containing all the recommended SUN Trail Features and Characteristics. Table A-2 contains a listing of the highest priority features and characteristics. Table A-3 contains location-related features and characteristics. Table A-4 contains SUN Trail features and characteristics relating to trail maintenance. The remaining Tables A-5 through A-8 contain features and characteristics that can contribute to assessing the performance of the SUN Trail, by the categories of utilization, safety, connectivity, and ADA accessibility compliance. Appendix B provides a narrative of all recommended SUN Trail features and characteristics, organized by owning office, and described by responsible party for data collection, how to measure or gather the data, and a format for the value for each characteristic.

Chapter 2 Results and Findings

Chapter 2 discusses the results and findings from Tasks 1 through 3 of the research project.

2.1 Existing FDOT Road and SUN Trail Field Inventory Methods

The current driven roadway data collection method consists of field data collection stored in the RCI database. The data are then extracted and consolidated with GIS linear referencing systems to create a visual representation of RCI data for transportation project reporting and planning purposes. The data are used by other applications to create various products, including the following.

- Straight-Line Diagrams
- Linear Referencing System (LRS) Data
- Geographic Information Systems (GIS) shapefiles
- Mileage reports, data reports, and other statistical analyses

Presently, FDOT is researching and reviewing automated data collection processes that would reduce the data collection time spent in the field, develop consistent section-to-section data collection, increase accuracy of information, and improve the value of data collection for FDOT. The value of geospatially collected data would support building a stronger data governance by creating a single source of truth of location for Linear Referencing Systems. To manage this geospatial information, FDOT is developing a new data model to fit the advanced linear referencing system model which could potentially be used as part of the SUN Trail data management. The Transportation Data & Analytics (TDA) Office produces the *Transportation GIS Handbook* that packages the RCI and linear referencing system (LRS), and is used to report discrepancies. The RCI LRS is an ArcInfo based coverage. With the future RCI rewrite, FDOT plans to maintain the coverage dataset (topology rules). Presently, the GIS function is decentralized at FDOT, with different units working with different datasets.

In July 2018, FDOT held a workshop to assist knowledge transfer of the Esri Roads and Highways data management product. FDOT has issued an RFP for a vendor to rebuild RCI data into Esri Roads and Highways. This would replace RCI and some of its related systems. Esri Roads and Highways is a linear referencing system (LRS) solution for departments of transportation, which extends the ArcGIS platform. Roads and Highways supports multiple linear referencing methods, enabling data interoperability and sharing across business units. FDOT's ongoing IRAIS project (Integrated Roadway and Asset Identification System) aims to convert the RCI data into the Esri Roads and Highways data model.

Staff at FDOT Central Office and the Districts were interviewed to determine roles, types of inventory equipment, applications used, and costs. Table 2-1 below provides an overview of the RCI tasks performed at different process stages. Technical Memorandum #1 provides a detailed review of the existing inventory process.

Table 2-1: Existing RCI Process and Methods

Process Stage	RCI Tasks	Equipment Used	Applications Used	Source Documentation	Products and Archiving
Office preparations prior to field work	1. Run report to see which roads are due for an inventory 2. Prioritize roadways to inventory: • Notice of Contract Status Changes for Final Acceptance • On-System HPMS • On-System • Off-System 3. Develop inventory schedule 4. Study existing documentation		• RITA • Google Earth • iView	• RITA report of roadways due for inventory • Notice of Contract Status Changes for Final Acceptance • As-built construction plans • Previous hard copy inventories • Existing SLDs	Inventory schedule
In-office inventory and Field inventory	1. Consult source documentation 2. Record changes and notes onto hard copy SLDs	• GPS • Distance measuring instrument (DMI) • Measuring Wheel • Digital camera • Video log • Tablet, laptop • Trimble (position and attribute data on handheld computer such as GeoXT) • Other Windows mobile devices • SOLO Forest—mobile GIS without need for Internet connection, compatible with every GPS receiver and GIS file format		• GIS • Aerial photos • As-built construction Plans • District Soil lab • Latest approved urban boundary maps • Annexation notices • Official Road Transfers Paperwork • Official city maps • MPO/City/County • FHWA • Structures Office PONTIS report • Inventory field sheets • Recorded changes and notes onto hard copy SLDs	
Office processing of field data	1. Any intermediate steps 2. Transcribe Video Log 3. Data entry into RCI 4. Perform data validation edits 5. Do Quality Assurance and validate the data		• RCI application • DART • Video Log		
Update SLDs and submit changes			• Straight-Line Diagrammer		DGN files for SLDs
Update RITA			• RITA		

2.2 Data Needs for the SUN Trail Inventory

SUN Trail data needs were identified through detailed discussions with FDOT staff. These data would be needed by FDOT to carry out the FDOT Transportation Project Life Cycle Inventory Management. An efficient data management design is proposed through incorporation of the identified SUN Trail inventory data into existing RCI features and characteristics, where it makes sense to do so. New proposed characteristics and some additional codes for existing characteristics are proposed where data unique to SUN Trail has been identified.

The SUN Trail Linear Referencing System has been developed and maintained in GIS by the Systems Implementation Office. Some inventory SUN Trail data are presently stored in RCI under Feature 801. Currently, the RCI stores the following two characteristics on SUN Trail.

SUNTRCOR: Describes the SUN Trail Corridor Name.

SUNTRTYP – SUN Trail Type. Describes the status of the SUN Trail (Code 1: Active Trail; Code 2: Pending Trail; Code 3: Dropped SUN Trail GIS Route (Historical); and Code 4: Deleted, Physical Removal of Infrastructure). It is recommended that FDOT should consider prioritizing how tracking of historical SUN Trail alignments may occur through RCI and GIS.

Data for the SUN Trail network initially come from the Florida Department of Environmental Protection (FDEP) Office of Greenways and Trails (OGT). OGT oversees the creation and update of the statewide Florida Greenways and Trails System Plan) (FDEP 2019), from which a statewide Priority Land Trail network is established. The statewide Priority Land Trail network is shown in Figure 2-1 below. The SUN Trail network is a subset of the Florida Greenways and Trails System (FGTS) Plan's Priority Land Trail network, physically separated from the road (FDOT 2019a).

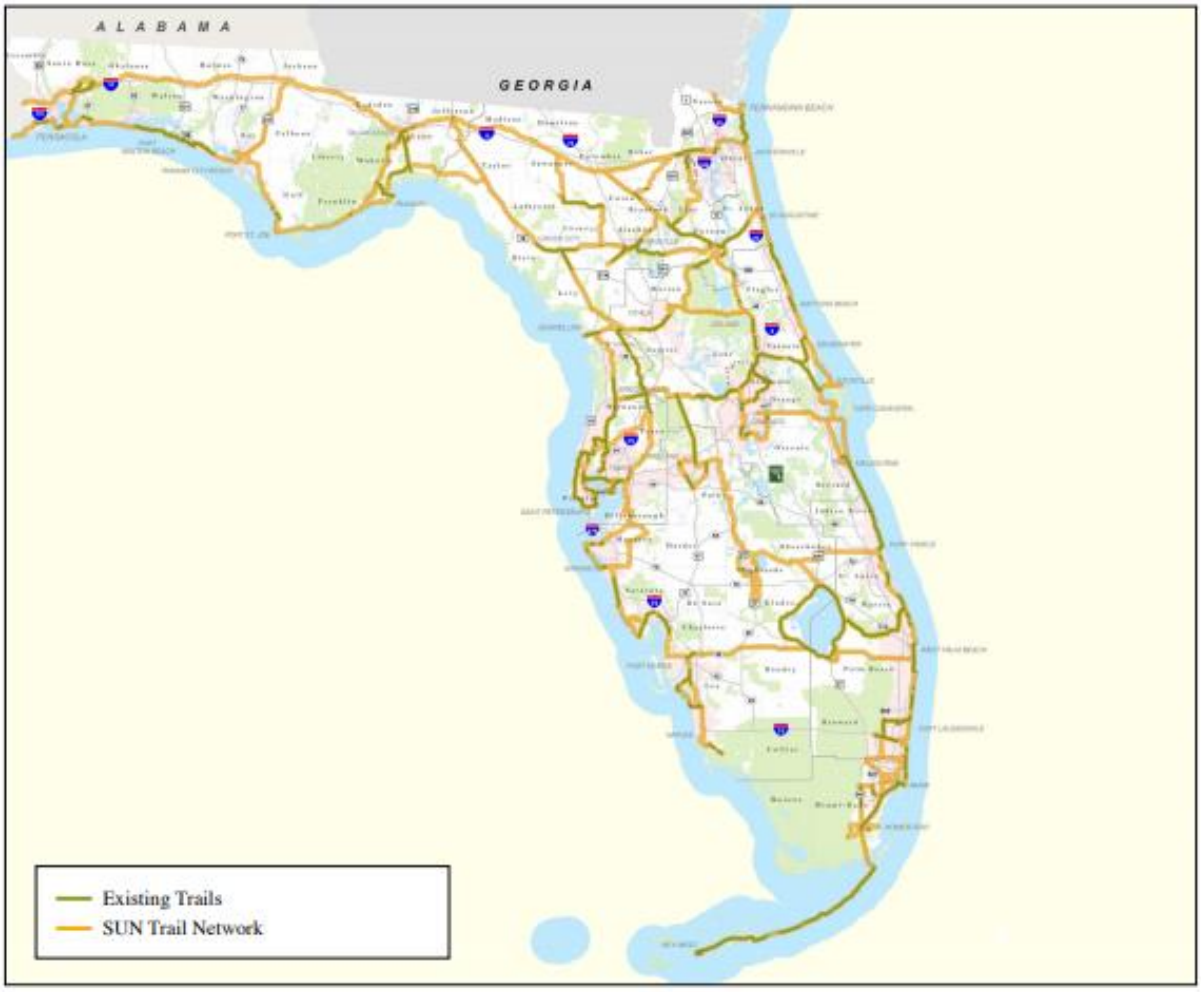
The development process of new SUN Trail segments is the initial part of the total life cycle of the SUN Trail. This development process, including the programmatic framework, funding structure, trail project identification, evaluation, prioritization, selection, and implementation, is described in detail in the handbook, *Implementing Florida's Shared-Use Nonmotorized (SUN) Trail Program* (FDOT 2019b). The bullet list below summarizes the chronology of the SUN Trail development process.

2.2.1 Project Identification

- Identification of purpose, location and goals of the project
- Consistent with the community's vision, plans, and policies
- Consistent with transparent public involvement procedures

2.2.2 Project Prioritization

- Identified priority of Metropolitan Planning Organization (MPO)
- Identified priority of the county (inclusive of their cities), tribal government, federal or state managing agency



Source: Florida Department of Transportation. Implementing Florida's Shared-Use Nonmotorized (SUN) Trail Program. Systems Implementation Office. March 2019. p. 3.

Figure 2-1. SUN Trail Statewide Network Map

2.2.3 Project Selection and Programming

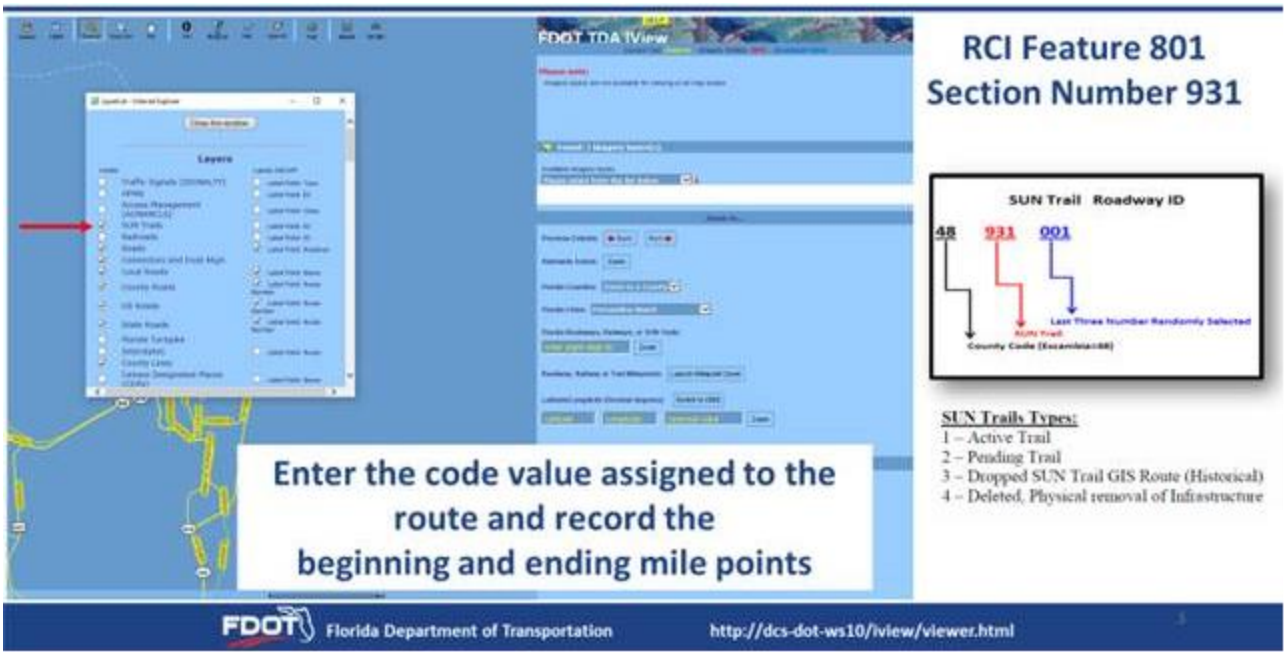
- Priority list and project details submitted to FDOT District by applicable entity
- District project evaluation and development of draft funding scenario
- Development of Statewide draft prioritization scenario
- Upon approval, projects are programmed into appropriate fiscal year of the five year Tentative Work Program[1]

More information about the SUN Trail Program and the development process of new SUN Trail segments, in coordination with FDOT Districts, Metropolitan/Transportation Planning Organizations (MPO/TPO), municipalities, counties, and other stakeholders, may be found at www.FloridaSUNTrail.com.

[1] Robin Birdsong. Florida Department of Transportation. SUN Trail Program Manager.

SUN Trail projects can receive funding from multiple sources, including federal, state, and local funds, in addition to inclusion in the funding as part of a roadway construction project. FDOT receives an annual allocation from the redistribution of new vehicle tag revenues, pursuant to Section 320.072, F.S., motor vehicle licenses. These "Wheels on the Road" revenues, coded as TLWR funds, are deposited into the State Transportation Trust Fund (STTF), to be used exclusively for programming project phases of SUN Trail segments in the FDOT Work Program.

When a SUN Trail project is initially selected for programming, the Systems Implementation Office assigns a unique Roadway ID to the SUN Trail project segment, as shown in Figure 2-2 below. SUN Trail segments are coded with section number 931 so that they can be added to the Work Program. The responsibility of the Work Program Financial Management System is not to track performance of the SUN Trail but instead is strictly to ensure that funding is made available for the SUN Trail. While the Work Program Instructions provide that multimodal trails Off-System do not require Roadway ID numbers, all new SUN Trail projects require Roadway IDs, and the Work Program obtains them from RCI Feature 801. The FDOT Work Program Instructions provide guidance for programming SUN Trail projects. Part III--Chapter 38: Trails, provides an overview of the SUN Trail Program, how funding is allocated, eligibility criteria, selection criteria, specific codes to key into the Work Program, and project administration guidance. Non-FDOT agencies may administer funds and serve as the project manager on projects that are located outside of FDOT's right of way.



When projects are implemented by non-FDOT agencies, SIO is dependent on the non-FDOT agencies to notify SIO and provide detailed project information and GIS data so that the SUN Trail GIS/LRS-based network can be updated. Part III, Chapter 19 of the Work Program Instructions explains the use of certain fields in the Trail – Item Segment Location (WP38) screen. It is used by another FDOT office in performance reporting of the number of miles of trail added to the system, and is linked to the RCI through Roadway ID, project limits as defined by the beginning and end milepoints, and applicable item group identifiers with state milepoint information. GIS software uses this data to map work program projects (FDOT 2018a).

Unlike the Roadway ID assignment process for roadways, SUN Trail segment Roadway IDs are assigned by SIO after corridors are given to FDOT from FDEP/OGT from their FGTS Plan Priority Land Trail Network.

The OGT originally developed the statewide trail mapping data as a component of the FGTS Plan. As primary partners, OGT and FDOT have ongoing communications and data sharing to track progress in developing the statewide network. FDOT has brought the OGT statewide Priority Land Trail network GIS data into the FDOT environment, adding the LRS milepoints. FDOT has continued to refine the accuracy of the linework by conducting computer based review of aerial imagery and other project data sources.

As it relates to the RCI, there is a distinct difference between newly developing segments of the roadway network and newly developing SUN Trail segments. This difference is that there is no Linear Referencing System (LRS) of milepoints for a roadway segment until after it is constructed, whereas for the SUN Trail network, a LRS already exists for “pending” trail segments during the development phases from planning through construction. However, during this development process, the feature linework represented by the GIS/LRS could potentially change.

Presently, TDA receives the characteristics from SIO. The priority SUN Trail LRS network contains the milepoints, and just two associated characteristics, including status and name. The process of coding SUN Trail through GIS and batch loading the data into the RCI is a relatively new process. It is under consideration by TDA for the SUN Trail local names for all On-System and Off-System SUN Trail segments to be defined along with measurements and put into the GIS/LRS system all at once, before the data are batch loaded into the RCI, under Trails—Feature 801, as contained in the DB2 mainframe.

After construction of a SUN Trail segment is complete, then RCI coding for that segment is changed from “pending” to “active”. The SUN Trail section milepoints are loaded into the RCI. Roadways that have parallel SUN Trail segments programmed on Roadway IDs could have the potential of having two IDs within which to be programmed, both the Roadway ID and the Roadway ID for the SUN Trail segment.

As part of the SUN Trail construction project close out process, the FDOT District construction project manager will provide mapping information to the District Trail Coordinator.

This mapping information may be derived from GIS shapefiles, the As-Built documentation, or Computer-aided Design and Drawing (CADD) files. The District Trail Coordinators will provide the data from the Project Manager to the SIO Transportation Planner to facilitate updating FDOT resources and mapping tools.

During the close out process of non-FDOT administered construction projects, the District Trail Coordinator will receive similar mapping information and provide it to the SIO Transportation Planner. The SIO Transportation Planner will coordinate with OGT and ensure updates to the mapping sources, including iView, Roadway Characteristics Inventory, external online mapping tools, and the Florida Geographic Data Library (FGDL). This occurs annually or on an as-needed basis (FDOT 2019b, 19-20).

Presently, Trails - Feature 801 in the RCI does not contain field collected data describing trail characteristics. No SUN Trail field data has yet been collected by the Districts. When FDOT is ready to implement field data collection methods for the SUN Trail, then data collection of assets (pavement, bridges, or other prioritized assets) can proceed for existing designated SUN Trail segments, as well as for SUN Trail segments for which construction is newly completed. This process chronology of initial field data collection of features and characteristics of SUN Trail segments after construction completion would be consistent with the RCI field data collection process for completed roadway segments.

Appendix A provides a series of matrices that list the features and characteristics that are recommended to be collected for an inventory of the SUN Trail network. Further description of the proposed inventory and method is described in later sections of this report. Appendix B provides a more detailed narrative of all recommended SUN Trail features and characteristics, organized by owning office, and described by responsible party for data collection, how to measure or gather the data, and a format for the value for each characteristic.

2.3 Identification and Evaluation of Other Methods to Inventory Trails

A review was undertaken of existing inventory methods in use by state DOTs, regions and municipalities. Research was conducted on new inventory measurement methods. Examples of available equipment within each inventory measurement method category were sought, with cost information.

Table 2-2 below summarizes the findings about roadway and shared use path inventory methods of selected state DOTs, state parks departments and two municipalities. Technical Memorandum 3 provides detailed descriptions of the roadway inventory methods.

Table 2-2. Summary of Roadway and Shared Use Path Inventory Methods

Entity	Roadway Inventory Methods	Shared Use Path Inventory Methods
Arkansas DOT (ARDOT)	Esri Basemap Arkansas statewide imagery from National Agriculture Imagery Program (NAIP) As-built construction plans Video log	None
California DOT (Caltrans)	As-built construction plans. All Roads LRS built from original line work and supplemented using TIGER files from U.S. Bureau of Census, and imagery from NAIP Event tables generated in GeoMedia/Oracle. Presently migrating data from GeoMedia/Oracle to Esri Roads and Highways	None Seeking partnerships with other agencies to collect bicycle/pedestrian facility data
California State Parks	--	Variety of trail types, including Class 1 that is typically paved. GPS, aerial photos, USGS maps, LiDAR, Trimble, measuring wheel, measuring tape, digital camera
Colorado DOT (CDOT)	OTIS windshield video log Esri ArcGIS	Aerial imagery from Google Earth, OTIS windshield video log
Colorado State Parks	--	Esri ArcCollector on tablet plus digital images Also collected trail data from federal and municipal entities
City of Boulder, CO	--	WISP (Wheeled Instrumentation Sensor Package) with HETAP 3 Data Collection Software 3.0, Autofocus USB camera Garmin GPS 18
Florida DOT (FDOT)	As-built construction plans Aerial imagery Google Earth Bing Maps Visual surveys Measuring wheelGPS-enabled DMI Tape measure Digital camera GPS devices GIS analysis Trimble GeoXT SOLO Forest Laptops, tablets, Windows mobile devices Video log provided by Mandli, Inc., for data quality check and ADA data collection, starting in 2015	Measuring wheel Distance measuring instrument (DMI) Esri ArcGIS Shapefiles received from FDEP, OGT Aerial imagery

Table 2-2, continued

Entity	Roadway Inventory Methods	Shared Use Path Inventory Methods
Orange County, FL	High resolution digital imagery for ADA inventory GPS, IMU, DMI, and CORS	Vendor mobile mapping system using photogrammetry
Minnesota DOT (MnDOT)	High resolution digital imagery LiDAR demonstration project for condition of roadside barriers	--
Montana DOT (MDT)		Bicycle, GPS receiver, field notes, digital photo images
North Carolina DOT (NCDOT)	As-built construction plans Design plans Aerial imagery Esri Roads and Highways Collector for ArcGIS, collected by consultants Oracle and SQL server databases ArcSDE and SQL Spatial	--
Ohio DOT (ODOT)	GPS-enabled collection vehicles, with measuring wheel, measuring tape, video log, aerial imagery, iPads with Esri Arc Collector	DOT Safety Office just starting initiative to aggregate bike/ped data from other agencies
Oregon DOT	Construction plans GPS-enabled DMI Measuring wheels Aerial imagery Digital video log Leica Pegasus Two mobile scanner	Within street ROW only
Tennessee DOT (TDOT)	Contractor's mobile mapping system that includes: GPS receiver LiDAR Photo log Pavement imagery 3D laser crack mapping Pavement roughness Vertical bridge clearance	--
Washington State Department of Transportation (WSDOT)	Video log Laptop application that logs data while driving the road Google StreetView, Google Maps, Bing Maps ArcPad 10.0 with service pack 1, distance measuring instrument, Trimble GPS Analyst Motor vehicles with DMIs, measuring wheels, tape measures, digital cameras. Arc Collector	Shared use paths are part of ADA inventory, features collected by field inventory using steel tape measure, digital level, Stabila or Smart Level for slope measurement. Trimble data collector and Excel spreadsheet on laptop, digital camera and motor vehicle
Washington State Trails	--	Aggregation of data from multiple sources

Researchers did not find a state DOT with a comparable statewide continuous nonmotorized shared use path system that also is being inventoried as part of its road inventory system. Some DOTs, such as Montana Department of Transportation (MDT), collect data on shared use paths that are parallel to the roadway. Most DOTs that were contacted do not collect data on shared use paths. In some states, such as California and Colorado, trail inventories, including paved paths, are conducted by the state parks systems.

Both the efforts of Southeastern Surveying and Mapping Corporation on behalf of Orange County, FL, and Continental Mapping Consultants, Inc., on behalf of the Minnesota Department of Transportation (MnDOT) were examples of the use of mobile mapping systems. MnDOT used LiDAR for illustrative purposes, and Orange County used photogrammetry to flag locations of deficient infrastructure. These data collection efforts were not designed to collect all data needed for an entire inventory.

Many DOTs are relying on partnerships to share data relating to bicycle and pedestrian facilities, including shared use paths, trails, bike lanes, and sidewalks. Inventories that are attempts to create a common template for collecting trail and shared use path data from multiple trail inventory sources have encountered the challenge of obtaining data from other entities in a timely manner, especially if the data sharing requires any labor to first reformat the data or do data entry.

The most basic field inventory methods of driving the roadway and measuring characteristics with measuring wheel continue to be used. The recording of continuous digital camera images taken while driving along the roadway can be combined with GPS and inertial measurement unit technology to document the location characteristics relative to the roadway centerline.

Roadway inventory methods and systems have been a continual topic of interest in the transportation profession. Newly emerging image processing capabilities can allow the direct extraction of characteristics from digital images. A key point made by researchers highlighted in the literature review for this research project is that the identification of data needs should first arise from an articulation of the problem(s) that the state DOT wants to solve or the objective(s) to be accomplished and that this problem articulation and data identification should be done before selecting data collection technologies and equipment.

A similar point has been made more recently by the vendor for the Tennessee Department of Transportation (TDOT) which collects asset data for their roadway inventory. During project initiation, one of the tasks includes the creation of a complete data dictionary. This involves first articulating the final output or purpose of the data being collected.

> This initial step is most important in the data dictionary development as it will inform all stakeholders of exactly what elements need to be reported on from the data collection systems. Working backward from the final output, the Project Management team can begin to work with our Data Integration and Information Specialists to produce a document that outlines how each element of the final output will be produced. (Mandli Communications, Inc. 2018, 122)

A finding by this research project confirms a finding of the earlier study conducted by Jalayer et al. (2014) that most state DOTs indicated that they require and use multiple methods of roadway data collection, as no one method is best for collection of all data. Zhou et al. (2015), in their survey of state DOTs about inventory methods, found that the majority of survey respondents indicated that the state DOTs use more than one data collection method.

Recommendations for SUN Trail features and characteristics were developed as part of Task 2 of the research, based upon input from Central Office and the Districts. For each characteristic, it was determined whether the characteristic requires a measurement or an observation in the field (as opposed to data that can be found in office documents). For those characteristics requiring measurement, the accuracy requirement was determined, based upon existing RCI accuracy requirements. Height measurements and their accuracy requirements also were identified, because methods for measuring height are more limited. It also was determined whether there may be any line-of-sight issue relative to the method of measurement. For example, depending upon the dimension, this might rule out certain measurement methods, such as aerial imagery, ground-based photogrammetry, and LiDAR.

The inventory methods that were identified and evaluated for use for the SUN Trail, and described in Technical Memorandum 3, include the following.

1. Florida County Digital Orthoimagery Program
2. Airborne LiDAR
3. GNSS receivers of varying sensitivity, including Trimble R1 GNSS, and the Trimble R2 GNSS
4. Handheld computers, such as the Trimble 88180-04
5. Esri Collector for ArcGIS
6. GPS-enabled Distance Measuring Instruments
7. Manual measurement, including distance measuring instrument (DMI), measuring wheel and tape measure
8. WISP HETAP by Beneficial Designs, Inc.
9. Mobile mapping system using ground-based photogrammetry
10. Mobile laser scanner
11. Mobile mapping system using combination of photogrammetry and LiDAR
12. University of Florida proof of concept mobile LiDAR system

One set of SUN Trail characteristics pertains to maintenance, and are listed in Appendix Table A-4. These are important to support FDOT's responsibilities to maintain the functionality of the SUN Trail network and the implementation of the Maintenance Memoranda of Agreement (MMOA) between FDOT and many local entities throughout the State. Characteristics relating to trail maintenance contain most of the dimension measurements of the physical infrastructure of the SUN Trail. Measured dimensions are listed in Table 2-3, with illustrative examples of RCI features.

Table 2-3. RCI Feature Measurement Dimensions, Units, and Required Measurement Accuracy

Type of Dimension	Required Accuracy and Examples of Assets	Example of RCI Feature
Distance	0.001 mile* (5.28 feet) roadway segment	--
Length	1 foot, outfall ditch	248 Outfall Ditches
	1 foot, retaining wall**	275 Miscellaneous Concrete Structures
	2 feet, crossdrain**	241 Crossdrains
	2 feet, box culvert**	241 Crossdrains
Height	1 foot, box culvert**	241 Crossdrains
	1 in. pipe**	241 Crossdrains
Width	0.5 feet, shoulder	214 Outside Shoulders
	1 foot, sidewalk	216 Bike lanes/Pedestrian Sidewalk
	1 foot, box culvert**	241 Crossdrains
	1 inch, pipe**	241 Crossdrains
Diameter	1 inch, pipe**	241 Crossdrains
Area	0.01 acre, roadside mowing	411 Roadside Mowing
	1 square yard, slope paving area**	275 Miscellaneous Concrete Structures

*= "Discrepancy Selection Criteria: The acceptable deviation (as of 9/20/2006) between the LRS and RCI mileage lengths for each Roadway ID should be less than 0.100 mile, or less than 5% of the RCI gross length value, ignoring any that are less than 0.009 miles." (FDOT 2017, 4)
**= Feature is not easily visible from an aerial view.

Table 2-4 below summarizes methods that were reviewed for their ability to measure dimensions of interest to inventory data. Table 2-4 also provides examples of assets that represent a dimension of a particular required standard of accuracy. 'Y' represents 'Yes' and 'N' represents 'No'.

Table 2-5 contains a complete matrix of all recommended FDOT data needs for the inventory of the SUN Trail network, which can be integrated with the Roadway Characteristics Inventory. These characteristics are compared with the ability of each inventory and technology option to measure them. An 'x' means that the inventory option can measure that characteristic. The lightly shaded rows that contain no 'x' represent those characteristics that represent data that can be collected in the office, such as administrative data, or it is a characteristic that represents information that is observed in the field but not measured, for example, a count of the number of manholes.

Table 2-4. Measurement Methods and Their Ability to Measure Each Dimension

Measured Dimensions	Required Accuracy with Representative Examples of Assets	FCDOP Aerial Images	Airborne LiDAR*	GPS receiver (i.e., Trimble R1 GNSS) $2,500 range	GPS receiver (i.e., Trimble R2 GNSS) $5,800 range	Handheld computer (i.e., Trimble 88180-04) $8,200 range	Collector for ArcGIS $2,800 range/yr	GPS enabled distance measuring instrument (i.e., JAMAR) $800 range	Manual tape measure and measuring wheel	WISP HETAP (Beneficial Designs, Inc.) $9,310 range	Mobile mapping, no LiDAR** (i.e., SSMC) $130,000 range	Mobile Laser Scanner (i.e., Leica Pegasus) $421,820 range	Mobile mapping, photogrammetry plus LiDAR (i.e., Mandli) $3.2 Million/yr range	Univ. of FL proof of concept mobile LiDAR $5,796 for hardware***
Milepoint	0.001 mile (5.28 feet)	Y	N	Can Calculate	Can Calculate	Can Calculate	N	Y	N	Y	Y	Y	Y	Y
GPS location		N	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Length	1 foot outfall ditch	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	NT
	1 foot retaining wall	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	NT
	2 feet cross drain	N	N	N	Y	Y	Y	N	Y	N	N	N	N	NT
	2 feet culvert	N	N	N	Y	Y	Y	N	Y	N	N	N	N	NT
Vertical Clearance	1 inch bridge height	N	N	N	N	N	N	N	Y	N	N	Y	Y	NT
Height	1 foot, culvert	N	N	N	N	N	N	N	Y	N	N	N	N	NT
	1 inch, pipe	N	N	N	N	N	N	N	Y	N	N	N	N	NT
Width	0.5 foot, shoulder	N	N	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
	1 foot, sidewalk	N	N	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
	1 foot, culvert	N	N	N	Y	Y	Y	N	Y	N	N	N	N	NT
	1 foot, turnout pipe	N	N	N	Y	Y	Y	N	Y	Y	Y	Y	Y	NT
	1 inch, pipe	N	N	N	N	N	N	N	Y	N	N	N	N	NT
Diameter	1 inch, pipe	N	N	N	N	N	N	N	Y	N	N	N	N	NT
Area	0.01 acre, roadside mowing	Y	N	Y	Y	Y	Y	N	Y	N	Y	Y	Y	NT
	1 square yard, slope paving area	N	N	N	Y	Y	Y	N	y	N	Y	Y	Y	NT

* Affordable airborne LiDAR would have insufficient resolution

** Mobile mapping to include photogrammetry with IMU

*** NT = Not Tested

Table 2-5: Matrix of FDOT Recommended Data Requirements with Available Inventory Options

FDOT RCI Feature by Owning Office	Characteristic	Description	Available Inventory and Technology Options*									
			FDOR Aerial Images	Trimble R2 GNSS	Collector for ArcGIS	GPS-Enabled DMI	Tape Measure and measuring wheel	Photogram-metry	WISP HETAP	Mobile laser scanner	Photogramm etry plus LiDAR	U. of FL POC Mobile LiDAR**
Transportation Data & Analytics												
113 AASHTO	USBRNMBR (proposed)	US Bicycle Route Number										
124 Urban Classification	PLACECD	Census Place (City) Code										
126 Context Classification												
138 Roadway Realignment	NALIGNDT	New Alignment Date										
	NALIGNID	Section/Subsection of the New Alignment										
	NALNBGPT	New Alignment Begin MP	x	x	x	x		x		x	x	NT
	NALNENPT	New Alignment End MP	x	x	x	x		x			x	NT
139 Old Alignment	OALIGNID	Section/Sub-section of Old Alignment										
	OALNBGPT	Old Alignment Begin MP										
	OALNENPT	Old Alignment End MP										
140 Section Status Exception	OSDATE	On or Off-System Date										
	STATEXPT (proposed add'l codes)	Segment Status										
141 Stationing Exceptions	BEGSCPT	Begin Section MP of Exception Field	x	x	x	x		x		x	x	NT
	ENDSECPT	End Section MP of Exception Field	x	x	x	x		x		x	x	NT
	RDWYID	County, Section, Sub-section										
214 Outside Shoulders	SHLDTYPE	Highway Shoulder Type	x	x	x	x		x		x	x	x
	SLDWIDTH	Highway Shoulder Width		x	x		x	x	x	x	x	x
216 Bike Lanes/Pedestrian Sidewalk	BIKELNCD (proposed add'l codes)	Bicycle Lane	x	x	x	x		x		x	x	x
	BIKSLTCD	Bicycle Slot	x	x	x	x		x		x	x	x
	SDWLKBCD	Sidewalk Barrier Code										
	SHARDPTH	Shared Path Width and Separation		x	x		x	x	x	x	x	x
230 Surface Description	PAVECOND	Pavement Condition	x	x	x	x		x		x	x	NT
	SURFNUM	Pavement Surface Type	x	x	x	x		x		x	x	NT

Table 2-5, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Available Inventory and Technology Options*									
			FDOR Aerial Images	Trimble R2 GNSS	Collector for ArcGIS	GPS-Enabled DMI	Tape Measure and measuring wheel	Photogram-metry	WISP HETAP	Mobile laser scanner	Photogramm etry plus LiDAR	U. of FL POC Mobile LiDAR**
251 Intersection	BEGSECNM	Begin Roadway Section MP Description	x	x	x	x		x		x	x	x
	ENDSECNM	End Roadway Section MP Description	x	x	x	x		x		x	x	x
	INTSDIRx	Intersection Direction										
	SUNTRTRH (proposed)	SUN Trail Trailhead										
	SUNTRADA (proposed)	SUN Trail ADA Access										
	SUNTRGAT (proposed)	SUN Trail Intersection Access Control										
253 Railroads	CHKDIGIT	Check Digit										
	RRCROSNO	National Railroad Grade Crossing Number										
258 Structures	BOXCULNO	Box Culvert Number										
	BRIDGENO	Bridge Number										
	FACCROSS	Facility Crossed	x	x	x	x		x		x	x	NT
	UNDPASNO	Underpass Number										
	BRIDGEVA (proposed)	SUN Trail Bridge Emergency Vehicle Access					x			x	x	NT
320 Mile Marker Signs	MILEDECL (proposed)	Mile Marker Decal	x	x	x	x		x	x	x	x	x
326 Traffic Monitoring Sites	NMSTATLR (proposed)	Nonmotorized Station/Location Record Identifier ('L')										
	NMSTFIPS (proposed)	Nonmotorized State FIPS Code ('12')										
	NMCOFIPS (proposed)	Nonmotorized County FIPS Code										
	NMSTATID (proposed)	Nonmotorized Station ID Number										
	NMFUNCLS (proposed)	Nonmotorized (Functional) Classification of Road (expanded)										
	NMDIRRTE (proposed)	Nonmotorized Direction of Route										
	NMFACTYP (proposed)	Nonmotorized Facility Type										
	NMINTRST (proposed)	Nonmotorized Intersection										
	NMMETHCT (proposed)	Nonmotorized Method of Counting										

Table 2-5, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Available Inventory and Technology Options*									
			FDOR Aerial Images	Trimble R2 GNSS	Collector for ArcGIS	GPS-Enabled DMI	Tape Measure and measuring wheel	Photogram-metry	WISP HETAP	Mobile laser scanner	Photogramm etry plus LiDAR	U. of FL POC Mobile LiDAR**
	NMTYPSEN (proposed)	Nonmotorized Type of Sensor										
	NMYEREST (proposed)	Nonmotorized Year Station Established										
	NMYERDIS (proposed)	Nonmotorized Year Station Discontinued										
	NMNATLHS (proposed)	Nonmotorized National Highway System										
	NMLATITD (proposed)	Nonmotorized Latitude										NT
	NMLONGTD (proposed)	Nonmotorized Longitude										NT
	NMPOSTRS (proposed)	Nonmotorized Posted Route Signing										
	NMPOSTRN (proposed)	Nonmotorized Posted Signed Route Number										
	NMLRSRID (proposed)	Nonmotorized LRS Route ID										
	NMLRSLOC (proposed)	Nonmotorized LRS Location Point	x	x	x	x		x		x	x	NT
	NMSTATLC (proposed)	Nonmotorized Station Location										
	NMONOTES (proposed)	Nonmotorized Other Notes										
Traffic Engineering and Operations												
311 Speed Limits	MAXSPEED	Maximum Speed Limit (Posted Speed Limit)	x	x	x	x		x		x	x	NT
322 Signals	SDESTRET	Side Street Name										
	SIGNALTY (proposed add'l codes)	Type of Traffic Signal										
Office of Maintenance												
137 Maintenance Area Boundary	CCNUMBER	Cost Center Number	x	x	x	x		x		x	x	NT
217 Sidewalks	SIDEWALK		x	x	x	x		x		x	x	x
		Sidewalk Width		x	x		x	x	x	x	x	x
230 Surface Description	PAVECOND	Pavement Condition		x	x	x		x		x	x	NT
	SURFNUM	Pavement Surface Type		x	x	x		x		x	x	NT
241 Crossdrains	BOXCULHT	Box Culvert Height					x					NT
	BOXCULLT	Box Culvert Width		x	x		x					NT
	BXCULGTH	Box Culvert Length		x	x		x					NT

Table 2-5, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Available Inventory and Technology Options*									
			FDOR Aerial Images	Trimble R2 GNSS	Collector for ArcGIS	GPS-Enabled DMI	Tape Measure and measuring wheel	Photogram-metry	WISP HETAP	Mobile laser scanner	Photogramm etry plus LiDAR	U. of FL POC Mobile LiDAR**
	NOBXCULV	Number of Box Culverts										
	CRSDRLGH	Length of Crossdrain Pipes		x	x		x					NT
	NOCRDRAN	Number of Crossdrain Pipes										
	PIPEDIAM	Pipe Diameter					x					NT
	PIPEHIGH	Non-Circular Pipe Height					x					NT
	PIPETYPE	Type of Pipe										
	PIPEWIDTH	Non-Circular Pipe Width					x					NT
242 Storm Sewers	MANHOLES	Number of Manholes										
	MDITCBAS	Number of Catch Basins										
248 Outfall Ditches	ODITHAND	Outfall Ditch by Hand Length		x	x		x	x	x	x	x	NT
	ODITHAUL	Outfall Ditch by Hauled Length		x	x		x	x	x	x	x	NT
	ODITPIPE	Outfall Ditch by Length Piped		x	x		x	x	x	x	x	NT
	ODITSPR	Outfall Ditch Spread Length		x	x		x	x	x	x	x	NT
256 Turnouts	TRNOTPNP	Paved Turnouts Without Pipe	x	x	x	x		x		x	x	NT
	TRNOTPPI	Paved Turnouts With Pipe	x	x	x	x		x		x	x	NT
	TRNOTUNP	Unpaved Turnouts Without Pipe	x	x	x	x		x		x	x	NT
	TRNOTUPI	Unpaved Turnouts With Pipe	x	x	x	x		x		x	x	NT
	WDTRNPNP	Average Width Turnout, Paved, No Pipe		x	x		x	x	x	x	x	NT
	WDTRNPPI	Average Width Turnout, Paved With Pipe		x	x		x	x	x	x	x	NT
	WDTRNUNP	Average Width Turnout, Unpaved, No Pipe		x	x		x	x	x	x	x	NT
	WDTRNUPI	Average Width Turnout, Unpaved, With Pipe		x	x		x	x	x	x	x	NT
	SUNTRACP (proposed)	SUN Trail Access Point	x	x	x	x		x		x	x	NT
	SUNTRACC (proposed)	SUN Trail ADA Access at Turnout	x	x	x	x		x		x	x	NT
	SUNTRGTE (proposed)	SUN Trail Access Control		x	x	x		x		x	x	NT
	SUNTREVA (proposed)	SUN Trail Emergency Vehicle Access					x			x	x	NT

Table 2-5, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Available Inventory and Technology Options*									
			FDOR Aerial Images	Trimble R2 GNSS	Collector for ArcGIS	GPS-Enabled DMI	Tape Measure and measuring wheel	Photogram-metry	WISP HETAP	Mobile laser scanner	Photogramm etry plus LiDAR	U. of FL POC Mobile LiDAR**
271 Guardrail	SPCGRAIL	Miscellaneous Guardrail Length	x	x	x	x		x		x	x	x
272 Fencing	OTHERFCS	Number of Other Types of Fences	x	x	x	x		x		x	x	x
275 Miscellaneous Concrete Structures	RETWALL	Retaining Wall Length		x	x	x		x	x	x	x	NT
	SLOPEPAV	Slope Paving Area Concrete		x	x		x	x		x	x	NT
411 Roadside Mowing	SMMACMOW	Small Machine Mowing Area	x	x	x		x	x		x	x	NT
421 Roadside Ditch Cleaning	RDCANALS	Number of Roadside Canals	x	x	x	x		x		x	x	NT
	RDITEXCA	Number of Roadside Ditches (Excavator)	x	x	x	x		x		x	x	NT
443 Delineators	BRDELIN	Number of Bridge End Delineators										
	DELINEAT	Number of Guide Posts/Hazard Marker Delineators										
451 Striping	SNGLLINE	Number of Stripes—Single White or Yellow	x	x	x	x		x		x	x	x
452 Symbols & Messages	PNTLETTR	Number of Letters	x		x			x			x	x
	RADIUSMK	Radius Marking Area	x		x			x			x	x
454 Stop Bars	STOPBR12 (proposed add'l code)	Number of 12 Foot Stop Bars	x		x			x			x	x
480 Highway Signs	GRPSTL30	Number of Ground Sign Posts Less than 30 Square Feet										
	PANLLT30	Ground Panels Less Than 30 Square Feet										
Systems Implementation												
801 Trails	SUNTRTYP	SUN Trail Type										
	SUNTRDAT (proposed)	SUN Trail Date										
	SUNTRCOR	SUN Trail Corridor Name										
	SNTRBGPT (proposed)	SUN Trail Beginning Milepoint	x	x	x	x		x		x	x	NT
	SNTRENPT (proposed)	SUN Trail End Milepoint	x	x	x	x		x		x	x	NT
	SUNTRLOC (proposed)	SUN Trail Local Name										

Table 2-5, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Available Inventory and Technology Options*									
			FDOR Aerial Images	Trimble R2 GNSS	Collector for ArcGIS	GPS-Enabled DMI	Tape Measure and measuring wheel	Photogram-metry	WISP HETAP	Mobile laser scanner	Photogramm etry plus LiDAR	U. of FL POC Mobile LiDAR**
	STROVRLP (proposed)	SUN Trail Overlap										
	BEGTRMPT (proposed)	Begin SUN Trail Overlap Milepoint	x	x	x	x		x		x	x	NT
	ENDTRMPT (proposed)	End SUN Trail Overlap Milepoint	x	x	x	x		x		x	x	NT
	NEWTRDAT (proposed)	New SUN Trail Realignment Date										
	NSUNTRID (proposed)	Section/Sub-section of New SUN Trail Realignment										
	NSTRBGPT (proposed)	New SUN Trail Realignment Beginning Milepoint	x	x	x	x		x		x	x	NT
	NSTRENPT (proposed)	New SUN Trail Realignment End Milepoint	x	x	x	x		x		x	x	NT
	OSUNTRID (proposed)	Old SUN Trail Alignment ID										
	OSTRBGPT (proposed)	Old SUN Trail Alignment Beginning Milepoint										
	OSTRENPT (proposed)	Old SUN Trail Alignment End Milepoint										
	SUNTROWN (proposed)	SUN Trail Land Ownership										
	SUNTRMOA (proposed)	SUN Trail Local Entity Responsible for Maintenance										
	SUNTRFIN (proposed)	SUN Trail Final As-Built Construction Plans										
	SUNTRPER (proposed)	SUN Trail Permits										

*Source of accuracy requirements are those listed for each characteristic from FDOT (2016a).

** NT = Not Tested

Chapter 3 Recommendations for a Technical Framework for the SUN Trail Inventory

The recommended technical framework for the SUN Trail network is based upon the existing RCI inventory process and methods summarized in Technical Memorandum 1, the identified SUN Trail data needs identified in Technical Memorandum 2, and the identification and evaluation of other inventory methods from Technical Memorandum 3. Each of the measurement methods and representative equipment examples were evaluated, based upon the following.

1. Ability of the equipment to measure the dimension to the required level of accuracy
2. Consideration to FDOT's plan to use Esri Roads and Highways software
3. Safety of the measurement method, including method of travel
4. Relative cost, including staff required
5. Existing measurement equipment already in use by the Districts
6. Ability of the measurement method and representative equipment to measure characteristics in the seven characteristics categories

A Master Matrix of Recommended SUN Trail Features and Characteristics is provided in Appendix Table A-1. Based upon stakeholder input of the business needs, the level of resources available to conduct the SUN Trail inventory, and in consideration of FDOT's transition into geospatial data collection and data management, CUTR researchers suggest that the inventory process could be initially staged by applying priority to the SUN Trail characteristics considered most important. For example, designated SUN Trail segments of state interest that are defined as On-System may take a higher priority over SUN Trail segments that are considered as Off-System. The most basic aspect of the SUN Trail inventory is to establish accurate location for FDOT project tracking for asset and trail management. These recommended "minimum necessary characteristics", as summarized in the Appendix Table A-2, are almost all related to establishing the location of the SUN Trail alignment.

Beyond the SUN Trail alignment as established by the recommended minimum necessary characteristics, Appendix Table A-3 identifies additional location-related characteristics. Depending on FDOT's focus of resources for field surveys, it is recommended that these additional location-related characteristics should be inventoried next. The third set of characteristics pertain to maintenance and are listed in Appendix Table A-4. These are important to support FDOT's responsibilities to maintain the functionality of the SUN Trail network and the implementation of the Maintenance Memoranda of Agreement (MMOA) between FDOT and many local entities throughout the state.

FDOT has the opportunity to develop additional sets of characteristics to add to the inventory program, based upon strategic development, work program project information, utilization, safety, connectivity, and ADA (Americans with Disabilities Act) compliance access. These are listed in Appendix Tables A-5 through A-8. Many characteristics fit into two or more of these categories, as indicated in the tables.

Table A-1: Master matrix of recommended SUN Trail features and characteristics
Table A-2: Minimum necessary characteristics
Table A-3: Additional location characteristics
Table A-4: Characteristics that would support assessment of maintenance conditions
Table A-5: Characteristics that support calculation of SUN Trail utilization and meet reporting requirements for the FHWA Traffic Monitoring Analysis System (TMAS). This includes data for nonmotorized count station description records.
Table A-6: Characteristics that would support safety analysis
Table A-7: Characteristics that would support connectivity analysis
Table A-8: Characteristics that provide quick assessment of ADA accessibility. These are not characteristics representing detailed dimensions and measures necessary for Americans with Disabilities Act (ADA) accessibility compliance per the *2010 ADA Standards for Accessible Design* (U.S. DOJ 2010) and the *Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way; Shared Use Paths* (PROWAG) (ATBCB 2013)

3.1 Minimum Necessary Characteristics

These characteristics are considered to be the minimum SUN Trail characteristics to inventory and are listed in Appendix Table A-2. In the following order, these are the recommended steps to conduct the inventory to establish location of the SUN Trail alignment.

1. Prioritize the inventory of SUN Trail segments in the following order.
    I. On-system, funded with FDOT funds
    II. On-system, funded with non-FDOT funds
    III. Off-system, funded with FDOT funds
    IV. Off-system, funded with non-FDOT funds
2. Glean all useful inventory data from the as-built construction plans and other documentation.
3. Consult aerial imagery generated from the Florida County Digital Orthoimagery Program for alignment data. Because the imagery is generated on a three-year cycle, the most recently constructed SUN Trail segments may not appear on the aerial images.
4. Where the aerial images do capture the SUN Trail, collect the alignment data that is visible. For designated SUN Trail that is on system, including segments of bike lane that connect two SUN Trail shared use path segments, this data should be collected concurrently with the inventory for the parallel roadway.
5. The aerial view of some portions of the SUN Trail will be obscured by tree canopy. These remaining SUN Trail segments will require measurement in the field. Existing serviceable equipment as available to the Districts can be used, such as GPS-enabled DMIs and Trimble handheld computers.
6. Prior to the inventory, FDOT or the consultant responsible for the inventory must coordinate with the local trail authority to implement a Temporary Traffic Control plan to ensure the safety of the traveling public. Any work related to data collection, maintenance, or installation of signage, traffic monitoring stations or other assets will require strong coordination with local entities.

Department procedures like Maintenance of Traffic (MOT) guidelines are important for FDOT to follow, to make sure the inventory work does not impact the motoring or non-motoring public.

7. Document where locations have emergency vehicle access, including at SUN Trail access points, SUN Trail bridges, and SUN Trail underpasses. These will require measuring access point width and vertical clearance. It is recommended to use a standard tape measure that is able to traverse features in the field.
8. FDOT prioritizes the utilization of GIS tools and technology. It is recommended to record inventory data using Esri Collector for ArcGIS.

It also is possible that the University of Florida's proof of concept mobile LiDAR system could be piloted on the SUN Trail to establish location, trail segment length, and emergency vehicle accessibility. Not all features and characteristics in the field can be inventoried using the proof-of-concept system presently. In the future, further research about the use of additional LiDAR sensors, development and refinement of algorithms that detect more characteristics, and the use of neural networks for pattern matching could potentially expand the range of characteristics that this system could inventory. The fact that the SUN Trail inventory for Off-System segments that run along an independent alignment will consist of a single lane, means that the proof-of-concept LiDAR system could be anticipated to perform well as an inventory method for the SUN Trail in the future.

Use of an established mobile mapping system, provided by a vendor, which includes some combination of photogrammetry and/or LiDAR is recommended only if FDOT pursues such inventory methods for the State Highway System. This is because mobile mapping services are the most expensive. Where a mobile mapping system, such as that provided by Mandli Communications, Inc. is used for the roadway system, the cost of equipment and mobilization is fixed, and the additional mileage for inventorying SUN Trail segments in proximity to scheduled roadway inventories could then be added to the inventory route plan. Each year, there will be some number of completed miles of SUN Trail in various locations in each of the Districts. The mileage of SUN Trail completed each year is not large enough, by itself, to justify contracting with a mobile mapping service, unless it is included as part of the larger roadway inventory program that will also be inventoried by a mobile mapping system.

3.2 Additional Location Characteristics

Establishing location of the characteristics of the existing SUN Trail will be needed for purposes of SUN Trail network development phases, as well as for developing the maintenance Work Program. Appendix Table A-3 identifies recommended data that should be collected, and the level of accuracy needed.

1. In the office, review the latest official municipal maps to determine location of city boundaries relative to the alignment of the SUN Trail segment.
2. Prior to the inventory, FDOT or the consultant responsible for the inventory must coordinate with the local trail authority to implement a Temporary Traffic Control plan to ensure the safety of the traveling public.

Any work related to data collection, maintenance, or installation of signage, traffic monitoring stations or other assets will require strong coordination with local entities. Department procedures like Maintenance of Traffic (MOT) guidelines are important for FDOT to follow, to make sure the inventory work does not impact the motoring or non-motoring public.

3. The remaining location-related characteristics include field documentation of signed street names that intersect the SUN Trail, SUN Trail trailheads and access points, a count of the number of turnouts located along the SUN Trail segment having the same Roadway ID, and other characteristics that can mark locations along the SUN Trail. These include data relating to bridges, underpasses, trail segments coded into the local Emergency Management System (e.g., Suncoast Trail), and locations where the SUN Trail may overlap with another named facility, such as designated sections of the Florida National Scenic Trail, the Department of Interior's National Recreational Trail, and the East Coast Greenway. The same methods used for the recommended minimum necessary characteristics would apply to these additional location-related characteristics.
4. Appendix A contains Table A-3: Matrix of Recommended SUN Trail Data for Additional Location Characteristics. Within this matrix, there is Trails – Feature 801, PROPOSED CHARACTERISTIC, STROVRLP, SUN Trail Overlap. This characteristic also is listed as a connectivity characteristic in Table A-7, and is proposed to contain the name of other trail systems that overlap the SUN Trail. This represents the RCI method that is to code multiple features/characteristics on the Roadway ID section to create an attribute field. Additionally, if RCI were to report on a single route that overlaps with another route, as in the case of US17-92, then the practice is to code the feature and characteristic and length data once on one Roadway ID and have the route feature calculate mileage on all the sections within the route. It is important to note that there are other options for coding trail overlaps. For example, the SUN Trail GIS method could have multiple attribute fields to reflect multiple trail names to the trail section. In GIS, spatial querying and selecting the segments with their trail can be performed to calculate the trail length as well. Both data coding methods have their distinct advantages of reporting data due to the nature of the system of data needs.

3.3 Recommended SUN Trail Maintenance Characteristics

Appendix Table A-4 lists characteristics relating to maintenance. While the maintenance of the SUN Trail is the responsibility of the local entities, FDOT may keep some maintenance tasks for SUN Trail segments On-System. These facilities include pavement and structures. The list of recommended maintenance characteristics to be inventoried include the RCI features and characteristics for pavement condition, crossdrains, storm sewers, outfall ditches, and turnouts, under which may include drain pipes. These RCI features may also include retaining walls, slope paving area, roadside mowing, signage, and pavement markings. These maintenance characteristics are included because there may be circumstances where a local entity may fail to perform their maintenance commitment. In such a case, FDOT may choose to perform the maintenance and invoice the local entity.

In order to schedule and do the maintenance work, FDOT would first need an inventory of the scope and size of the SUN Trail infrastructure to be maintained.

Prior to the inventory, FDOT or the consultant responsible for the inventory must coordinate with the local trail authority to implement a Temporary Traffic Control plan to ensure the safety of the traveling public. Any work related to data collection, maintenance, or installation of signage, traffic monitoring stations or other assets will require strong coordination with local entities. Department procedures like Maintenance of Traffic (MOT) guidelines are important for FDOT to follow, to make sure the inventory work does not impact the motoring or non-motoring public.

Many of the measurements for maintenance characteristics are to the nearest inch and may not be seen from an aerial image. Many of these features and characteristics also are not in the line-of-sight of a moving vehicle, such as a mobile mapping system equipped with photogrammetry or LiDAR. As a result, such measurements would need to be taken using a Trimble handheld computer, Esri Collector for ArcGIS, or manual measuring wheel and steel measuring tape that can traverse features in the field.

3.4 Recommended SUN Trail Utilization Characteristics

The SUN Trail Program plans to include collecting data on utilization of the SUN Trail network. A list of recommended characteristics for SUN Trail related to utilization is presented in Appendix Table A-5. Utilization performance metrics for bicyclist and pedestrian mobility are not listed in the *FDOT Source Book*. However, the *2018 FDOT Traffic Monitoring Handbook* (FDOT 2018c, 51-68) provides a chapter on the methodology for establishing and conducting a non-motorized traffic monitoring program. This *Handbook* closely follows the guidance in the *FHWA 2016 Traffic Monitoring Guide* (USDOT 2016a). FDOT is in the process of establishing the Statewide Non-Motorized Traffic Monitoring Program (hereinafter abbreviated as NMTMP) and the Non-Motorized Statewide Data Repository (hereinafter abbreviated as NMSDR). The process for developing a continuous nonmotorized traffic program includes developing an inventory of available continuous count locations and equipment.

The purpose of this statewide database is to contain all the data in one format, for a seamless and integrated data resource that is available to anyone. The nonmotorized count data also will be reported to FHWA. FDOT's goal for the bicycle and pedestrian count program is to have all statewide nonmotorized count stations logged in FHWA's recently launched national nonmotorized traffic monitoring program. The data format that FHWA requires includes the documentation of attributes such as directionality, speed, and bike/ped classification, among many others.

FDOT has already accepted approximately 100 voluntary nonmotorized traffic volume data sets from other agencies throughout the state (FDOT 2019c). For example, there are permanent continuous count stations that are already on some older existing trails that have been designated as SUN Trail facilities, such as on the Fred Marquis Pinellas Trail in Pinellas County, M-Path in Miami-Dade County, and Cascades Park Bridge in the City of Tallahassee.

FDOT will analyze the submitted data for accuracy, and format the data into record formats that can be accepted by the FHWA Traffic Monitoring and Analysis System (TMAS) software (USDOT 2016b).

Two record formats are defined for submitting nonmotorized traffic volume data to FHWA. These are the Nonmotorized Count Station Description Record (location), and the Nonmotorized Count Record. The Count Station Description Record is of interest to the development of the RCI to integrate data for the SUN Trail network. Providing these records for the Count Station Description Record type is a prerequisite for reporting nonmotorized count data in the Nonmotorized Count Records to FHWA. This includes initially developing an inventory of available nonmotorized continuous count locations and equipment, similarly in purpose to the existing RCI Feature 326 Traffic Monitoring Sites for motor vehicle traffic counts.

The *FHWA 2016 Traffic Monitoring Guide* (TMG) specifies the record format for the Nonmotorized Count Station Description record.

> The Nonmotorized Count Station Description file contains one record per traffic monitoring station for each facility type and nonmotorized travel mode counted. In addition, updated station records can be submitted at any time during the year if an equipment change occurs at a site, which would result in a different type of data being submitted at that location. All fields on each record are considered to be character fields (U.S. DOT 2016a, 7-71).

Table 3-1 below recreates "Table 7-31 Nonmotorized Count Station Description Record" from the FHWA TMG. The right column labelled 'Type' indicates if the data field is critical (C) and must be supplied to FHWA, or if the data field is optional (O) for reporting to FHWA.

The RCI is currently being updated. Decisions to be made might include the degree of integration of the RCI data collection process and database, with the NMTMP/NMSDR. Some of the data fields in Table 3-1 describe the nonmotorized count stations, and these data could be supplied by the RCI data collection process. The data for some of these fields could be collected in the office, including the data for FHWA Record Fields 1-6, 22-24, 29, and 32 in Table 3-1.

Data for other fields would have to be collected on location, including the data for Fields 9-10, 12-13, 21, 25-28, and 30-32. Prior to the inventory, FDOT or the consultant responsible for the inventory must coordinate with the local trail authority to implement a Temporary Traffic Control plan to ensure the safety of the traveling public. Any work related to data collection, maintenance, or installation of signage, traffic monitoring stations or other assets will require strong coordination with local entities. Department procedures like Maintenance of Traffic (MOT) guidelines are important for FDOT to follow, to make sure the inventory work does not impact the motoring or non-motoring public.

There are some data fields that are specific to the type of count data being collected by the nonmotorized traffic counting station. These fields are more associated with the design of the count and would be more appropriate for the Traffic Characteristics Inventory (TCI)/NMTMP to contain. These fields include FHWA Record Fields 7-8, 11, and 14-20. Decisions may need to be made regarding integration with the existing TCI and other offices that may provide direction for the nonmotorized counts, such as the SUN Trail Program and the NMTMP. Four columns in Table 3-1 were added to the original FHWA TMG Table 7-31. These are the four far left columns. The left-most column distinguishes those fields of the Nonmotorized Count Station Description Record, which are recommended to be contained in the RCI/NMSDR database, as distinguished from those fields containing data that describe the type of count and which would more appropriately be included in the TCI/NMSDR. The remaining three columns added on the left side of Table 3-1, identify the recommended data collector for each data field, the data collection location (in office or in field), and if the data is collected in the field, then whether the data is collected by measurement or simply by observation.

There are 11 fields that would require measurement in the field, and of these, four are critical (C) to FHWA. These four fields are shaded in Table 3-1. These are FHWA Record Fields 9 and 12, Facility Type and Method of Counting, respectively, both of which are observable. FHWA Record Fields 25 and 26, Latitude and Longitude, respectively, would require measuring with a GPS device.

Table 3-1: Nonmotorized Count Station Description Record as Defined by FHWA

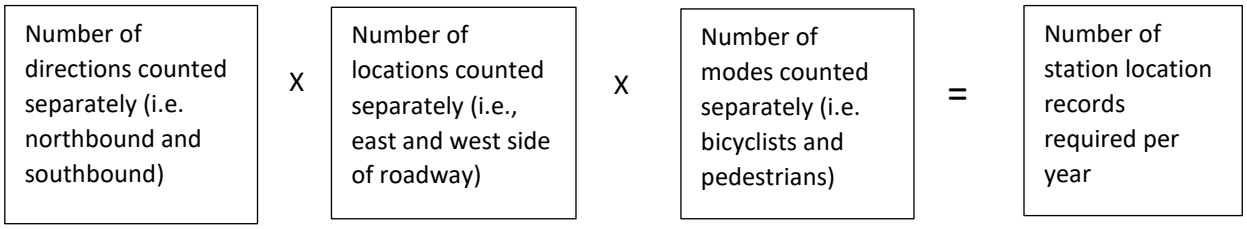
Recommended Database Options	Recommended Data Collector	Data Collection Location	Observed (O) or Measured (M)	FHWA Record Field	FHWA Record Columns	Width	Description	Type Critical (C) or Optional (O)
RCI/NMSDR	RCI/NMTMP	In office	--	1	1	1	Nonmotorized station/location record identifier ('L')	C
RCI/NMSDR	RCI/NMTMP	In office	--	2	2-3	2	State FIPS Code ('12')	C
RCI/NMSDR	RCI/NMTMP	In office	--	3	4-6	3	County FIPS Code	C
RCI/NMSDR	RCI/NMTMP	In office	--	4	7-12	6	Station ID	C
RCI/NMSDR	RCI/NMTMP	In office	--	5	13-14	2	(Functional) classification of road (expanded)	C
RCI/NMSDR	RCI/NMTMP	In office	--	6	15	1	Direction of route	C
TCI/NMSDR	TCI/NMTMP	--	--	7	16	1	Location of count relative to roadway	C
TCI/NMSDR	TCI/NMTMP	--	--	8	17	1	Direction of movement	C
RCI/NMSDR	RCI/NMTMP	In field	O	9	18	1	Facility type	**C**
RCI/NMSDR	RCI/NMTMP	In field	O	10	19	1	Intersection	O
TCI/NMSDR	TCI/NMTMP	--	--	11	20	1	Type of count (bike/pedestrian/both)	C
RCI/NMSDR	RCI/NMTMP	In field	O	12	21	1	Method of counting	**C**
RCI/NMSDR	RCI/NMTMP	In field	O	13	22	1	Type of sensor	O
TCI/NMSDR	TCI/NMTMP	--	--	14	23-26	4	Year of data	C
TCI/NMSDR	TCI/NMTMP	--	--	15	27	1	Factor Group 1	O
TCI/NMSDR	TCI/NMTMP	--	--	16	28	1	Factor Group 2	O
TCI/NMSDR	TCI/NMTMP	--	--	17	29	1	Factor Group 3	O
TCI/NMSDR	TCI/NMTMP	--	--	18	30	1	Factor Group 4	O
TCI/NMSDR	TCI/NMTMP	--	--	19	31	1	Factor Group 5	O
TCI/NMSDR	TCI/NMTMP	--	--	20	32	1	Primary Count Purpose	O
RCI/NMSDR	RCI/NMTMP	In field	O	21	33-34	2	Posted Speed Limit	O
RCI/NMSDR	RCI/NMTMP	In office	--	22	35-38	4	Year station established	C
RCI/NMSDR	RCI/NMTMP	In office	--	23	39-42	4	Year station discontinued	O

Table 3-1, continued

Recommended Database Options	Recommended Data Collector	Data Collection Location	Observed (O) or Measured (M)	FHWA Record Field	FHWA Record Columns	Width	Description	Type Critical (C) or Optional (O)
RCI/NMSDR	RCI/NMTMP	In office	--	24	43	1	National Highway System	O
RCI/NMSDR	RCI/NMTMP	In field	M	25	44-51	8	Latitude	**C**
RCI/NMSDR	RCI/NMTMP	In field	M	26	52-60	9	Longitude	**C**
RCI/NMSDR	RCI/NMTMP	In field	O	27	61-62	2	Posted Route Signing	O
RCI/NMSDR	RCI/NMTMP	In field	O	28	63-70	8	Posted Signed Route Number	O
RCI/NMSDR	RCI/NMTMP	In office	--	29	71-130	60	LRS Route ID	O
RCI/NMSDR	RCI/NMTMP	In field	M	30	131-138	8	LRS Location Point	O
RCI/NMSDR	RCI/NMTMP	In field	O	31	139-188	50	Station Location (text description)	O
RCI/NMSDR	RCI/NMTMP	In office and/or in field		32	189-239	51	Other Notes	O

Source: U.S. DOT. FHWA Federal Highway Administration Traffic Monitoring Guide. (Washington, D.C.: FHWA, 2016), 7-71, Table 7-31.

It is important to note that Table 3-1 represents one count station description record for a particular combination of location, nonmotorized travel mode, and direction of travel. The number of station location records needed, in general, can be determined by the following equation in Figure 3-1 below, as recreated from Exhibit 14 in the FHWA document, *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format*.



Source: U.S. DOT 2016b, Chapter 5, Exhibit 14, p. 41.

Figure 3-1. Number of Station Location Records Required per Year

The FDOT Statewide Non-Motorized Traffic Monitoring Program Coordinator advises documenting each sensor separately in the RCI, including those at the same location, to maintain a record of the vendor source for each sensor device.[2]

Station location fields may change when multiple counts are collected at a single location on a facility. For example, multiple counts could include both northbound and southbound bicyclists on a shared use path, or a total count of both bicyclists and pedestrians. Table 3-2 below recreates Table 14 from the FHWA document, *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format*. It illustrates examples of which station location fields may change when multiple counts are collected at a single location on a facility, such as a total count of both pedestrians and bicyclists. The "Notes" column indicates when and why fields in the count station description record may change (U.S. DOT 2016b, Chapter 5, Exhibit 14, p. 41). From Table 3-2, FHWA Record Field 12, Method of Counting (i.e. portable or permanent device) is observed in the field, while FHWA Record Fields 7, 8, and 11 pertain to the type of count data to be collected.

Possible locations of the nonmotorized continuous count stations may be along designated SUN Trail segments that are bicycle lanes, and/or shared use paths that are parallel to roadways On-System, and/or shared use paths that are Off-System, including shared use paths that follow an independent alignment.

[2] Florida Department of Transportation. Eric Katz, Statewide Non-Motorized Traffic Monitoring Program Coordinator, Transportation Data and Analytics Office. Email communication. February 20, 2019.

Table 3-2: Station Location Data Fields That May Change with Different Counts

FHWA Record Field (from Table 3)	Description	Type (Critical or Optional)	Notes
7	Location of count relative to roadway	C	May change if counts taken on a different side of the roadway
8	Direction of movement	C	Change if counts taken in a different direction
11	Type of count (bike, pedestrian or both)	C	Change if different type of traveler counted
12	Method of counting	C	May change if different method used to count user

Source: U.S. DOT. 2016b. *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format*. (Washington, D.C.: FHWA, 2016), 41, Table 14.

The *FDOT Traffic Monitoring Handbook* recommends that the Districts initially target three to five continuous count stations to be installed for each factor group. Factor groups, as described in the *FDOT Traffic Monitoring Handbook*, include commuter and work/school-based trips, recreation/utilitarian trips, and mixed trip purposes (FDOT 2018c, 54). Initially, this would sum to at least nine to 15 continuous count stations per District. As traffic patterns in each District are observed over time, new factor groups may emerge. In the FHWA TMG, the fields containing the factor groups for each nonmotorized count station description record are listed as optional, and FHWA offers alternative definitions for five factor groups to identify patterns in nonmotorized traffic volumes, such as time-of-day, day of week, seasonality, weather, and counter equipment adjustments (U.S. DOT 2016a, 7-77 to 7-78).

The *FDOT Traffic Monitoring Handbook* also provides a list of considerations for determining the best locations for the continuous count stations. These considerations include locations to capture a representative sample of activity to be adjusted for annualized counts. Other considerations are to select count station locations that reduce the possibility of the sensor to fail to register a trip or reduce the incidence of a traveler circumventing the sensor (FDOT 2018c, 55).

Based upon the intended use of the nonmotorized count data, the following is an example that illustrates some considerations for the location of count stations for the purpose of measuring utilization. One of the outcomes of providing the SUN Trail network may be to stimulate new pedestrian and bicyclist activity, representing nonmotorized trips not taken previously. For a selected major trip origin-destination pair, such a determination might entail collecting bicycle and pedestrian count data on the roadway network near the new SUN Trail segment access point, prior to completion, to compare with the number of bicycle and pedestrian trips counted at some time after the SUN Trail opening.

The following is a second example that illustrates some considerations for the location of count stations for the purpose of measuring utilization. One of the primary purposes of the SUN Trail network is to provide a safe place for bicyclists and pedestrians to travel, separated from motorized traffic. A measure of SUN Trail utilization will also support the measure of safety provided by the SUN Trail, with regard to measuring exposure. The current crash rate cannot be calculated accurately without traffic volume data because the volume data is the denominator in the crash rate calculation. The SUN Trail network may have the effect of altering the route that pedestrians and bicyclists previously took. For example, a bicyclist may now use the SUN Trail for a trip that was previously taken using a roadway with less accommodation for bicyclists and pedestrians. The pedestrian LOS, the bicycle LOS, and number of bicycle and pedestrian fatalities and serious injuries along that roadway, in addition to utilization, also could be measured prior to the opening of a parallel SUN Trail segment. A decrease in nonmotorized utilization along that segment of roadway, and a concurrent increase in nonmotorized utilization along the new SUN Trail segment, supplemented with a travel survey of SUN Trail users, would be useful measures associated with the comparative number of bicyclist and pedestrian fatalities and serious injuries along the roadway, after the SUN Trail segment opened.

Presently, there are 12 identified permanent count station sensor types that have been identified by the *FDOT Traffic Monitoring Handbook* and are listed below (FDOT 2018c, 58-68).

- Pneumatic tubes
- Passive side-fire infrared sensors
- Passive overhead infrared sensors
- Active infrared sensors
- Digital continuous camera recording
- Inductive loops
- Piezoelectric strips
- Radar scanners
- Thermal sensors
- Laser scanners
- Pressure and acoustic sensors
- Magnetometers

One or more sensor types may be installed in the same general location. FHWA Record Field 13, Type of Sensor, within the FHWA TMG format for the Nonmotorized Count Station Description Record, provides alphanumeric codes for 18 sensor type options.

Vendors that meet FDOT's requirements for sensors will be added to the FDOT Approved Products List (APL) in the near future. It is recommended that the RCI provide codes that enable distinguishing among the many different types of sensors that could be chosen for a specific location.

Other potential physical characteristics of the nonmotorized continuous count stations, which FDOT might consider documenting in the RCI, could include the position and height of the sensor, and descriptive information about the sensor mounts.

Presently, a more commonly used technology for counting bicyclist and pedestrian utilization is a passive infrared sensor attached to a post positioned along the side of the trail, which emits a temperature detection zone. The zone registers every nonmotorized traveler and their direction of movement. Adjacent to the post is either inductive loops or piezo strips that detect the metal in bicycles. The total nonmotorized count from the infrared device is subtracted from the total count detected by the inductive/piezo loops, thereby providing separate counts for bicyclists and pedestrians.[3]

While the 2016 FHWA Nonmotorized Traffic Monitoring Program and FHWA TMG provide information on the required data and format for bicyclist and pedestrian utilization data, the FDOT Statewide Non-Motorized Traffic Monitoring Program may also identify additional data that should be collected and documented in the RCI. The Program is presently under development. The FDOT division and office that will maintain the continuous count stations will be the Transportation Data and Analytics Office. The Program is presently developing data-sharing partnerships with the Districts and non-FDOT agencies statewide. In addition, some non-FDOT agencies are offering to assist with maintenance of these count station sites. If those maintenance relationships are developed, these could become part of the Maintenance Memorandum of Agreement between FDOT and a local entity.

The format of the FHWA nonmotorized station location information (found in the FHWA 2016 TMG) compared with the RCI format, as summarized in Table 3-3 below shows that four FHWA Record Fields could potentially use existing RCI features and characteristics to contain the data. These are FHWA Record Fields 4, 21, 29, and 30.

A comparison of all Record fields for the FHWA Nonmotorized Count Station Description Records, with the RCI Features and Characteristics is shown in Table 3-4.

The RCI Feature 326 Traffic Monitoring Sites, Traffic Station Number could contain the FHWA TMG Station ID (Field 4) in the FHWA Nonmotorized Count Station Description Record. FDOT is in the process of developing the station identification number format. FDOT could consider making the identification number for each continuous count station to match the FHWA TMG required identification number, given that the only FHWA requirements are that the identification number be six digits and alphanumeric. FHWA Record Field 21, Posted Speed Limit, corresponds to the RCI Feature 311 Speed Limits, Maximum Speed Limit, MAXSPEED. FHWA Record Field 29, LRS Route ID, has a 60-character LRS identification value reported in the HPMS for the section of roadway where the count station is located. FDOT may be able to link to these LRS identification values if FDOT has this information located within the RCI.

[3] Florida Department of Transportation. Eric Katz, Statewide Non-Motorized Traffic Monitoring Program Coordinator, Transportation Data and Analytics Office. Email communication. February 20, 2019.

Otherwise a new characteristic is proposed to contain this information. FHWA Record Field 30, LRS Location Point, corresponds to the milepoint location measured for the count station, and it is recommended that it could be linked with the proposed RCI characteristic for FHWA Record Field 4, Station ID.

Table 3-3: Four Record Fields from the FHWA Nonmotorized Count Station Description Record Potentially Corresponding to RCI Features and Characteristics

FHWA Record Field	FHWA Record Description	FHWA TMG Nonmotorized Count Station Description Record Field Compatibility with RCI Features and Characteristics
4	Station ID	FDOT has tentatively agreed on Traffic Station Number containing 2-digit county and 4-digit site number (beginning with N for Nonmotorized), unique for each county, as provided for RCI Feature 326 Traffic Monitoring Site. FHWA TMG instructions require only that Station Number be alphanumeric.
21	Posted Speed Limit	RCI Feature 311 Speed Limits, Maximum Speed Limit (MAXSPEED) corresponds to this FHWA TMG field
29	LRS Route ID	There is no corresponding LRS Route ID characteristic in the RCI. For SUN Trail bike lanes and SUN Trail shared use paths On-System, it is recommended to use the same 60-character LRS identification value reported in the HPMS for the section of roadway where the count station is located. For SUN Trail shared use paths Off-System, this field would be left blank.
30	LRS Location Point	The continuous count station is assigned a milepoint xxxx.xxx. This milepoint could be linked with the Field 4 Station ID.

Where there is no potential to integrate the data from the FHWA TMG fields into the existing RCI features and characteristics, then new characteristics are proposed to be created within the RCI. It is recommended that these new characteristics representing the data contained in the FHWA Nonmotorized Count Station Description Records be located within Feature 326 Traffic Monitoring Sites, to contain at a minimum, the data that correspond to the fields identified as critical (C) in the FHWA TMG Nonmotorized Count Station Description Record. These proposed characteristics are included in Appendix Table A-1, Matrix of Recommended SUN Trail Features and Characteristics, listed under Operational Features, Traffic Monitoring Sites, and Feature 326. These proposed characteristics also are listed within Appendix Table A-5, Matrix of Recommended SUN Trail Data for Measuring Utilization. The descriptions of the characteristics under Feature 326 in Appendix Tables A-1 and A-5 correspond to the descriptions in the Description column in Table 3-4 below.

Table 3-4: Comparison of FHWA Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format With RCI Format

Recommended Database Options	Recommended Data Collector	Data Collection Location	Observed (O) or Measured (M)	FHWA Record Field	FHWA Record Columns	Width	Description	Type Critical (C) or Optional (O)	FHWA TMG Nonmotorized Count Station Description Record Field Compatibility with RCI Features and Characteristics
RCI/NMSDR	RCI/NMTMP	In office	--	1	1	1	Nonmotorized station/location record identifier ('L')	C	--
RCI/NMSDR	RCI/NMTMP	In office	--	2	2-3	2	State FIPS Code ('12')	C	--
RCI/NMSDR	RCI/NMTMP	In office	--	3	4-6	3	County FIPS Code	C	FDOT has its own 2-digit codes for counties, used as part of Roadway ID. These do not correspond to the County FIPS Codes
RCI/NMSDR	RCI/NMTMP	In office	--	4	7-12	6	Station ID	C	FDOT format still under development. RCI Feature 326 Traffic Monitoring Site, Traffic Station Number includes the 2-digit county code plus a 4-digit site number. TMG instructions require only that Station Number be alphanumeric.
RCI/NMSDR	RCI/NMTMP	In office	--	5	13-14	2	(Functional) classification of road (expanded)	C	RCI Feature 121 Functional Classification, FUNCLASS and PROFUNCL do not correspond to classification codes listed in the TMG
RCI/NMSDR	RCI/NMTMP	In office	--	6	15	1	Direction of Route	C	Geographic orientation of roadway, coded in TMG as a digit from 0 to 9. There is no corresponding Direction of Route data in RCI
TCI/NMSDR	TCI/NMTMP	--	--	7	16	1	Location of Count Relative to Roadway	C	--
TCI/NMSDR	TCI/NMTMP	--	--	8	17	1	Direction of Movement	C	--
RCI/NMSDR	RCI/NMTMP	In field	O	9	18	1	Facility Type	C	There is no corresponding Facility Type data in RCI
RCI/NMSDR	RCI/NMTMP	In field	O	10	19	1	Intersection	O	There is no corresponding Intersection data in RCI
TCI/NMSDR	TCI/NMTMP	--	--	11	20	1	Type of Count (bike/pedestrian/both)	C	There is no corresponding Type of Count data in RCI

Table 3-4, continued

Recommended Database Options	Recommended Data Collector	Data Collection Location	Observed (O) or Measured (M)	FHWA Record Field	FHWA Record Columns	Width	Description	Type Critical (C) or Optional (O)	FHWA TMG Nonmotorized Count Station Description Record Field Compatibility with RCI Features and Characteristics
RCI/NMSDR	RCI/NMTMP	In field	O	12	21	1	Method of Counting	C	--
RCI/NMSDR	RCI/NMTMP	In field	O	13	22	1	Type of sensor	O	RCI Feature 326 Traffic Monitoring Sites, Traffic Station Type, contains codes for five types of motor vehicle traffic counters. These are I, P, R, T, and V. These same letter codes also are used in the TMG for nonmotorized counters but these do not match similar sensor types. Therefore, RCI Feature 326 Traffic Monitoring Sites, Traffic Station Type would be unsuitable to contain information about the nonmotorized traffic sensor types.
TCI/NMSDR	TCI/NMTMP	--	--	14	23-26	4	Year of data	C	--
TCI/NMSDR	TCI/NMTMP	--	--	15	27	1	Factor Group 1	O	--
TCI/NMSDR	TCI/NMTMP	--	--	16	28	1	Factor Group 2	O	
TCI/NMSDR	TCI/NMTMP	--	--	17	29	1	Factor Group 3	O	
TCI/NMSDR	TCI/NMTMP	--	--	18	30	1	Factor Group 4	O	
TCI/NMSDR	TCI/NMTMP	--	--	19	31	1	Factor Group 5	O	
TCI/NMSDR	TCI/NMTMP	--	--	20	32	1	Primary Count Purpose	O	There is no corresponding Primary count purpose in RCI
RCI/NMSDR	RCI/NMTMP	In field	O	21	33-34	2	Posted Speed Limit	O	RCI Feature 311 Speed Limits, Maximum Speed Limit (MAXSPEED) corresponds to this TMG field
RCI/NMSDR	RCI/NMTMP	In office	--	22	35-38	4	Year Station Established	C	There is no corresponding Year Station Established in RCI
RCI/NMSDR	RCI/NMTMP	In office	--	23	39-42	4	Year Station Discontinued	O	There is no corresponding Year Station Discontinued in RCI
RCI/NMSDR	RCI/NMTMP	In office	--	24	43	1	National Highway System	O	RCI Feature 112 Federal System provides codes that indicate federal aid funding eligibility of public roadways, but the code breakdown does not correspond with the TMG

Table 3-4, continued

Recommended Database Options	Recommended Data Collector	Data Collection Location	Observed (O) or Measured (M)	FHWA Record Field	FHWA Record Columns	Width	Description	Type Critical (C) or Optional (O)	FHWA TMG Nonmotorized Count Station Description Record Field Compatibility with RCI Features and Characteristics
RCI/NMSDR	RCI/NMTMP	In field	M	25	44-51	8	Latitude	C	There is no corresponding Latitude data in RCI
RCI/NMSDR	RCI/NMTMP	In field	M	26	52-60	9	Longitude	C	There is no corresponding Longitude data in RCI
RCI/NMSDR	RCI/NMTMP	In field	O	27	61-62	2	Posted Route Signing	O	Route signing codes are based on Data Item 18 in HPMS Sections dataset of the 2012 HPMS Field Manual. These codes do not correspond to coding used for the RCI Feature 113 AASHTO US Route Number
RCI/NMSDR	RCI/NMTMP	In field	O	28	63-70	8	Posted Signed Route Number	O	There is no corresponding Posted Signed Route Number in the RCI that matches the TMG format
RCI/NMSDR	RCI/NMTMP	In office	--	29	71-130	60	LRS Route ID	O	There is no corresponding LRS Route ID characteristic in the RCI. For SUN Trail bike lane and SUN Trail shared use paths On-System, use the same 60-character LRS identification value reported in the HPMS for the section of roadway where the count station is located. For SUN Trail shared use paths Off-System, this field would be left blank.
RCI/NMSDR	RCI/NMTMP	In field	M	30	131-138	8	LRS Location Point	O	The continuous count station is assigned a milepoint xxxx.xxx. This milepoint could be associated with Field 4 Station ID.
RCI/NMSDR	RCI/NMTMP	In field	O	31	139-188	50	Station Location	O	There is no corresponding Station Location English text entry field in RCI
RCI/NMSDR	RCI/NMTMP	In office and/or in field		32	189-239	51	Other Notes	O	There is no corresponding Other Notes field in RCI

Source: U.S. DOT. Federal Highway Administration Traffic Monitoring Guide (Washington, D.C.: FHWA, 2016), 7-71. Table 7-31.

3.5 Recommended Characteristics for Safety Performance Metrics

Appendix Table A-6 lists characteristics relating to safety performance metrics. There are characteristics that require measuring distance, such as Miscellaneous Guard Rail Length that may include a variety of handrail types. Safety also will include width of the shared use path, to the nearest 0.5 foot. In addition, there are a number of safety-related characteristics that require observation, such as type of traffic signal, and counting the number of sign panels under 30 square feet. Because there is much to measure, observe, and count for the safety-related characteristics, it is recommended to use serviceable equipment that is currently available to the Districts, such as GPS-enabled DMIs and Trimble handheld computers, and Esri Collector for ArcGIS.

It is important to note that Esri Collector for ArcGIS is downloaded to the field inventory crew's mobile devices, such as a tablet. This means that the investment in Collector would also require investment in tablets or some other suitable mobile devices. Districts may already have tablets that can be used for this purpose. Another consideration is that tablets can be accidently dropped and may be less resilient in various weather conditions. This would highlight the advantage of alternatively using a Trimble handheld computer to collect the field data, because the Trimble is ruggedly designed for the purpose of being taken out into the field to conduct measurements. The Trimble 88180-04 measures to decimeter accuracy and has Floodlight satellite shadow reduction technology for use in areas where trees can obstruct GNSS satellite reception.

For measuring safety performance, the discussion below identifies recommended data that should be collected, the level of accuracy needed, and the recommended methods and technologies to use to collect the data.

Prior to the inventory, FDOT or the consultant responsible for the inventory must coordinate with the local trail authority to implement a Temporary Traffic Control plan to ensure the safety of the traveling public. Any work related to data collection, maintenance, or installation of signage or other assets will require strong coordination with local entities. Department procedures like Maintenance of Traffic (MOT) guidelines are important for FDOT to follow, to make sure the inventory work does not impact the motoring or non-motoring public.

The *FDOT Source Book* (FDOT 2018b) and *Methodologies for The FDOT Source Book: A Technical Report – 2018*, (FDOT 2019d) Chapter 7, provide mobility measures for pedestrian and bicycle safety, in terms of quality. Mobility measures relating to quality include pedestrian level of service, bicyclist level of service, pedestrian fatalities and serious injuries, and bicyclist fatalities and serious injuries (FDOT 2018b, 8). The summaries below list the required data to calculate these performance measures. It appears that there already are data sources for all the data needed to calculate these performance measures, and no further data is needed, which could otherwise be proposed for collecting as part of the RCI. Much of the data for the level of service calculations is sourced from the RCI.

3.5.1 Pedestrian Level of Service (LOS)

The measure of pedestrian LOS is based upon the methodology provided in the *FDOT 2013 Quality/Level of Service Handbook* (FDOT 2013) and the FDOT Pedestrian LOS Model. The pedestrian LOS is based on the pedestrian's perception of the roadway or nearby roadside environment. Pedestrian LOS is determined by the following variables (FDOT 2018b, 51).

1. Existence of a sidewalk
2. Sidewalk width and offset, RCI Feature 216 SIDWLKWD
3. Shared path width and separation, RCI Feature 216 SHARDPTH
4. Motorized vehicle volumes, AADT, supplied by FDOT GIS Website (https://gis-fdot.opendata.arcgis.com/datasets/annual-average-daily-traffic-tda) (FDOT 2019d, 7-1)
5. Motorized vehicle speeds, Maxspeed, supplied by FDOT GIS Website (https://gis-fdot.opendata.arcgis.com/datasets/maximum-speed-limit-tda) (FDOT 2019d, 7-1)
6. Highway Median Type, RCI Feature 215 RDMEDIAN
7. Total number of through lanes (FDOT 2019d, 7-2) RCI Feature 212, NOLANES
8. Surface Width, RCI Feature 212, SURWIDTH (total width all through lanes)
9. Type of Road, RCI Feature 120, TYPEROAD (one way, divided, not divided)
10. Sidewalk Barrier Code, RCI Feature 216 SDWLKBCD

3.5.2 Bicyclist Level of Service (LOS)

The bicyclist LOS is based on the bicyclist's perception of the roadway environment. Bicycle LOS is based on the following variables (FDOT 2018b, 54).

1. Average effective width of the outside through lane
2. Percent heavy vehicles (truck), Traffic Characteristics Inventory
3. Pavement condition, RCI Feature 230, PAVECOND
4. Motorized vehicle volumes, AADT, supplied by FDOT GIS Website (https://gis-fdot.opendata.arcgis.com/datasets/annual-average-daily-traffic-tda) (FDOT 2019d, 7-1)
5. Motorized vehicle speeds, Maxspeed, supplied by FDOT GIS Website (https://gis-fdot.opendata.arcgis.com/datasets/maximum-speed-limit-tda) (FDOT 2019d, 7-1)
6. Highway median Type, RCI Feature 215 RDMEDIAN, supplied by FDOT GIS Website (https://gis-fdot.opendata.arcgis.com/datasets/median-type-tda) (FDOT 2019d, 7-1)
7. Total number of through lanes (FDOT 2019d, 7-2) RCI Feature 212, NOLANES
8. Surface Width, RCI Feature 212, SURWIDTH (total width all through lanes)
9. Type of Road, RCI Feature 120, TYPEROAD (one way, divided, not divided)
10. Shoulder Type, RCI Feature 214 SHLDTYPE (includes bike lane)
11. Bicycle Lane, RCI Feature 216 BIKELNCD
12. Sidewalk Barrier Code, RCI Feature 216 SDWLKBCD

3.5.3 Pedestrian Fatalities and Serious Injuries

Pedestrian fatalities and serious injuries are reported on an annual basis, and is calculated by summing the total number of incidents (FDOT 2018b, 52). The information is reported in the Florida Department of Highway Safety and Motor Vehicles (DHSMV) "Traffic Crash Facts Annual Report." (FL DHSMV 2017)

3.5.4 Bicyclist Fatalities and Serious Injuries

Bicyclist fatalities and serious injuries are reported on an annual basis, and is calculated by summing the total number of incidents (FDOT 2018b, 55). The information is reported in the Florida Department of Highway Safety and Motor Vehicles (DHSMV) "Traffic Crash Facts Annual Report." (FL DHSMV 2017)

3.6 Recommended Characteristics for Connectivity Performance Metrics

Appendix Table A-7 lists characteristics relating to the connectivity performance metric. In the Connectivity category, all of the characteristics are shared with one or more of the other categories, as illustrated in Appendix Tables A-2, A-3, A-4, and A-6. Context Classification is the only characteristic that is not shared with characteristics from the other categories. Context Classification is collected in the office.

For measuring connectivity performance, the discussion below identifies recommended data that should be collected, the level of accuracy needed, and the recommended methods and technologies to use to collect the data.

Prior to the inventory, FDOT or the consultant responsible for the inventory must coordinate with the local trail authority to implement a Temporary Traffic Control plan to ensure the safety of the traveling public. Any work related to data collection, maintenance, or installation of signage, traffic monitoring stations or other assets will require strong coordination with local entities. Department procedures like Maintenance of Traffic (MOT) guidelines are important for FDOT to follow, to make sure the inventory work does not impact the motoring or non-motoring public.

The *FDOT Source Book* provides bicycle and pedestrian facility metrics in terms of the number of miles of bicycle facilities on the non-freeway SHS and the number of miles of pedestrian facilities on the urban non-freeway SHS (FDOT 2018b, 3). Mobility measures for pedestrian and bicycle travel are provided for accessibility. Mobility measures relating to accessibility include percentage of pedestrian facility coverage, percentage of bicycle facility coverage, and the percentage of the population within one mile of a bike lane and shared-use path (FDOT 2019d, ES-2).

3.6.1 Percent Pedestrian Facility Coverage

This is the percentage of centerline miles of non-freeway SHS facilities in urban areas (population 5,000+), which have sidewalks and/or shared use paths available to pedestrians (FDOT 2018b, 53). The source data comes from the FDOT Roadway Characteristics Inventory. This metric, as defined, would not include shared use paths, Off-System, in the calculation.

3.6.2 Percent Bicycle Facility Coverage

This is the percentage of centerline miles of non-freeway SHS facilities that has bike lanes, paved shoulders, or shared pathways available to bicyclists (FDOT 2018b, 56). The source data also would come from the FDOT Roadway Characteristics Inventory. This metric, as defined, would also not include shared use paths, Off-System, in the calculation.

3.6.3 Percent Population within One Mile of Bike Lane and Shared Use Path

This is the ratio of the population within one mile of bike lanes and shared use paths to Florida's total population. "The bike lane and shared use path miles include those on the SHS and a limited number of non-SHS miles deemed of interest to FDOT" (FDOT 2018b, 57). These might be interpreted to include SUN Trail segments that are Off-System. The source data for this metric is from the FDOT Roadway Characteristics Inventory and the U.S. Census's American Community Survey.

3.7 Recommended ADA Accessibility Performance Metrics

Appendix Table A-8 lists characteristics relating to accessibility performance metrics. There are just two ADA characteristics recommended to be collected for the SUN Trail network. These are the proposed new characteristics: SUN Trail ADA Access under the Feature 251 Intersection and SUN Trail ADA Access at Turnout under the Feature 256 Turnouts. For both of these proposed characteristics, it is recommended to collect the number of curb ramps and tactile surfaces. This would identify the presence or absence of ADA facilities and is largely data for use by Maintenance. These recommendations do not reflect the level of detail required for ADA accessibility infrastructure, as specified for compliance with ADA Standards and PROWAG. This is because the recommendations have been developed to be comparable to the level of detail found in the original RCI.

If FDOT chooses to include a complete ADA inventory in the RCI upgrade, then the Safe and Accessible Pedestrian Facility Inventory Model (SAPFIM), developed by the Lehman Center for Transportation Research at Florida International University, would serve this purpose. Measuring ADA infrastructure for compliance is a laborious process. In this case, it may be worthwhile to consider investment in a mobile laser scanner, such as the Leica Pegasus: Two mobile mapping system, manufactured by Leica Geosystems. Such a system must be mounted to a vehicle and would be operated by FDOT field staff or a hired contractor. The complete system, including mission planning software, advanced adjustment software, cameras, and accompanying training, maintenance, and support, costs on the order of $422,000.

It also is possible that the University of Florida's proof of concept mobile LiDAR system could be used to inventory ADA accessibility compliance characteristics in the future. Not all features and characteristics in the field can be inventoried using the proof-of-concept system presently. In the future, further research about the use of additional LiDAR sensors, development and refinement of algorithms that detect more characteristics, and the use of neural networks for pattern matching could potentially expand the range of characteristics that this system could inventory. The fact that the SUN Trail inventory for Off-System segments that run along an independent alignment will consist of a single lane, means that the proof-of-concept LiDAR system could be anticipated to perform well as an inventory method for the SUN Trail in the future.

Prior to the inventory, FDOT or the consultant responsible for the inventory must coordinate with the local trail authority to implement a Temporary Traffic Control plan to ensure the safety of the traveling public. Any work related to data collection, maintenance, or installation of signage, traffic monitoring stations or other assets will require strong coordination with local entities. Department procedures like Maintenance of Traffic (MOT) guidelines are important for FDOT to follow, to make sure the inventory work does not impact the motoring or non-motoring public.

3.8 Proposed Data Collection by Responsible Office and Inventory Type

Table 3-5 lists the proposed data collection in the office for features for the SUN Trail according to responsible Office and by inventory type. Table 3-6 lists proposed data collection in the field for features for the SUN Trail according to responsible Office and by inventory type.

At the initial stage when a proposed trail segment is selected for inclusion in a phase of development as part of the SUN Trail network, District Planning staff would coordinate with the Systems Implementation Office for the assignment of a Roadway ID number for the newly identified SUN Trail segment.

For SUN Trail segments that are Active, Pending, Dropped, or Deleted, the Systems Implementation Office, Transportation Planner would be responsible for processing the data collected by the Districts for coding by TDA into the RCI. These include coding for Trails – Feature 801, SUNTRTYP, SUN Trail Type, the initial SUNTRCOR, SUN Trail Corridor Name, and beginning and end milepoints, based upon data provided by FDEP OGT and other governmental entities most involved in the project.

For Off-System SUN Trail development projects, as successive development phases are conducted, including feasibility study, PD&E, ROW acquisition, and design, the District Planning Office would have access to the results of the work and have updated data on the alignment of the SUN Trail. The District Planning Office would communicate this information to the Systems Implementation Office, for updating the SUN Trail LRS.

Table 3-5: Proposed In-Office Features Collection for SUN Trail by Responsible Office and by Inventory Type

Inventory Type	Potential SUN Trail Facility Types	SIO*	District Planning	District RCI Coordinator	District NMTMP**	Dist. Maintenance
Active On-System	• Bike Lane • Shared Use Path On-System		113, 124, 126, 138, 139, 140, 141		326	137, 801
Active Exclusive	• Bike Lane • Shared Use Path On-System		113, 124, 126, 138, 139, 140, 141		326	137, 801
Active Off-System	• Bike Lane • Shared Use Path Off-System		113, 124, 126, 140, 141, 801	801	326	137, 801
Local Road with FM Project	• Bike Lane • Shared Use Path Off-System		113, 124, 126, 140, 141		326	137, 801
New Construction/ Pending	• Bike Lane • Shared Use Path On- and Off-System	801	113, 124, 126, 140, 141, 801			137, 801

Source: FDOT 2016a.

*SIO = Systems Implementation Office

**NMTMP = Nonmotorized Traffic Monitoring Program. The NMTMP may either be part of the District Planning Office or District Traffic Operations Office, depending on which office has the responsibility to manage traffic counting contracts.

Table 3-6: Proposed Field Collected Features for SUN Trail by

Inventory Type	Potential SUN Trail Facility Types	District Planning	District NMTMP*	District Maintenance
Active On-System	• Bike Lane • Shared Use Path On-System	138, 214, 216, 230, 251, 253, 258, 801	326	137, 217, 230, 241, 242, 248, 256, 271, 275, 411, 421, 443, 451, 452, 454, 480
Active Exclusive	• Bike Lane • Shared Use Path On-System	214, 216, 230, 251, 253, 258, 801	326	137, 217, 230, 241, 242, 248, 256, 271, 275, 411, 421, 443, 451, 452, 454, 480
Active Off-System	• Bike Lane • Shared Use Path Off-System	214, 216, 230, 251, 253, 258, 320, 801	311, 326	137, 217, 230, 241, 242, 248, 256, 271, 272 275, 411, 421, 443, 451, 452, 454, 480
Local Road with FM Project	• Bike Lane • Shared Use Path Off-System	214, 216, 230, 251, 253, 258, 320, 801	326	137, 217, 230, 241, 242, 248, 256, 271, 272, 275, 411, 421, 443, 451, 452, 454, 480

Source: FDOT 2016a.

*NMTMP = Nonmotorized Traffic Monitoring Program. The NMTMP may either be part of the District Planning Office or the District Traffic Operations Office, depending on which office has the responsibility to manage traffic counting contracts.

For new construction/pending, District Planning staff who ordinarily collect data for roadways for these same features for Active On-System, Active Exclusive, Active Off-System, and Local Road with FM Project, would likewise be responsible for collecting the data for designated SUN Trail segments that are bike lanes, or shared use paths either On- or Off-System.

The District Trail Coordinator would be responsible for communicating any known information, such as whether the SUN Trail segment also aligns with a designated U.S. Bicycle Route, and if the applicants that originally prepared the Request for Funding for SUN Trail funds, uses a local name when they refer to that trail segment.

3.9 Existing Inventory Workflow Process Diagram with Possible Changes to Include SUN Trail

As shown in a series of seven chronological work flow diagrams below, the process encompasses FDOT's Transportation Project Life Cycle Inventory Management. It incorporates the proposed new SUN Trail network inventory process, in green boxes, with the existing process, in yellow boxes. The diagrams show cross departmental interaction, and the tasks performed by offices within FDOT Central Office and the offices at the District level. The process is diagrammed, from the beginning stages of SUN Trail segment development, through the phases of project development to the initial inventory and re-inventory thereafter. The diagrams illustrate inventory preparation, the responsible parties for office and field inventory of data features, and the data processing and management steps. Figures 3-2 through 3-8 below diagram the SUN Trail Network Workflow that includes the existing and proposed data management framework.

Figure 3-2: Trail Segment Development
Figure 3-3: Trail Segment Development Phases
Figure 3-4: Initial and Periodic Inventory of SUN Trail
Figure 3-5: Initial and Periodic Inventory of SUN Trail
Figure 3-6: Data Preparation and Entry in RCI
Figure 3-7: Review and Correction of SUN Trail Basemap Alignment
Figure 3-8: Preparation of SLD and County Key Sheets for Active On-System SUN Trail

The work flow diagram illustrates the life cycle process of current and proposed incorporation of the SUN Trail inventory, using the existing RCI process, as detailed in the *Roadway Characteristics Inventory Planning Data Handbook*. The work flow diagram depicts which office—Planning, Traffic Engineering and Operations, and Maintenance--would collect particular data, as listed by Feature number.

3.9.1 Roadway IDs

Per the Work Program Instructions, Part III--Chapter 19, bike paths and multimodal trails that are Off-System and not part of the SUN Trail network do not require a Roadway ID. The Work Program Instructions do not address Roadway IDs for On-System shared use paths that are not part of the SUN Trail network. It is recommended that shared use paths that are not part of the SUN Trail network and that are within an On-System road right of way, would share the same Roadway ID as that for the roadway to which it is parallel. Per the Work Program Instructions, Part III—Chapter 38: Trails, all SUN Trail segments receive a unique Roadway ID.

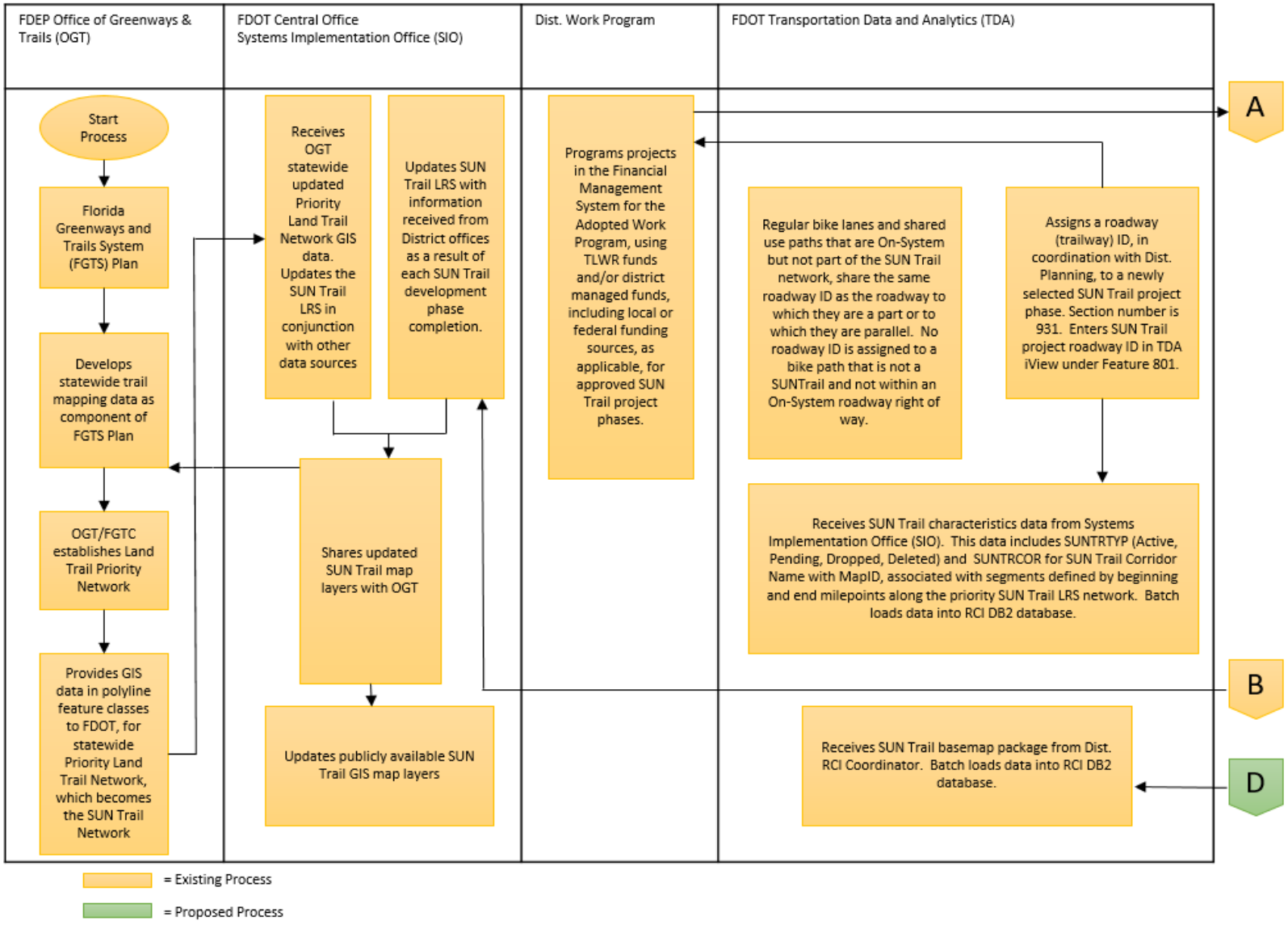


Figure 3-2. Existing Data Management Framework: Trail Segment Development

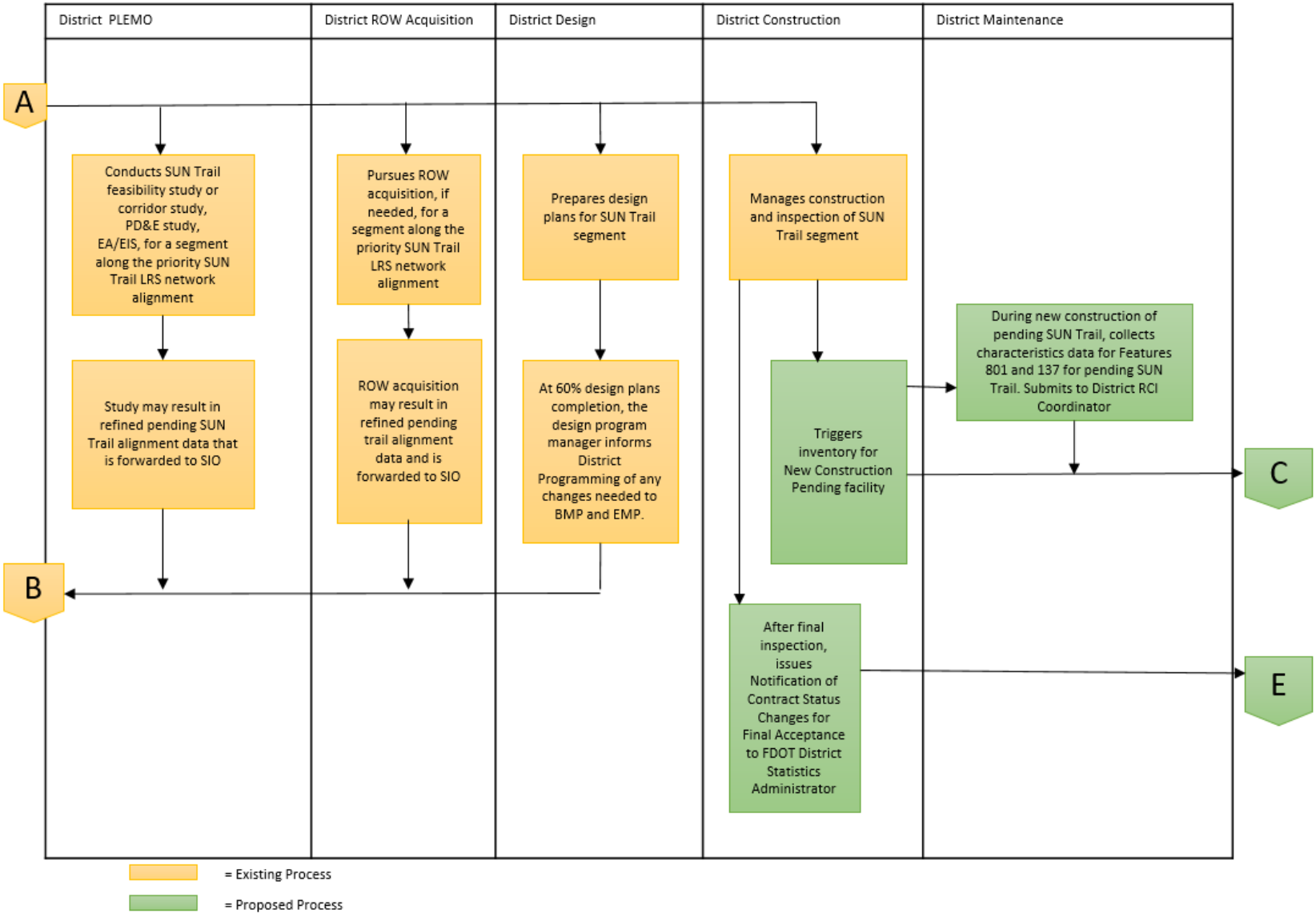


Figure 3-3. Existing and Proposed Data Management Framework: Trail Segment Development Phases

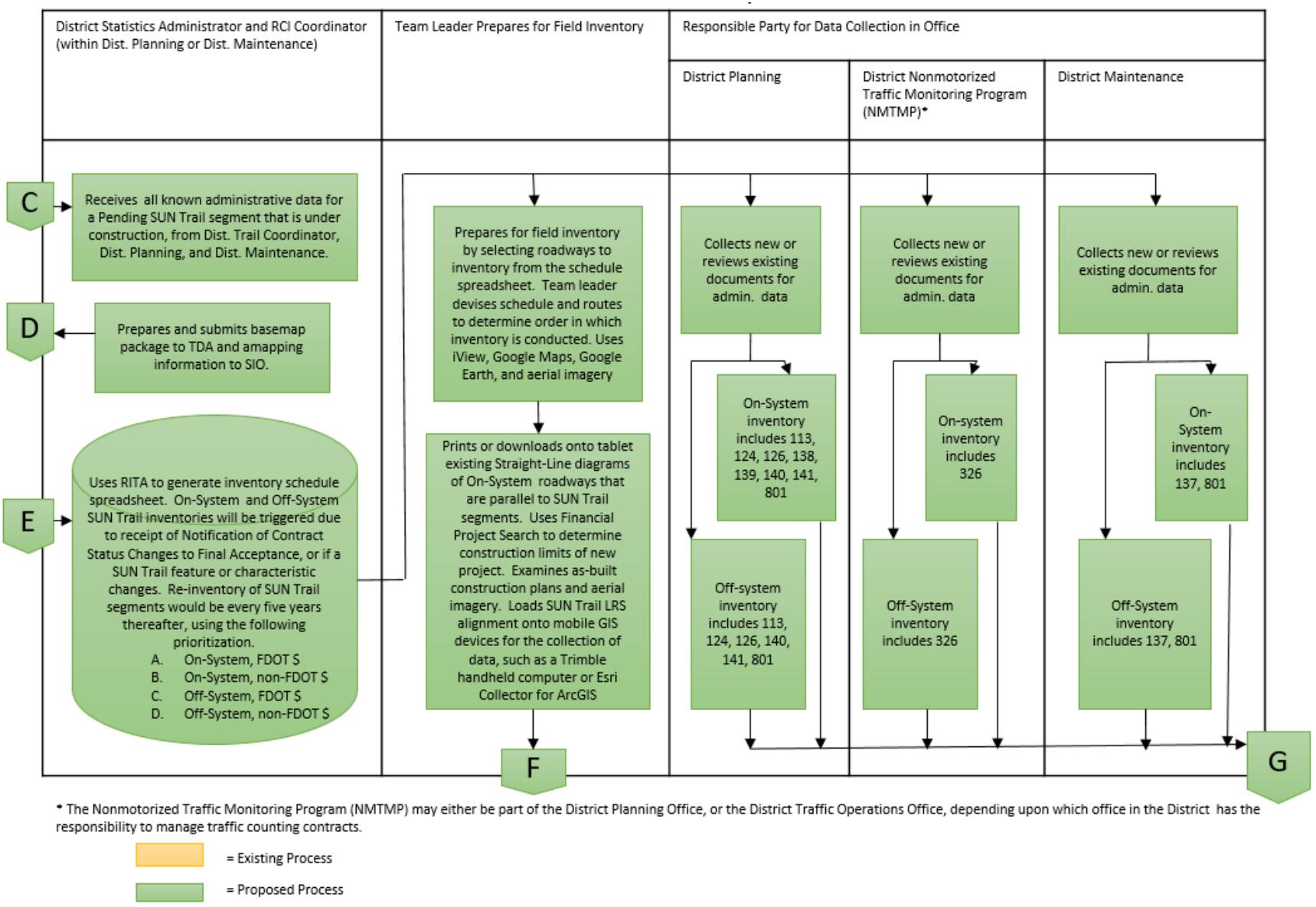


Figure 3-4. Proposed Data Management Framework: Initial and Periodic Inventory of SUN Trail

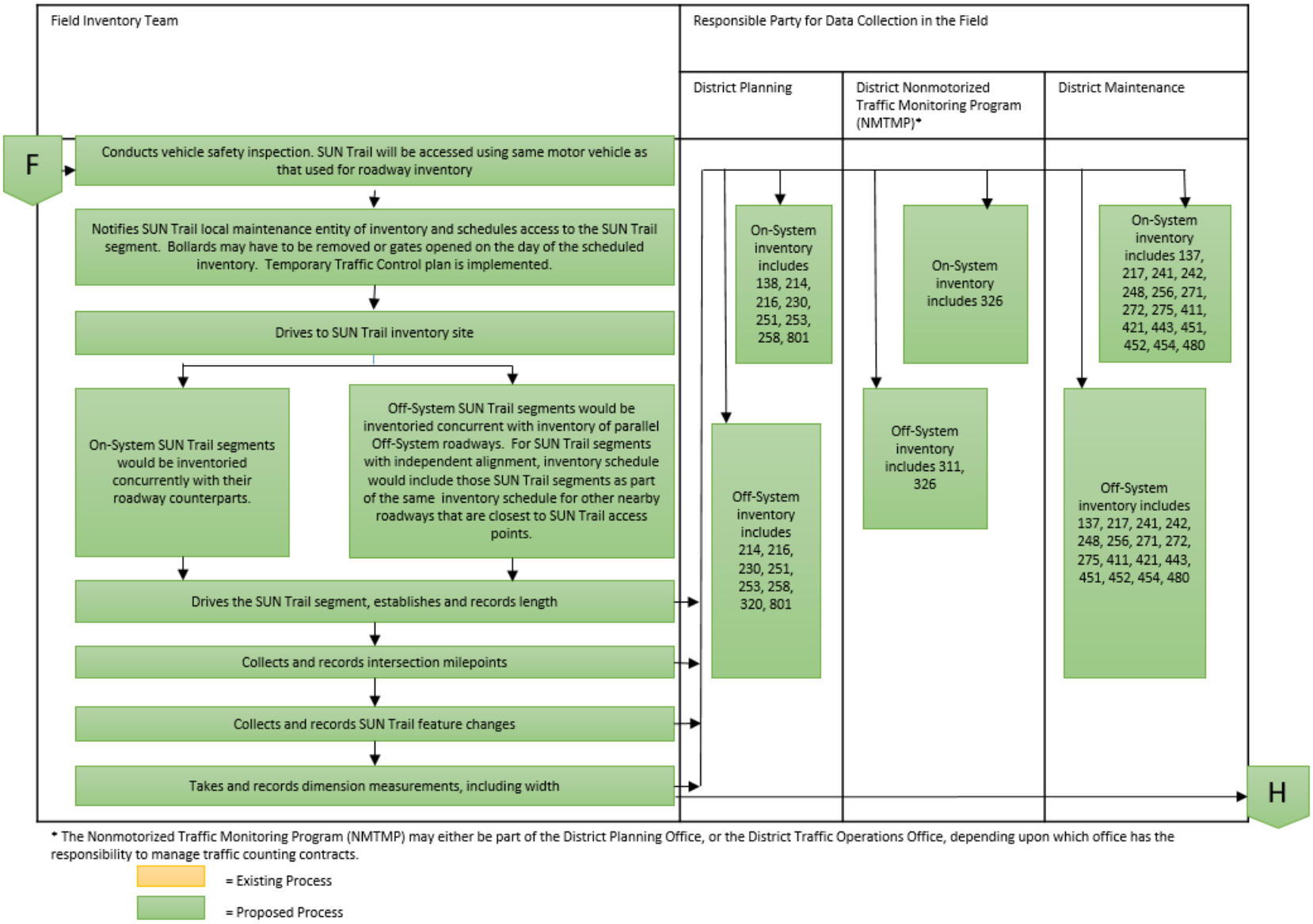


Figure 3-5. Proposed Data Management Framework: Initial and Periodic Inventory of SUN Trail

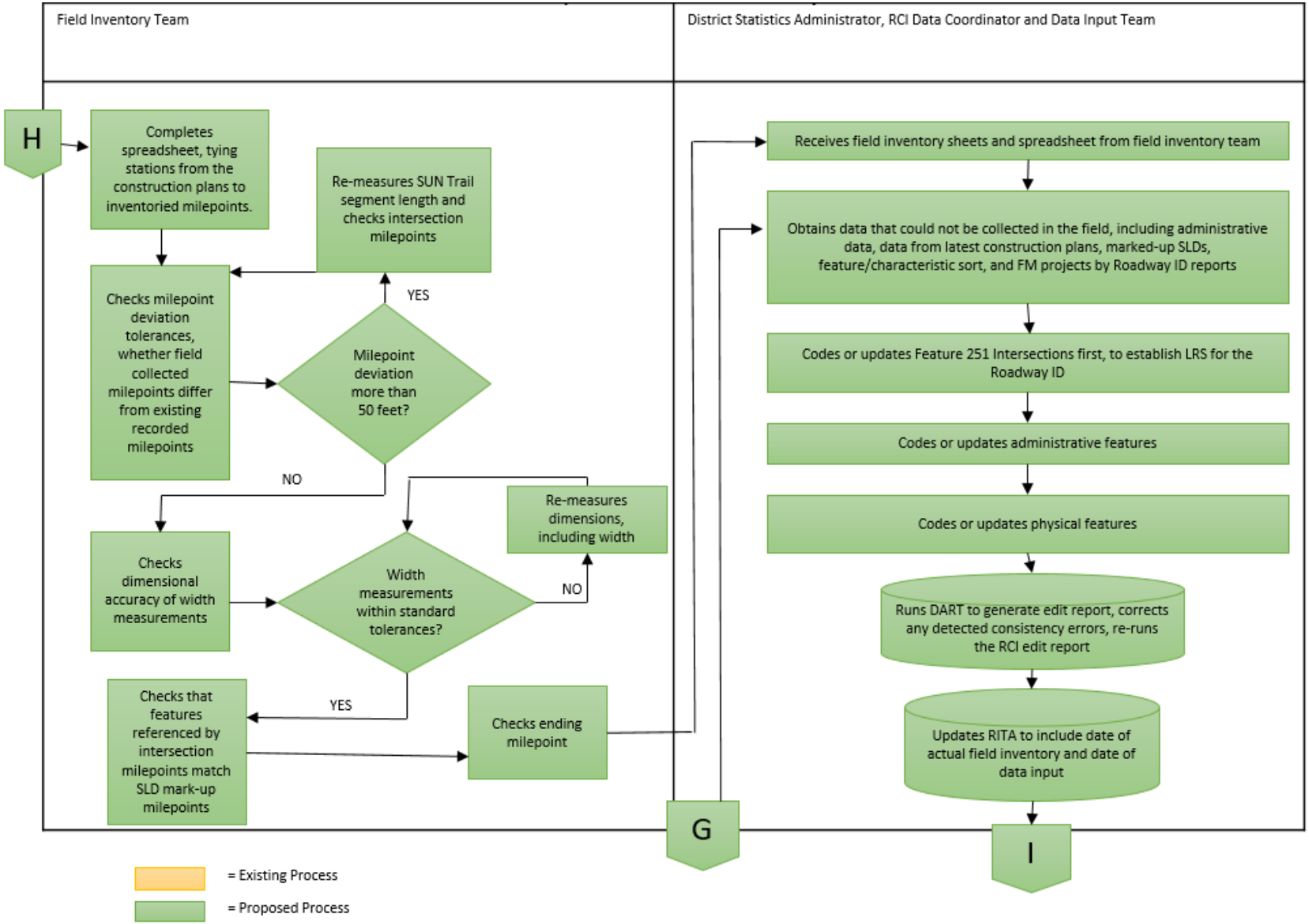


Figure 3-6. Proposed Data Management Framework: Data Preparation and Entry in RCI

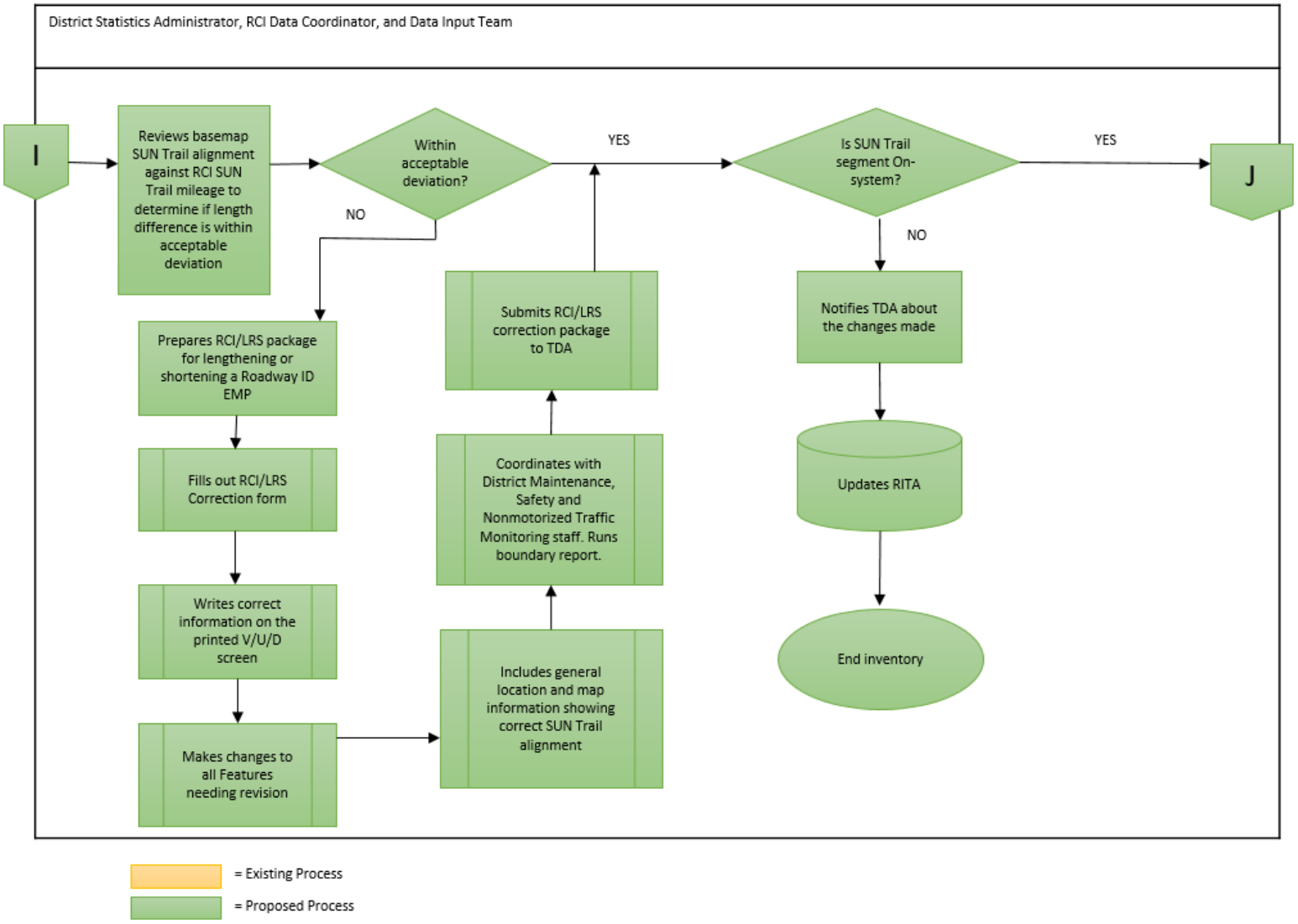


Figure 3-7. Proposed Data Management Framework: Review and Correction of SUN Trail Basemap Alignment

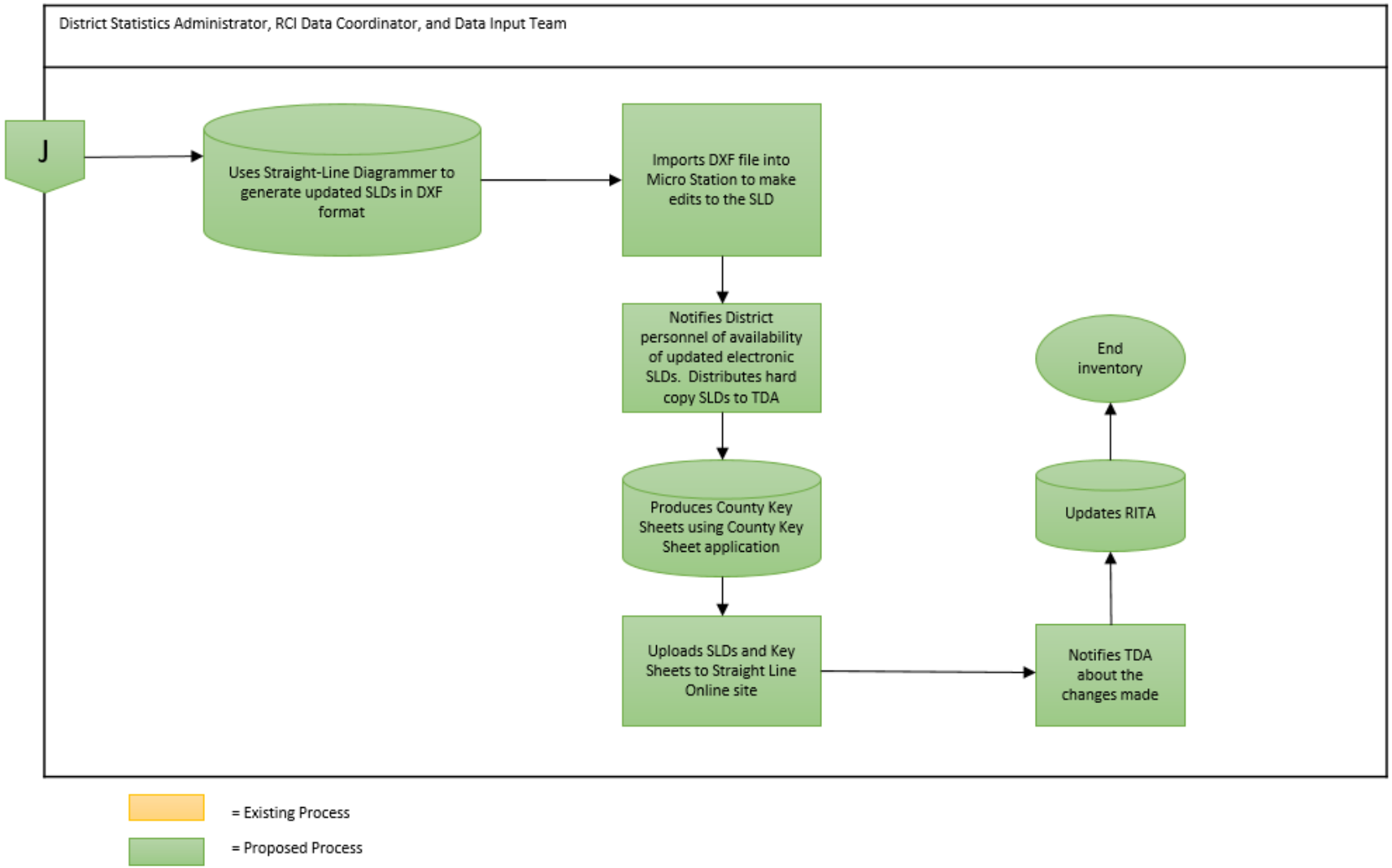


Figure 3-8. Proposed Data Management Framework: Preparation of SLD and County Key Sheets for Active On-System SUN Trail Segments

Because of the role of the District Trail Coordinator in providing technical support to the applicants in the preparation of a Request for Funding, the District Trail Coordinator may be in a unique position to know certain details about the trail. For example, the District Trail Coordinator may know the name that the applicants use to refer to a specific trail segment within a corridor.

As a SUN Trail segment draws close to construction completion, during which a New Construction/Pending inventory can take place, certain office data can be collected and entered into the RCI. CUTR researchers recommend that District Maintenance would provide certain key data that can be collected in the office, including the Cost Center Number (Feature 137) and information regarding the Local Entity Responsible for Maintenance, which is proposed as a new characteristic, SUNTRMOA, under Feature 801. These and other office data collected by District Planning would be conveyed to the District RCI Data Coordinator, who would submit a basemap package and forward it to TDA.

3.9.2 SUN Trail Linear Referencing System

The current RCI/LRS reconciliation process for roadway features and characteristics ensures that the LRS corresponds to the RCI measures/milepoints collected in the field. Conversely, the new method would utilize GIS to derive the measures/milepoints from more accurate (submeter) aerial imagery. This reference of accuracy would be the basis for field data collection, as supported by Esri Roads and Highways that manages spatially referenced data. Unlike the present roadway inventory, the SUN Trail inventory and the passenger rail inventory already use GIS derived milepoints through a digital GIS framework.

The priority SUN Trail LRS network alignments would be used by District data collectors to perform office and field data collection methods to capture features and characteristics. FDOT is interested in the prospect of data collection efficiencies through the use of SUN Trail data collection in the field via automated sensors, such as LiDAR paired with pattern recognition algorithms, conflated with GIS-derived milepoints from aerial imagery. Using the SUN Trail inventory as an example, the roadway LRS could follow suit, with GIS-derived milepoints through a digital GIS network.

District data collectors representing Planning, Traffic Engineering and Operations, and Maintenance business areas would perform field visits and would use the LRS loaded on mobile GIS devices to collect data in reference to the SUN Trail LRS alignment. This new method would correspond to the successful migration of RCI data from the DB2 into the Esri Roads and Highway data model.

Beyond the migration of the RCI from the DB2 to the Esri Roads and Highways data management system, FDOT envisions a next step to making the RCI work efficiently by investing in centralized data collection for RCI features and characteristics.

3.10 Products Using SUN Trail Inventory Information

The products using SUN Trail inventory information will include project development updates and the finalization of location of the SUN Trail alignment for the update of the SUN Trail LRS of the FDOT Systems Implementation Office. The SUN Trail inventory also will produce updated shapefiles for use by the FDEP Office of Greenways and Trails, for the Florida Greenways and Trails System. The SUN Trail inventory data will be used to update web mapping applications, including the SUN Trail Network app within GIS@FDOT, in FDOT's Transportation Data Portal. The mapping data for the location of the SUN Trail, in addition to information relating to trailheads, can be used by FDEP and FDOT in public information products to publicize the availability of the SUN Trail network to residents and tourists, for transportation and recreation.

Other data, such as mapped locations allowing emergency vehicle access, will be useful to emergency responders. SUN Trail inventory data relating to utilization will support data reporting requirements for the FHWA Traffic Monitoring and Analysis System. ADA access inventory data can be used in public information products supporting use of SUN Trail by persons with disabilities. The ADA access inventory data also can be used to flag locations where accessibility infrastructure is absent and needs to be installed, and also to support scheduling more thorough ADA accessibility inventories per design requirements of ADA and PROWAG. The SUN Trail inventory data relating to maintenance can support documentation regarding compliance of local entities with the requirements of their Maintenance Memoranda of Agreement and support scheduling of needed maintenance activities and planning for infrastructure replacement.

The SUN Trail inventory data supporting connectivity performance measures can be used in studies evaluating community access to walking and bicycling opportunities. The SUN Trail inventory data supporting safety performance measures, can be paired with utilization data to evaluate progress toward reducing bicyclist and pedestrian fatalities and serious injuries. Finally, the SUN Trail inventory data will be used to update Straight-Line Diagrams, providing documentation of existing infrastructure for use by planners and engineers in the continued development and maintenance of the multimodal transportation system.

Chapter 4 Recommended SUN Trail Inventory Framework

There are many considerations for an inventory framework for the SUN Trail, listed in Table 4-1.

Table 4-1. Considerations for the Inventory of SUN Trail Segments

What SUN Trail Segments to Measure	What SUN Trail Characteristics to Measure	How to Measure the SUN Trail
• On-System/Off-System • FDOT funds/non-FDOT funds • Proximity to scheduled roadway inventories • Financial means of the local entity	• Performance evaluation priorities • Resource availability	• Field conditions hazardous to field collectors • Complexity of data to collect, such as height measurements • Already available serviceable technologies • FDOT commitments to invest in other inventory technologies for the SHS

4.1 Considerations for a Customized Inventory Approach

Building upon these considerations, a customized approach for selecting which SUN Trail to inventory and what inventory technology to use, could be defined based upon the following.

1. Whether the SUN Trail segment is On-System or Off-System and whether development funds are from FDOT sources or non-FDOT sources
2. The proximity of the SUN Trail segment to the nearest roadway location needing inventory
3. The financial means of the local entity
4. FDOT performance evaluation priorities
5. The identification of any SUN Trail conditions that are potentially hazardous to field data collectors
6. Roadway inventory technologies already available to the Districts

4.1.1 Whether the SUN Trail Segment is On-System or Off-System and Whether Development Funds were from FDOT Sources or Non-FDOT Sources

Based upon input from the SUN Trail Program of the Systems Implementation Office, SUN Trail segments should be prioritized for inventory in the following order.

1. On-System, FDOT funds
2. On-System, non-FDOT funds
3. Off-System, FDOT funds
4. Off-System, non-FDOT funds

4.1.2 The Proximity of the SUN Trail Segment to the Nearest Roadway Location

As a schedule of roadways to be inventoried is generated by RITA, the proximity of a SUN Trail segment access point to the nearest roadway location should be considered as a way to prioritize the SUN Trail inventory. It would take advantage of the inventory field crew that is already on location. SUN Trail segments located parallel to a roadway that has been prioritized for inventory, could also be incorporated into the inventory schedule. For segments of SUN Trail that follow an independent alignment, these segments could be included with the inventory for roadways in closest proximity to the SUN Trail access point.

4.1.3 The Financial Means of the Local Entity

For local entities of sufficient financial and technical means, FDOT could consider requiring such local entities who are responsible for the maintenance of SUN Trail segments Off-System to also be required to complete periodic inventories of the SUN Trail segments, with specifications for such inventories detailed in their Maintenance Memoranda of Agreement. This requirement could be made explicit in the initial local commitment prior to SUN Trail construction completion, and made more specific in the Maintenance Memorandum of Agreement (MMOA) that takes effect upon construction completion. FDOT could conduct periodic data quality checks.

The District Statistics Administrators for both FDOT Districts 2 and 3 had expressed concern that some rural counties in their Districts may not have the resources to maintain SUN Trail segments. As a result, these same counties likely would also not have the resources to conduct SUN Trail inventories. FDOT could choose to conduct these inventories, verifying the location and attributes of prioritized assets (pavement, bridge structures, drainage structures, ADA accessibility features) using the as-built construction plans. A customized approach to the inventory of specific SUN Trail segments could be detailed in the MMOA and revised periodically as needed.

4.1.4 FDOT Performance Evaluation Priorities and Resource Availability

After decisions are made with regard to which SUN Trail segments to inventory, it is recommended that FDOT consider whether to collect data for all recommended characteristics or to select a subset of characteristics based upon FDOT resource availability and/or performance evaluation priorities. In initial interviews with the Districts for Task 2, the primary performance metrics consistently identified across the Districts were safety and connectivity, as measured by the closing of trail gaps and the length of continuous SUN Trail.

Table A-1 in the Appendix, Master Matrix of Recommended SUN Trail Features and Characteristics, provides a complete list, organized by Owning Office, and in order of Feature number. Appendix Tables A-2 through A-8 break out these features and characteristics, first in Appendix Table A-2, according to those considered most important to collect. These are the minimum necessary characteristics for establishing location and should be collected first. Appendix Table A-3 provides additional location characteristics that should be prioritized second, for establishing locations of trailheads and other landmarks.

The third recommended order of priority should be the maintenance features listed in Appendix Table A-4. Beyond these, the Tables A-5 through A-8 organize features and characteristics according to their application for supporting performance measurement for utilization, safety, connectivity, and ADA access compliance.

4.1.5 The Identification of Any SUN Trail Conditions that are Potentially Hazardous to Field Data Collectors

After SUN Trail segments and priority features and characteristics are selected, FDOT can consider what inventory methods to use to take measurements. An early consideration should be the identification of any potential hazards to field data collectors. Initial reliance on as-built construction plans and aerial imagery has the potential to reduce exposure to some hazards. For example, these methods could be used for the documentation of designated SUN Trail segments that are on-road bicycle lanes connecting two shared use path segments. Avoidance of exposure to motor vehicle traffic through selection of inventory methods can reduce safety hazards to field data collectors. Another example of a potentially hazardous condition is the collection of height measurements of culverts and non-circular pipes. Mobile terrestrial LiDAR may not be useful for such measurements because the equipment is mounted to a motor vehicle, and drainage infrastructure such as culverts and pipes may be out of the line-of-sight. A manual tape measure should be used only if it is safe to do so. Use of as-built construction plans to establish height measurements would eliminate this safety issue. Finally, a stationary laser scanner mounted on a tripod could be considered for these measurements if there is a location from which to safely set up the scanner and view the infrastructure. FDOT's Surveying and Mapping Office can supply vertical measurements. A stationary laser scanner provides measurements of survey grade accuracy, which is not a necessary level of accuracy for an inventory and would not be cost efficient to consider for the SUN Trail network. However, exceptions could be made for culverts and non-circular pipes. In the future, the Surveying and Mapping Office may choose to invest in an unmanned aircraft system (UAS) that could be used to take measurements of infrastructure in locations that are difficult to access.

The SUN Trail environment will be unlike a roadway environment in that the SUN Trail will have only nonmotorized traffic, and the volume of such traffic will likely be low, at least initially. As a result, the dangers of the road environment that field crews are exposed to when collecting roadway data would be greatly reduced along the SUN Trail.

A primary reason for interest in mobile mapping systems is reducing exposure of data collectors to safety hazards associated with working in close proximity to high speed traffic. Mobile mapping systems, including use of photogrammetry and LiDAR, greatly reduce such exposure of data collectors who are operating the mobile mapping systems from within the relative safety of a motor vehicle driven along the highway being inventoried, at the same speed as regular traffic. As a result, the safety risk to the data collectors is equal to that of any other motorist.

However, the SUN Trail environment is free of hazards posed by motor vehicles driven at high rates of speed. Safety hazards associated with accessing the SUN Trail using FDOT's existing fleet of motor vehicles to document SUN Trail milepoints is the risk of colliding with a trail user.

Prior to the inventory, FDOT or the consultant responsible for the inventory must coordinate with the local trail authority to implement a Temporary Traffic Control plan to ensure the safety of the traveling public. Any work related to data collection, maintenance, or installation of signage, traffic monitoring stations or other assets will require strong coordination with local entities. Department procedures like Maintenance of Traffic (MOT) guidelines are important for FDOT to follow, to make sure the inventory work does not impact the motoring or non-motoring public. SUN Trail inventory procedures should require the motor vehicle to operate flashing lights while it is in motion, operate at speeds no greater than 10 mph, and tap lightly on the horn to warn SUN Trail users that the motor vehicle is approaching from behind them.

Perhaps the greater risk is potential collisions between data collectors with SUN Trail users, primarily bicyclists, some of whom may be riding at speeds over 20 mph. This safety risk could be managed with procedures requiring data collectors to post warning signage several hundred feet in front of and behind the measurement activity taking place. Procedures also should include wearing reflective vests, and the placement of traffic cones on the SUN Trail in the area where dimensions are being measured. SUN Trail inventory could be scheduled during days of the week, and times of day when there are fewer trail users. Trail managers also could choose to temporarily close the SUN Trail segment, with posted announcements and detour signage at trailheads, during the inventory.

4.1.6 Complexity of Data to Collect, such as Height Measurements

The SUN Trail inventory data that will be most complex to gather are primarily measured dimensions, as opposed to features and characteristics that can be inventoried by observation. The features and characteristics that have dimensions that must be measured are all maintenance characteristics. As previously discussed, height measurements may require extra consideration. Drainage features, such as crossdrains, catch basins, and outfall ditches may be challenging to measure if vegetation impedes line-of-sight.

For SUN Trail segments that contain large numbers of prioritized attributes, such as many bridge structures, and frequent points of access where ADA accessibility features are located, the cost to inventory these SUN Trail segments will be more expensive than segments with fewer and less complex characteristics. Likewise, some priority characteristics relating to safety, such as railings, may be more prevalent along some SUN Trail segments than along others.

4.1.7 Roadway Inventory Technologies Already Available to the Districts

This project evaluated several inventory methods for their potential application to the SUN Trail network inventory. The results from Technical Memorandum #3 show that no one method can measure all dimensions of potential interest for the SUN Trail. It is recommended that in the case of the SUN Trail inventory, use of existing technologies and equipment for which FDOT has already made investments and which continue to operate reliably, would be more efficient, at least initially. More than one method in combination provides the most flexibility, selecting the method based upon dimensional accuracy requirements, cost, and maintaining safety of field data collectors.

It is recommended that a combination of measuring and recording devices be used in conjunction with aerial imagery generated through the Florida County Digital Orthoimagery Program (FCDOP). The FCDOP provides statewide orthoimagery coverage on a three-year cycle. In addition, as-built construction plans contain detailed information about the completed project. RCI data collectors should first glean all relevant information from existing documentation, with follow-up field reviews where line-of-sight on aerial imagery is obscured by tree cover.

With the exception of determining location by GPS coordinates, and position based upon milepoints on the LRS, manual measurement methods are the most versatile and include vertical and height measurements. To capture both milepoints and GPS coordinates, use of a GPS-enabled distance measuring instrument or a Trimble R2 GNSS receiver fills the gap. FDOT has already invested in the use of Esri Arc Collector, which can be used to record data, as well as measure dimensions.

Esri offers Software-as-a-Service (SaaS), including field apps that can be used in a connected or disconnected environment. Field captured data, including digital photos, feeds directly into the system of record.[4] Arc Collector can use the location service on the field collector's mobile device, such as a tablet, to identify global position. Arc Collector also can use Assisted-GPS on an Android device but accuracy is still only within 16 feet. Arc Collector also can work with professional grade GPS receivers. The Trimble R2 GNSS receiver, list price of $5,800.00, provides decimeter accuracy, which would deliver the ability to measure shoulder widths to the nearest 0.50 feet.

While collecting data in the field is labor intensive, use of manual measurement and Esri Arc Collector also "reduce" the data as it is being recorded because, unlike LiDAR, photogrammetry or even video log, only the data that has been identified as needed is measured and recorded in the field. Mobile mapping systems require a data post-processing step to extract the data of interest. Existing data collection methods require less equipment investment, less training, and less data reduction efforts.

Each field data collection team would require at least one tablet to collect the data, and a vehicle to travel the shared use path. There was considerable early discussion about the best type of vehicle for inventory of the SUN Trail. Some suggested that use of a motor vehicle on the SUN Trail would be dangerous to trail users. Concerns were expressed that motor vehicles would be unable to cross foot bridges, or be disallowed by regulation. Discussions considered alternatives, such as bicycles, golf carts, and ATVs. One of the issues with the use of these alternative travel methods, is that such vehicles would have to be transported to the inventory site. It is recommended that it would be most efficient to use the same motor vehicle to inventory the SUN Trail as that used to drive to the inventory. In addition, prior to the inventory, FDOT or the consultant responsible for the inventory must coordinate with the local trail authority to implement a Temporary Traffic Control plan.

[4] ESRI Collector for ArcGIS. https://www.esri.com/en-us/arcgis/products/collector-for-arcgis/overview

This is to ensure the safety of the traveling public. Any work related to data collection, maintenance, or installation of signage, traffic monitoring stations or other assets will require strong coordination with local entities. Department procedures like Maintenance of Traffic (MOT) guidelines are important for FDOT to follow, to make sure the inventory work does not impact the motoring or non-motoring public.

All bridges on the SUN Trail network, built after the inception of the SUN Trail program, are built to withstand load bearing weights of emergency vehicles, and so can also accommodate a van, SUV, or light truck. However, for existing trail segments that were built prior to the inception of the SUN Trail program, and which are now a part of the designated SUN Trail network, there may be boardwalks and bridges that will not accommodate the weight of a motor vehicle. An example is the Ochlockonee Bay Trail (Roadway ID 59931002), which includes boardwalks and bridges along Surf Road in Wakulla County. In such cases, the in-office preparation for the field inventory will identify such locations, requiring rerouting for the SUN Trail inventory, and alterations in inventory methods, as needed.

Other advantages of the use of a motor vehicle to inventory the SUN Trail are that it can accommodate multiple field crew, it can securely transport and store inventory equipment, and can provide shelter to data collectors from heat and during inclement weather. Where SUN Trail segments are inventoried as part of the schedule that also includes roadway segments, use of the same motor vehicle for both inventories would be more convenient.

4.1.8 FDOT Commitments to Invest in Other Inventory Technologies for the SHS

Another primary reason for the interest in mobile mapping systems is the opportunity to capture a rich dataset for multiple purposes and departments. The results of this study are proposing that data for up to 35 features and 126 characteristics be collected for SUN Trail, depending upon the available resources and priorities of FDOT. This is not a trivial amount of data to collect, record, and manage. However, the entire SUN Trail network, when finished, may be in the range of over 4,000 miles, while the State Highway system is over 12,000 centerline miles. The length of the SUN Trail network mileage would be roughly one third that of the highway system, and the SUN Trail data to be collected would not be as complex. Assuming the SUN Trail network will be 4000 miles when complete, then the average total number of SUN Trail miles to be inventoried by each of eight Districts might be about 500 miles.

New highways are inventoried when their construction is complete. According to the Adopted Work Program for the SUN Trail Program, FY 2018/2019 through FY 2022/2023, FDOT District 5 appears to have the most miles of SUN Trail under construction. The sum total mileage of new SUN Trail that would require an initial as-built inventory appears to be under 30 miles for District 5.

The use of a mobile mapping system to inventory the SUN Trail network, by itself, may generate more data than can be used, for too great a cost, and for no added safety risk reduction. However, use of mobile mapping systems for the SUN Trail does make sense if FDOT decides to invest in mobile mapping systems for its highway inventory. Combining the additional SUN Trail mileage with the roadway inventory would possibly result in a smaller unit cost per mile. The fixed costs of the equipment and mobilization is generally the same, whether more or less miles of facility are being inventoried.

FDOT will likely be considering inventory methods and technologies in light of enterprise needs for the purpose of collecting data once for multiple users. Based upon criteria most important to FDOT, inventory methods and technologies that are best for roadway data might drive the decision for investments, such that whatever selected technologies are applied to the roadway might also be applied to SUN Trail. For example, FDOT may plan to invest in the use of mobile mapping systems that could include photogrammetry and/or mobile terrestrial LiDAR technology for roadway data collection. The LiDAR data collection for specific targeted lengths of the SUN Trail network could be conducted immediately subsequent to the completion of LiDAR data collection for nearby roadway locations.

It may be helpful to consider the data collection evaluation method applied in the study by Jalayer et al. 2014, and summarized in Technical Memorandum 3. Table 4-2 recreates an evaluation matrix for highway data collection methods, with performance as assessed by the researchers, and with weighting factors as selected by Illinois Department of Transportation (IDOT). From the perspective of the data collection effort for the SUN Trail network, FDOT might choose to weight these criteria differently from how IDOT weighted them. For example, FDOT might choose to weight safety of the data collection crew higher. Additionally, if FDOT were to consider the relative importance of these performance criteria when applied to the entire RCI data collection and management enterprise, FDOT might choose to weight these factors differently from the weights chosen if considering the SUN Trail network alone.

4.2 Estimated Investment Cost

With the recommendation that FDOT use its existing inventory methods for the SUN Trail (Esri Arc Collector with a Trimble R2 GNSS receiver or a GPS-enabled DMI and manual measuring devices), then the cost of the inventory is largely the cost of labor. Technical Memorandum 1 reported on the challenge of isolating the labor cost of the RCI inventory using existing labor tracking processes of FDOT.

Survey data was collected by the University of Florida study, on the District Planning Office labor costs for On-System and Off-System using existing roadway inventory methods by District. These methods include use of Professional Services Contracts for data collection services. The study indicated a range of costs, depending on the number of features for which data are collected, based on the system being inventoried (On-System, Off-System, HPMS). The costs also vary due to the difference in the lane miles of urban versus rural highways (Crane 2018). Urban highway inventories are generally more complex and require more time. Across all Districts, the cost ranged from $250-600 per mile.

The Office of Maintenance also had provided estimated costs for one district to collect and input RCI data. For On-System data collection, these are $510.00 per highway centerline mile to collect the data in the field and $24.52 per centerline mile to enter the data into the RCI. With FDOT's transition to Esri Roads and Highways, and through the proposed use of Esri Arc Collector to both collect and record inventory data, there should be some decrease in data post processing, since field captured data feeds directly into the system of record.

Table 4-2. Evaluation Matrix for Highway Inventory Data Collection Methods

	Criteria	GPS Data Logger	Robotic Total Station	GPS Enabled Photo and Video Log	Satellite and Aerial Imagery	Mobile LiDAR	Weighting Factor as selected by IDOT	What Weighting Factor would FDOT select for SUN Trail?	What Weighting Factor would FDOT select for entire RCI enterprise?
Field Data Collection	Equipment Cost	3	2	4	5	1	0.25		
	Labor Cost	2	1	4	5	3	0.25		
	Data Collection Time	2	1	4	5	3	0.25		
	Safety	2	1	4	5	3	1.00		
	Data Completeness	3	4	2	1	5	2.00		
	Data Quality	3	4	2	1	5	2.00		
	Disruption to Traffic	2	1	4	5	3	1.00		
Field Data Reduction	Software Cost	5	4	3	2	1	0.25		
	Labor Cost	5	3	4	2	1	0.25		
	Data Reduction Time	5	3	4	2	1	0.50		
	Data Storage Size	5	4	2	3	1	0.25		
Total Weighted Score		24	23	23	21	29			

Source: Jalayer, Mohammad, Huaguo Zhou, Jie Gong, ShunFu Hu, and Mark Grinter. "A Comprehensive Assessment of Highway Inventory Data Collection Methods." Journal of the Transportation Research Forum. (Washington, D.C.: Transportation Research Forum, 2014), 88, Table 9.

Because it is anticipated that the SUN Trail inventory will be less complex than the roadway inventory, the use of the Office of Maintenance estimate of $510.00 per mile should be conservative. Using this cost assumption, District 5 could inventory the roughly 30 miles of newly completed segments of SUN Trail, as identified in the SUN Trail Adopted Work Program FY 2018/2019 through FY 2022/2023, for approximately $15,300. ($510 per mile X 30 miles).

The SUN Trail network, when complete, might include over 4,000 miles in total length. Using 4,000 miles as an assumption, and dividing equally among the eight Districts, the average number of total SUN Trail miles per District would be approximately 500. The reinventory cycle is every five years, so approximately one fifth of the system is inventoried yearly. The average annual cost to inventory the SUN Trail per District could be computed as 500 miles X $510 per mile/5 years = $51,000 or $408,000 statewide.

There are several subscription levels for Esri ArcGIS. The "Field Worker" level is $350 per year per person and includes the ability to view maps and apps, use ArcGIS essential apps, and edit data. It also includes use of the field apps bundle that includes Collector and Workforce for ArcGIS, an app that aids in team coordination of data collection.

$350 x 8 districts = $2,800 per year to provide one Arc Collector subscription per District per year.

In addition to the cost of labor, the use of an inventory vehicle, and Esri Collector for ArcGIS, a related remaining equipment cost would be supplying all Districts with tablets on which to download the Arc Collector app. The Districts are relied upon to implement the new SUN Trail program inventory, in addition to their existing roadway inventory responsibilities. In the future, it is recommended that the Districts and Central Office further discuss potential efficiencies in program coordination and delivery.

Chapter 5 Summary and Conclusions

As the Florida Department of Transportation's (FDOT) work advances the development of a multimodal system for the State of Florida, the Transportation Data & Analytics Office anticipates that the development of new modes, including the SUN Trail network, will soon outpace the current FDOT Roadway Characteristics Inventory (RCI) system and practices.

The aim of this research was to investigate acceptable inventory methods based on Department data accuracy requirements and available technology to create more efficient, scalable, and acceptable data inventory management standards, as applied to the growing Shared Use Nonmotorized (SUN) Trail network. The objectives of this research were to determine a methodology of inventory of SUN Trail assets and identify an efficient data management design for hardware/software investment.

The current driven roadway data collection method consists of field and office data collection stored in the RCI database. Field data are collected at the district level. All but one district use professional services contracts for data collection. Data is collected through use of a distance measuring instrument (DMI) enabled by Global Positioning System (GPS), or the use of other GPS receivers, such as a Trimble for determining location. Other tools include manual methods, such as measuring wheel and measuring tape that can traverse physical features, digital cameras and tablets for recording data. A video log has been used for data quality checking and for ADA data collection purposes. However, the stored data are not spatially intelligent. The data are extracted and consolidated with GIS linear referencing systems (LRS) for the roadway, rail, and SUN Trails, to create a visual representation of RCI data for transportation project reporting and planning purposes.

Data for the SUN Trail network initially come from the Florida Department of Environmental Protection (FDEP) Office of Greenways and Trails (OGT). The data is in the form of GIS shapefiles that approximate the planned location of a SUN Trail alignment. When SUN Trail projects are implemented by non-FDOT agencies, the Systems Implementation Office (SIO), must depend upon the non-FDOT agencies to notify SIO and provide detailed project information and Geographic Information Systems (GIS) data so that the SUN Trail GIS/LRS-based network can be updated. FDOT has brought the OGT statewide Priority Land Trail Network GIS data into the FDOT environment, adding the LRS milepoints. Unlike for roadways, the SUN Trail network LRS already exists for "pending" trail segments during the development phases from planning through construction. FDOT has continued to refine the accuracy of the linework by conducting computer based review of aerial imagery and other project data sources. FDOT plans to rebuild RCI data using Esri Roads and Highways. This would replace RCI and some of its related systems. Esri Roads and Highways is a LRS solution that extends the ArcGIS platform. Roads and Highways supports multiple linear referencing methods, enabling data interoperability and sharing across business units. FDOT's ongoing IRAIS project (Integrated Roadway and Asset Identification System) aims to convert the RCI data into the Esri Roads and Highways data model. With the future RCI rewrite, FDOT plans to maintain the coverage dataset, or topology rules.

Researchers did not find a state DOT with a comparable statewide continuous nonmotorized shared use path system that also is being inventoried as part of its road inventory system. Some DOTs, such as Montana Department of Transportation (MDT), collect only data on shared use paths that are parallel to the roadway. Most DOTs that were contacted do not collect data on shared use paths. In some states, such as California and Colorado, trail inventories, including paved paths, are conducted by the state parks systems.

Examples of the use of mobile mapping systems were documented. These data collection efforts were designed to collect some or all data needed for an entire inventory. Many DOTs are relying on partnerships to share data relating to bicycle and pedestrian facilities, including shared use paths, trails, bike lanes and sidewalks. Inventories that are attempts to create a common template for collecting trail and shared use path data from multiple trail inventory sources, have encountered challenges. These include obtaining data from other entities in a timely manner, especially if the data sharing requires any labor to first reformat the data, or do data entry. The most basic field inventory methods of driving the roadway, and measuring characteristics with measuring wheel continue to be used. The recording of continuous digital camera images taken while driving along the roadway can be combined with GPS and inertial measurement unit technology, to document the location characteristics relative to the roadway centerline.

Most state DOTs indicated that they require and use multiple methods of roadway data collection, as no one method is best for collection of all data. This finding is confirmed by the literature review. Research literature and the vendor that collects roadway asset data for the Tennessee Department of Transportation using LiDAR recommend to first identify needed data before selecting a method of data collection.

This research project also developed recommendations for features and characteristics data to collect for the SUN Trail. Priority for the inventory of SUN Trail segments is based on whether the trail segment is On-System or Off-System, and whether FDOT funds were used in trail project development. Safety, utilization, and connectivity are key performance metrics identified for the SUN Trail network, based upon input from Central Office, and the Districts. Data to support these metrics were identified, in addition to data establishing SUN Trail location, ADA accessibility compliance, and to support trail maintenance.

With regard to SUN Trail utilization, FDOT is in the process of establishing the Statewide Non-Motorized Traffic Monitoring Program (NMTMP) and the Non-Motorized Statewide Data Repository (NMSDR). The process for developing a continuous nonmotorized traffic program includes developing an inventory of available continuous count locations and equipment. The purpose of this statewide database is to contain all the data in one format, for a seamless and integrated data resource that is available to anyone. The nonmotorized count data also will be reported to the Federal Highway Administration (FHWA). Recommendations were also developed for characteristics to describe permanent continuous nonmotorized count stations as part of the SUN Trail inventory.

These characteristics were developed to be compatible with the FHWA *2016 Traffic Monitoring Guide*. Where SUN Trail characteristics could be incorporated into the existing RCI roadway features and characteristics, this was done so. Additional characteristics also were developed. Recommendations also were developed regarding responsibility for data collection and governance by FDOT office.

For the data supporting each recommended characteristic, it was determined whether the characteristic requires a measurement or an observation in the field (as opposed to data that can be found in office documents). For those characteristics requiring measurement, the accuracy requirement was determined, based upon existing RCI accuracy standards. Height measurements and their accuracy requirements also were identified, because methods for measuring height are more limited. It also was determined whether there may be any line-of-sight issue relative to the method of measurement. For example, depending upon the dimension, this might rule out certain measurement methods, such as aerial imagery, ground-based photogrammetry, and LiDAR.

Twelve inventory methods were evaluated against accuracy standards and other criteria. Each of the measurement methods and representative equipment examples were evaluated, based upon the following.

1. Ability of the equipment to measure the dimension to the required level of accuracy
2. Consideration to FDOT's plan to use Esri Roads and Highways software
3. Safety of the measurement method, including method of travel
4. Relative cost, including staff required
5. Existing measurement equipment already in use by the Districts
6. Ability of the measurement method and representative equipment to measure recommended characteristics

FDOT is interested in the prospect of data collection efficiencies through the use of SUN Trail data collection in the field via automated sensors, conflated with GIS-derived milepoints from aerial imagery. Using the SUN Trail inventory as an example, the roadway LRS could follow suit, with GIS-derived milepoints through a digital GIS network. The priority SUN Trail LRS network alignments would be used by District data collectors to perform office and field data collection methods to capture features and characteristics.

District data collectors representing Planning, Traffic Engineering and Operations, and from Maintenance business areas would perform field visits and would use the LRS loaded on mobile GIS devices to collect data in reference to the SUN Trail LRS alignment. This method would correspond to the successful migration of RCI data from the DB2 into the Esri Roads and Highway data model.

Newly emerging image processing capabilities can allow the direct extraction of characteristics from digital images. A primary reason for the interest in mobile mapping systems is the opportunity to capture a rich dataset for multiple purposes and departments.

The results of this study are proposing that data for up to 35 features and 128 characteristics be collected for the SUN Trail, depending upon the available resources and priorities of FDOT. This is not a trivial amount of data to collect, record, and manage. The entire SUN Trail network, when finished, may be over 4,000 miles, while the State Highway System is over 12,000 centerline miles. The length of the SUN Trail network mileage would be about one third that of the highway system, and the SUN Trail data to be collected would not be as complex. Assuming the SUN Trail network will be over 4000 miles when complete, then the average total number of SUN Trail miles to be inventoried by each of eight Districts might be 500 miles.

The use of a mobile mapping system to inventory the SUN Trail network, by itself, may generate more data than can be used, for too great a cost, and for no added safety risk reduction. However, use of mobile mapping systems for the SUN Trail does make sense if FDOT decides to invest in mobile mapping systems for its highway inventory. Combining the additional SUN Trail mileage with the roadway inventory would possibly result in a smaller unit cost per mile. The fixed costs of the equipment and mobilization is generally the same, whether more or less miles of facility are being inventoried.

Prior to the inventory, FDOT or the consultant responsible for the inventory must coordinate with the local trail authority to implement a Temporary Traffic Control plan to ensure the safety of the traveling public. Any work related to data collection, maintenance, or installation of signage, traffic monitoring stations or other assets will require strong coordination with local entities. Department procedures like Maintenance of Traffic (MOT) guidelines are important for FDOT to follow, to make sure the inventory work does not impact the motoring or non-motoring public.

It also is possible that the University of Florida's proof of concept mobile LiDAR system could be piloted on the SUN Trail to establish location, trail segment length, and emergency vehicle accessibility. Not all features and characteristics in the field can be inventoried using the proof-of-concept system presently. In the future, further research about the use of additional LiDAR sensors, development and refinement of algorithms that detect more characteristics, and the use of neural networks for pattern matching could potentially expand the range of characteristics that this system could inventory. The fact that the SUN Trail inventory for Off-System segments that run along an independent alignment will consist of a single lane, means that the proof-of-concept LiDAR system could be anticipated to perform well as an inventory method for the SUN Trail in the future.

FDOT will likely be considering inventory methods and technologies in light of enterprise needs for the purpose of collecting data once for multiple users. Based upon criteria most important to FDOT, inventory methods and technologies that are best for roadway data might drive the decision for investments, such that whatever selected technologies are applied to the roadway might also be applied to SUN Trail. For example, FDOT may plan to invest in the use of mobile mapping systems that could include photogrammetry and/or mobile terrestrial LiDAR technology for roadway data collection.

The LiDAR data collection for specific targeted lengths of the SUN Trail system could be conducted immediately subsequent to the completion of LiDAR data collection for nearby roadway locations.

The results of this research can be used as a basis to support future implementation of a SUN Trail characteristics inventory that may support stakeholder data needs. The recommendations for SUN Trail features and characteristics, and recommendations for the inventory process as well as methods to collect the data will result in the collection of business and geographical intelligence to manage and track the life cycle of the transportation project, support justification for future infrastructure investments, and establish data governance of transportation facilities and assets.

Table 5-1 below provides a list of FDOT and FDEP staff interviewed for this research. These personnel were interviewed based on their responsibilities for the SUN Trail and the RCI at the time the research project activities were performed. Table 5-2 below provides a list of those who provided information as part of the Task 3 investigation of other inventory methods used by other government entities.

Table 5-1. List of FDOT Staff Interviewed

District	Staff Interviewed
1	Kyle Purvis David Agacinski
2	Barney Bennette Debrah Miller Justin Bellot
3	Geoff Hynes Olen Pettis Starsky Harrell
4	Min-Tang Li Lauren Rand Autumn Young Jessica Reyes Newton Wilson Wibet Hay
5	David Cooke Matthew Pierce Heather Garcia Julia Holtzhausen
6	Neil Lyn Elizabeth Stacey Stevan Gonzalez Smiley Urena
7	Evangeline Black Anita Montjoy Stephen Branson Stephen Benson Kelly Nitzman Jennifer Bartlett Christopher Speese Alex Henry John Iten Keith Anders Anita Wang Brian Shroyer Tim Folsom
Central Office	
	Ed Hutchinson Joel Worrell Paul O'Rourke Tina Thompson Jerry Scott Bob Hendershot Judy Lenzyck Eric Hanson
	George Sirianni, Jr. Huiwei Shen Paul Fang Dean Rogers Khaleda Hatim Robin Birdsong
	Kirk Hutchison
	Javier Ponce
FDEP	
	Daniel Diaz, Office of Greenways and Trails

Table 5-2. Contacts Regarding Inventory Methods of Other Agencies

State	Contact
Arkansas	Sharon Hawkins, Section Head, Mapping and Graphics Arkansas Department of Transportation Phone: 501-569-2205 Sharon.Hawkins@ardot.gov
California	Mandy Chu, P.E. Chief, Office of Highway System Information and Performance Caltrans, Division of Research, Innovation, and System Information 1120 "N" Street, MS-83 Sacramento, CA 95814 Phone: 916-654-3995 Mandy.chu@dot.ca.gov Callie Hurd Associate Parks and Recreation Specialist California State Parks Phone: 916-324-0423 Trails@parks.ca.gov Jason Spann Associate Landscape Architect California State Parks Road and Trails Program Jason.spann@parks.ca.gov

Table 5-2, continued

State	Contact
Colorado	Kenneth Brubaker Bicycle and Pedestrian Facility Engineer Colorado Department of Transportation 2829 W. Howard Pl., Denver CO, 80204 Phone: 303-757-9804 Kenneth.brubaker@state.co.us Nick Dellaca Colorado Trails Coordinator Phone: 303-791-1757 x4129 Nick.dellaca@state.co.us Benjamin Plankis Trails Coordinator, Northeast Region Colorado Parks and Wildlife 6060 Broadway Denver, CO 80216 Phone: 303-291-7272 Benjamin.plankis@state.co.us
Florida (Orange County case study)	Brian Garvey Southeastern Surveying and Mapping Corporation 6500 All American Blvd. Orlando, Florida 32810-4350 Phone: 407-292-8580 ext. 2234 bgarvey@ssmc.us
Minnesota	Charlie McCarty Systems Analysis Unit Supervisor| Enterprise Services – GIS Services Minnesota IT Services | Partnering with Transportation 395 John Ireland Blvd. St. Paul, MN, 55155 Phone: 651 366 4042 charlie.mccarty@state.mn.us Trisha Stefanski State Asset Management Engineer Minnesota Department of Transportation Phone: 651-234-7993 Trisha.stefanski@state.mn.us

Table 5-2, continued

State	Contact
Montana	Jody Bachini MDT Maintenance Reviewer Montana Department of Transportation Phone: 406-444-6375 jbachini@mt.gov
North Carolina	Emmanuel Matata GIS Analyst / GIS Unit North Carolina Department of Information Technology Transportation 4101 Capital Blvd 1521 Mail Service Center Raleigh, NC 27699-1521 Phone: 919-707-2165 -Office ematata@ncdot.gov
Ohio	Ian Kidner GIS Manager ODOT Office of Technical Services 1980 W. Broad Street, Columbus, Ohio 43223 614.752.5743 ian.kidner@dot.ohio.gov Jordan Whisler Jordan.whisler@dot.ohio.gov
Oregon	Heather King Manager, Road Inventory and Classification Services (RICS) Unit Transportation Data Section, Oregon Department of Transportation 555 13th St. NE, Suite 2 Salem, OR 97301-4178 Phone: 503-986-4157 Heather.l.king@odot.state.or.us
Tennessee	Christopher Harris Civil Engineering Manager 2 Maintenance Division - Asset Management Office 505 Deaderick Street, Suite 400 Nashville, TN 37243 Phone: 615-532-3453 Chris.Harris@tn.gov

Table 5-2, continued

State	Contact
Washington	Lou Baker Transportation Planning Specialist GIS & Roadway Data Branch Transportation Data, GIS & Modeling Office Multimodal Planning Division, WSDOT 360-570-2361 bakerl@wsdot.wa.gov Clint Hill Computer Aided Engineering (CAE) Support Manager WSDOT Development Division GeoMetrix Office 7345 Linderson Way SW Tumwater, WA 98504-7334 Phone: 360-709-8016 Clint.Hill@wsdot.wa.gov Keith Anderson Computer Aided Engineering (CAE) InRoads Support Engineer 4 Development Division Tumwater, WA 98501 PO Box 47338, Olympia WA 98504-7338 360.709.8014 anderKA@wsdot.wa.gov Abigail Gleason LiDAR Manager, Washington Geological Survey Washington State Dept. of Natural Resources 360-902-1560 Abigail.gleason@dnr.wa.gov

References

AASHTO (American Association of State Highway and Transportation Officials). 2012. *Guide for the Development of Bicycle Facilities*. Washington, D.C.: AASHTO. ISBN: 978-1-56051-527-2.

ATBCB (Architectural and Transportation Barriers Compliance Board). 2013. *Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Right; Shared Use Paths*. Federal Register. Vol. 78. No. 30. 10110-10117. February 13. Washington, D.C.: Office of the Federal Register, National Archives and Records Administration. Accessed at https://www.govinfo.gov/app/details/FR-2013-02-13/2013-03298/summary

Crane, Carl. 2018. "LiDAR Data Collection to Support Quality Control (QC) Processes and the Florida Shared-Use Nonmotorized SUN Trail System: LiDAR Interview Responses." BDV31 TWO 977-57. Prepared for Transportation Data & Analytics Office. Tallahassee: FDOT.

FDEP (Florida Department of Environmental Protection). 2019. *Florida Greenways and Trails System Plan 2019-2023*. Office of Greenways and Trails. Tallahassee: FDEP. Accessed at https://floridadep.gov/sites/default/files/FL-Greenway%2BTrails-System-Plan-2019%2C%202023.pdf

FL DHSMV (Florida Department of Highway Safety and Motor Vehicles). 2017. "Traffic Crash Facts: Annual Report 2017." Accessed at https://flhsmv.gov/pdf/crashreports/crash_facts_2017.pdf

FDOT (Florida Department of Transportation). 2019a. "Shared-Use Nonmotorized (SUN) Trail Program Frequently Asked Questions." July. Tallahassee: FDOT. Accessed at https://www.fdot.gov/planning/systems/SUNTrail/guidance.shtm

_____. 2019b. *Implementing Florida's Shared-Use Nonmotorized (SUN) Trail Program.* Systems Implementation Office. March. Tallahassee: FDOT. Accessed at https://www.fdot.gov/planning/systems/SUNTrail/guidance.shtm

_____. 2019c. "Statewide Nonmotorized Traffic Monitoring Program." Eric Katz and Elizabeth Stolz. Webinar. February 19. Tallahassee: FDOT. https://register.gotowebinar.com/recording/2101469483328667916

_____. 2019d. *Methodologies for the FDOT Source Book: A Technical Report – 2018*. Forecasting and Trends Office. February. Tallahassee: FDOT. Accessed at https://www.fdot.gov/planning/FTO

_____. 2018a. Work Program Instructions. FY 19/20 – 23/24. Part III Programming Guidelines. Chapter 19: Location Information for Roadways, Bridges and Trail System, pp. 3-4, 6-7; and Chapter 38: Trails. pp. 1-6. September 12. Tallahassee: FDOT. Later editions of the Work Program instructions can be accessed at https://www.fdot.gov/workprogram/development/wp-instructions.shtm

_____. 2018b. *The FDOT Source Book 2018*. Forecasting and Trends Office. Updated February 2019. Tallahassee: FDOT. Accessed at https://www.fdot.gov/planning/FTO

_____. 2018c. *2018 Traffic Monitoring Handbook*. Tallahassee: FDOT. Accessed at https://www.fdot.gov/statistics/tsopubs.shtm

_____. 2017. *GIS Handbook: RCI General Interest Roadway Data Features and Characteristics*. Prepared by Transportation Data and Analytics Office. March. Tallahassee: FDOT. Accessed at https://www.fdot.gov/statistics/tsopubs.shtm

_____. 2016a. *Roadway Characteristics Inventory Features & Characteristics Handbook*. Prepared by Transportation Statistics Office. August. Tallahassee: FDOT. Accessed at https://www.fdot.gov/statistics/tsopubs.shtm

_____. 2016b. *Roadway Characteristics Inventory Planning Data Handbook*. Prepared by Transportation Statistics Office. August. Tallahassee: FDOT. Accessed at https://www.fdot.gov/statistics/tsopubs.shtm

_____. 2013. *FDOT 2013 Quality/Level of Service Handbook*. Systems Management Section of FDOT Systems Implementation Office. Tallahassee: FDOT. Accessed at https://www.fdot.gov/planning/systems/documents/sm/default.shtm#los

Jalayer, Mohammad, Huaguo Zhou, Jie Gong, ShunFu Hu, and Mark Grinter. "A Comprehensive Assessment of Highway Inventory Data Collection Methods." *Journal of the Transportation Research Forum* 53, no. 2 (2014): 73-92. doi:10.22004/ag.econ.207436

Mandli Communications, Inc. 2018. "Work Plan for the State of Tennessee Department of Transportation." Contract No. FA1544611. Updated February 2. Nashville: TDOT.

USDA Forest Service, National Forests in Florida, and the Florida Trail Association. 2018. *Florida National Scenic Trail Program, Strategic Plan Implementation Guide: A Companion Guide to the Florida National Scenic Trail Strategic Plan; Connecting Florida's Public Lands.* Version 2.0. September. Washington, D.C.: USDA.

U.S. DOJ (United States Department of Justice). 2010. 2010 ADA Standards for Accessible Design. September 15. Last updated December 7, 2012. Washington, D.C.: DOJ. Accessed at https://www.ada.gov/regs2010/2010ADAStandards/2010ADAstandards.htm

U.S. DOT (United States Department of Transportation). 2016a. *Federal Highway Administration Traffic Monitoring Guide*. FHWA-PL-17-003. Chapter 4. October. Washington, D.C.: FHWA. Accessed at https://www.fhwa.dot.gov/policyinformation/tmguide/tmg_fhwa_pl_17_003.pdf

_____. 2016b. *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format*. FHWA-HEP-17-011. November. Washington, D.C.: FHWA. Accessed at file:///P:/CUTR/Multimodal%20Data/Task%203%20Identify%20other%20methods/Tech%20Memo%203/fhwatraffic%20monitoring%20guide%20coding%20format.pdf

Zhou, Y., Y. Qi and F. Wang. "Survey Study of Inventory Data Collection Method for Public Road Systems." *Advances in Transportation Studies: an International Journal*. Section A 37 (2015): 15-30. doi:10.4399/978885488868502

Appendix A: Matrices of Recommended SUN Trail Features and Characteristics

Table A-1: Master Matrix of Recommended SUN Trail Features and Characteristics

Table A-2: Matrix of Recommended SUN Trail Data for the Minimum Necessary Characteristics

Table A-3: Matrix of Recommended SUN Trail Data for Additional Location Characteristics

Table A-4: Matrix of Recommended SUN Trail Data for Maintenance Characteristics

Table A-5: Matrix of Recommended SUN Trail Data for Measuring Utilization

Table A-6: Matrix of Recommended SUN Trail Data for Measuring Safety

Table A-7: Matrix of Recommended SUN Trail Data for Measuring Connectivity

Table A-8: Matrix of Recommended SUN Trail Data for ADA Characteristics

*For Tables A-1 through A-8, the source of accuracy requirements are those listed for each characteristic from the *Roadway Characteristics Inventory Features & Characteristics Handbook*, August 2016.
Other guidance provides "Discrepancy Selection Criteria: The acceptable deviation (as of 9/20/2006) between the LRS and RCI mileage lengths for each Roadway ID should be less than 0.100 mile, or less than 5% of the RCI gross length value, ignoring any that are less than 0.009 miles." FDOT Transportation Data and Analytics Office. *GIS Handbook: RCI General Interest Roadway Data Features and Characteristics*. March 2017. p. 4.

** N = Recommended minimum necessary
L = Location measure
S = Safety measure
C = Connectivity measure
ADA = ADA characteristic
M = Maintenance
U = Utilization

Table A-1: Master Matrix of Recommended SUN Trail Features and Characteristics

FDOT RCI Feature by Owning Office	Characteristic	Description	Data Collector	Recommended Priority**	Requires Field Measurement (M) and/or Observation (O)	Measurement Accuracy requirement*
Transportation Data & Analytics						
113 AASHTO	USBRNMBR (proposed)	US Bicycle Route Number	Dist. Planning, RCI Coordinator and Trail Coordinator	N, L		
124 Urban Classification	PLACECD	Census Place (City) Code	Dist. Planning	L, C		
126 Context Classification			Dist. Planning	C		
138 Roadway Realignment	NALIGNDT	New Alignment Date	Dist. Planning	N, L		
	NALIGNID	Section/Subsection of the New Alignment	Dist. Planning	N, L		
	NALNBGPT	New Alignment Begin MP	Dist. Planning	N, L	M	0.001 mile
	NALNENPT	New Alignment End MP	Dist. Planning	N, L	M	0.001 mile
139 Old Alignment	OALIGNID	Section/Sub-section of Old Alignment	Dist. Planning	N, L	Automatically generated	
	OALNBGPT	Old Alignment Begin MP	Dist. Planning	N, L		
	OALNENPT	Old Alignment End MP	Dist. Planning	N, L		
140 Section Status Exception	OSDATE	On or Off-System Date	Dist. Planning	N, L	M	0.001 mile
	STATEXPT (proposed add'l codes)	Segment Status	Dist. Planning	N, L		
141 Stationing Exceptions	BEGSCPT	Begin Section MP of Exception Field	Dist. Planning	N, L, C	M	0.001 mile
	ENDSECPT	End Section MP of Exception Field	Dist. Planning	N, L, C	M	0.001 mile
	RDWYID	County, Section, Sub-section	Dist. Planning	N, L, C		
214 Outside Shoulders	SHLDTYPE	Highway Shoulder Type	Dist. Planning	S	M O	0.001 mile
	SLDWIDTH	Highway Shoulder Width	Dist. Planning	S	M	0.5 feet
216 Bike Lanes/Pedestrian Sidewalk	BIKELNCD (proposed add'l codes)	Bicycle Lane	Dist. Planning	N, L, C	M O	0.001 mile
	BIKSLTCD	Bicycle Slot	Dist. Planning	S	M	0.001 mile
	SDWLKBCD	Sidewalk Barrier Code	Dist. Planning	S	O	
	SHARDPTH	Shared Path Width and Separation	Dist. Planning	S	M	0.5 feet
230 Surface Description	PAVECOND	Pavement Condition	Dist. Planning or Dist. Maintenance	M	M O	0.001 mile
	SURFNUM	Pavement Surface Type	Dist. Planning or Dist. Maintenance	M	M O	0.001 mile

Table A-1, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Data Collector	Recommended Priority**	Requires Field Measurement (M) and/or Observation (O)	Measurement Accuracy requirement*
251 Intersection	BEGSECNM	Begin Roadway Section MP Description	Dist. Planning	L, S, C	M	0.001 mile
	ENDSECNM	End Roadway Section MP Description	Dist. Planning	L, S, C	M	0.001 mile
	INTSDIRx	Intersection Direction	Dist. Planning	S	O	
	SUNTRTRH (proposed)	SUN Trail Trailhead	Dist. Planning	L, C	O	
	SUNTRADA (proposed)	SUN Trail ADA Access	Dist. Planning	ADA	O	
	SUNTRGAT (proposed)	SUN Trail Intersection Access Control	Dist. Planning or Dist. Maintenance	S, M	O	
253 Railroads	CHKDIGIT	Check Digit	Dist. Planning	S	O	
	RRCROSNO	National Railroad Grade Crossing Number	Dist. Planning	S	O	
258 Structures	BOXCULNO	Box Culvert Number	Dist. Planning	M	O	
	BRIDGENO	Bridge Number	Dist. Planning	L, M	O	
	FACCROSS	Facility Crossed	Dist. Planning	L	M	0.001 mile
	UNDPASNO	Underpass Number	Dist. Planning	L	O	
	BRIDGEVA (proposed)	SUN Trail Bridge Emergency Vehicle Access	Dist. Planning	N, L	M	0.001 mile (recommended) Min. height 1 inch Min. width 0.5 feet Bridge load rating information provided by Design Office
320 Mile Marker Signs	MILEDECL (proposed)	Mile Marker Decal	Dist. Planning	N, L	M O	0.001 mile (recommended)
326 Traffic Monitoring Sites	NMSTATLR (proposed)	Nonmotorized Station/Location Record Identifier ('L')	NMTMP in Central Office or District	N, U		
	NMSTFIPS (proposed)	Nonmotorized State FIPS Code ('12')	NMTMP in Central Office or District	N, U		
	NMCOFIPS (proposed)	Nonmotorized County FIPS Code	NMTMP in Central Office or District	N, U		
	NMSTATID (proposed)	Nonmotorized Station ID Number	Dist. Traffic Data Section, NMTMP	N, S, U		
	NMFUNCLS (proposed)	Nonmotorized (Functional) Classification of Road (expanded)	NMTMP in Central Office or District	N, U		
	NMDIRRTE (proposed)	Nonmotorized Direction of Route	NMTMP in Central Office or District	N, U		

Table A-1, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Data Collector	Recommended Priority**	Requires Field Measurement (M) and/or Observation (O)	Measurement Accuracy requirement*
	NMFACTYP (proposed)	Nonmotorized Facility Type	NMTMP in Central Office or District	N, U	O	
	NMINTRST (proposed)	Nonmotorized Intersection	NMTMP in Central Office or District	U	O	
	NMMETHCT (proposed)	Nonmotorized Method of Counting	NMTMP in Central Office or District	N, U	O	
	NMTYPSEN (proposed)	Nonmotorized Type of Sensor	NMTMP in Central Office or District	U	O	
	NMYEREST (proposed)	Nonmotorized Year Station Established	NMTMP in Central Office or District	N, U		
	NMYERDIS (proposed)	Nonmotorized Year Station Discontinued	NMTMP in Central Office or District	U		
	NMNATLHS (proposed)	Nonmotorized National Highway System	NMTMP in Central Office or District	U		
	NMLATITD (proposed)	Nonmotorized Latitude	NMTMP in Central Office or District	N, U	M	
	NMLONGTD (proposed)	Nonmotorized Longitude	NMTMP in Central Office or District	N, U	M	
	NMPOSTRS (proposed)	Nonmotorized Posted Route Signing	NMTMP in Central Office or District	U	O	
	NMPOSTRN (proposed)	Nonmotorized Posted Signed Route Number	NMTMP in Central Office or District	U	O	
	NMLRSRID (proposed)	Nonmotorized LRS Route ID	NMTMP in Central Office or District	U		
	NMLRSLOC (proposed)	Nonmotorized LRS Location Point	NMTMP in Central Office or District	U	M	0.001 mile
	NMSTATLC (proposed)	Nonmotorized Station Location	NMTMP in Central Office or District	U	O	
	NMONOTES (proposed)	Nonmotorized Other Notes	NMTMP in Central Office or District	U		
Traffic Engineering & Operations						
311 Speed Limits	MAXSPEED	Maximum Speed Limit (Posted Speed Limit)	NMTMP in Central Office or District	S, U	M O	0.001 mile
322 Signals	SDESTRET	Side Street Name (on-system, the side street may be the SUN Trail itself)	Dist. Traffic Ops.	L	O	
	SIGNALTY (proposed add'l codes)	Type of Traffic Signal	Dist. Traffic Ops.	S	O	
Office of Maintenance						

FDOT RCI Feature by Owning Office	Characteristic	Description	Data Collector	Recommended Priority**	Requires Field Measurement (M) and/or Observation (O)	Measurement Accuracy requirement*
137 Maintenance Area Boundary	CCNUMBER	Cost Center Number	Dist. Maintenance	N, M	M	0.001 mile
217 Sidewalks	SIDEWALK		Dist. Maintenance	M	M	0.001 mile
		Sidewalk Width	Dist. Maintenance	M	M	1 foot
230 Surface Description	PAVECOND	Pavement Condition	District Planning or Dist. Maintenance	M	M O	0.001 mile
	SURFNUM	Pavement Surface Type	Dist. Planning or Dist. Maintenance	M	M O	0.001 mile
241 Crossdrains	BOXCULHT	Box Culvert Height	Dist. Maintenance	M	M	1 foot
	BOXCULLT	Box Culvert Width	Dist. Maintenance	M	M	1 foot
	BXCULGTH	Box Culvert Length	Dist. Maintenance	M	M	2 feet
	NOBXCULV	Number of Box Culverts	Dist. Maintenance	M	O	
	CRSDRLGH	Length of Crossdrain Pipes	Dist. Maintenance	M	M	2 feet
	NOCRDRAN	Number of Crossdrain Pipes	Dist. Maintenance	M	O	
	PIPEDIAM	Pipe Diameter	Dist. Maintenance	M	M	1 inch
	PIPEHIGH	Non-Circular Pipe Height	Dist. Maintenance	M	M	1 inch
	PIPETYPE	Type of Pipe	Dist. Maintenance	M	O	
	PIPEWIDTH	Non-Circular Pipe Width	Dist. Maintenance	M	M	1 inch
242 Storm Sewers	MANHOLES	Number of Manholes	Dist. Maintenance	M	O	
	MDITCBAS	Number of Catch Basins	Dist. Maintenance	M	O	
248 Outfall Ditches	ODITHAND	Outfall Ditch by Hand Length	Dist. Maintenance	M	M	1 foot
	ODITHAUL	Outfall Ditch by Hauled Length	Dist. Maintenance	M	M	1 foot
	ODITPIPE	Outfall Ditch by Length Piped	Dist. Maintenance	M	M	1 foot
	ODITSPR	Outfall Ditch Spread Length	Dist. Maintenance	M	M	1 foot
256 Turnouts	TRNOTPNP	Paved Turnouts Without Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile
	TRNOTPPI	Paved Turnouts With Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile
	TRNOTUNP	Unpaved Turnouts Without Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile
	TRNOTUPI	Unpaved Turnouts With Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile
	WDTRNPNP	Average Width Turnout, Paved, No Pipe	Dist. Maintenance	M	M	1 foot
	WDTRNPPI	Average Width Turnout, Paved With Pipe	Dist. Maintenance	M	M	1 foot
	WDTRNUNP	Average Width Turnout, Unpaved, No Pipe	Dist. Maintenance	M	M	1 foot

Table A-1, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Data Collector	Recommended Priority**	Requires Field Measurement (M) and/or Observation (O)	Measurement Accuracy requirement*
	WDTRNUPI	Average Width Turnout, Unpaved, With Pipe	Dist. Maintenance	M	M	1 foot
	SUNTRACP (proposed)	SUN Trail Access Point (Off-System)	Dist. Maintenance	L, C, M	M O	0.001 mile (recommended)
	SUNTRACC (proposed)	SUN Trail ADA Access at Turnout	Dist. Maintenance	ADA, M	M O	0.001 mile (recommended)
	SUNTRGTE (proposed)	SUN Trail Access Control	Dist. Maintenance	M	O	
	SUNTREVA (proposed)	SUN Trail Emergency Vehicle Access	Dist. Maintenance	N, L, M	M	0.001 mile (recommended) Min. height 1 inch Min. width 0.5 feet
271 Guardrail	SPCGRAIL	Miscellaneous Guardrail Length	Dist. Maintenance	S, M	M	0.001 mile
272 Fencing	OTHERFCS	Number of Other Types of Fences	Dist. Maintenance	S, M	M O	0.001 mile
275 Miscellaneous Concrete Structures	RETWALL	Retaining Wall Length	Dist. Maintenance	M	M	1 foot within each 1 mi. increment
	SLOPEPAV	Slope Paving Area Concrete	Dist. Maintenance	M	M	1 sq. yard within each one mi. increment
411 Roadside Mowing	SMMACMOW	Small Machine Mowing Area	Dist. Maintenance	M	M	0.01 acre
421 Roadside Ditch Cleaning	RDCANALS	Number of Roadside Canals	Dist. Maintenance	M	M O	0.001 mile
	RDITEXCA	Number of Roadside Ditches (Excavator)	Dist. Maintenance	M	M O	0.001 mile
443 Delineators	BRDELIN	Number of Bridge End Delineators	Dist. Maintenance	S, M	O	
	DELINEAT	Number of Guide Posts/Hazard Marker Delineators	Dist. Maintenance	S, M	O	
451 Striping	SNGLLINE	Number of Stripes—Single White or Yellow	Dist. Maintenance	S, M, U	M O	0.001 mile
452 Symbols & Messages	PNTLETTR	Number of Letters	Dist. Maintenance	S, M	O	
	RADIUSMK	Radius Marking Area	Dist. Maintenance	S, M	O	
454 Stop Bars	STOPBR12 (proposed add'l code)	Number of 12 Foot Stop Bars	Dist. Maintenance	S, M	O	

Table A-1, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Data Collector	Recommended Priority**	Requires Field Measurement (M) and/or Observation (O)	Measurement Accuracy requirement*
480 Highway Signs	GRPSTL30	Number of Ground Sign Posts Less than 30 Square Feet	Dist. Maintenance	S, M	O	
	PANLLT30	Ground Panels Less Than 30 Square Feet	Dist. Maintenance	S, M	O	
Systems Implementation						
801 Trails	SUNTRTYP	SUN Trails Type	Systems Implementation/Dist. Planning	N, L		
	SUNTRDAT (proposed)	SUN Trails Date	Dist. Planning	N, L		
	SUNTRCOR	SUN Trails Corridor Name	Systems Implementation	N, L		
	SNTRBGPT (proposed)	SUN Trail Beginning Milepoint	Dist. Planning	N, L	M	0.001 mile (recommended)
	SNTRENPT (proposed)	SUN Trail End Milepoint	Dist. Planning	N, L	M	0.001 mile (recommended)
	SUNTRLOC (proposed)	SUN Trail Local Name	Dist. Planning, Dist. Trail Coordinator	L	O	
	STROVRLP (proposed)	SUN Trail Overlap	Systems Implementation	L, C		
	BEGTRMPT (proposed)	Begin SUN Trail Overlap Milepoint	Systems Implementation	L, C	M	0.001 mile (recommended)
	ENDTRMPT (proposed)	End SUN Trail Overlap Milepoint	Systems Implementation	L, C	M	0.001 mile (recommended)
	NEWTRDAT (proposed)	New SUN Trail Realignment Date	Dist. Planning	N, L		
	NSUNTRID (proposed)	Section/Sub-section of New SUN Trail Realignment	Dist. Planning	N, L		
	NSTRBGPT (proposed)	New SUN Trail Realignment Beginning Milepoint	Dist. Planning	N, L	M	0.001 mile (recommended)
	NSTRENPT (proposed)	New SUN Trail Realignment End Milepoint	Dist. Planning	N, L	M	0.001 mile (recommended)
	OSUNTRID (proposed)	Old SUN Trail Alignment ID	Dist. Planning	N	Automatically Generated	
	OSTRBGPT (proposed)	Old SUN Trail Alignment Beginning Milepoint	Dist. Planning	N		
	OSTRENPT (proposed)	Old SUN Trail Alignment End Milepoint	Dist. Planning	N		
	SUNTROWN (proposed)	SUN Trail Land Ownership	Systems Implementation/Dist. Planning	N, L		

Table A-1, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Data Collector	Recommended Priority**	Requires Field Measurement (M) and/or Observation (O)	Measurement Accuracy requirement*
	SUNTRMOA (proposed)	SUN Trail Local Entity Responsible for Maintenance	Systems Implementation/Dist. Planning/Dist. Maintenance	N, M		
	SUNTRFIN (proposed)	SUN Trail Final As-Built Construction Plans	Systems Implementation/Dist. Maintenance	M		
	SUNTRPER (proposed)	SUN Trail Permits	Systems Implementation/Dist. Maintenance	M		

Table A-2: Matrix of Recommended SUN Trail Data for the Minimum Necessary Characteristics

FDOT RCI Feature by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
Transportation Data & Analytics								
113 AASHTO	USBRNMBR (proposed)	US Bicycle Route Number	Dist. Planning, RCI Coordinator and Trail Coordinator	N, L				
138 Roadway Realignment	NALIGNDT	New Alignment Date	Dist. Planning	N, L				
	NALIGNID	Section/Subsection of the New Alignment	Dist. Planning	N, L				
	NALNBGPT	New Alignment Begin MP	Dist. Planning	N, L	M	0.001 mile		Aerial images
	NALNENPT	New Alignment End MP	Dist. Planning	N, L	M	0.001 mile		Aerial images
139 Old Alignment	OALIGNID	Section/Sub-section of Old Alignment	Dist. Planning	N, L	Automatically generated			
	OALNBGPT	Old Alignment Begin MP	Dist. Planning	N, L				
	OALNENPT	Old Alignment End MP{	Dist. Planning	N, L				
140 Section Status Exception	OSDATE	On or Off-System Date	Dist. Planning	N, L				
	STATEXPT (proposed add'l codes)	Segment Status	Dist. Planning	N, L				
141 Stationing Exceptions	BEGSCPT	Begin Section MP of Exception Field	Dist. Planning	N, L, C	M	0.001 mile		Aerial images
	ENDSECPT	End Section MP of Exception Field	Dist. Planning	N, L, C	M	0.001 mile		Aerial images
	RDWYID	County, Section, Sub-section	Dist. Planning	N, L, C				
216 Bike Lanes/Pedestrian Sidewalk	BIKELNCD (proposed add'l codes)	Bicycle Lane	Dist. Planning	N, L, C	M O	0.001 mile		Aerial images

Table A-2, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
258 Structures	BRIDGEVA (proposed)	SUN Trail Bridge Emergency Vehicle Access	Dist. Planning	N, L	M	0.001 mile Min. height 1 inch Min. width 0.5 feet Bridge load rating information provided by Design Office	X	Aerial images
320 Mile Marker Signs	MILEDECL (proposed)	Mile Marker Decal	Dist. Planning	N, L	M O	0.001 mile (recommended)		Aerial images
326 Traffic Monitoring Sites	NMSTATLR (proposed)	Nonmotorized Station/Location Record Identifier ('L')	NMTMP in Central Office or District	N, U				
	NMSTFIPS (proposed)	Nonmotorized State FIPS Code ('12')	NMTMP in Central Office or District	N, U				
	NMCOFIPS (proposed)	Nonmotorized County FIPS Code	NMTMP in Central Office or District	N, U				
	NMSTATID (proposed)	Nonmotorized Station ID Number	Dist. Traffic Data Section, NMTMP	N, S, U				
	NMFUNCLS (proposed)	Nonmotorized (Functional) Classification of Road (expanded)	NMTMP in Central Office or District	N, U				
	NMDIRRTE (proposed)	Nonmotorized Direction of Route	NMTMP in Central Office or District	N, U				
	NMFACTYP (proposed)	Nonmotorized Facility Type	NMTMP in Central Office or District	N, U	O			
	NMMETHCT (proposed)	Nonmnotorized Method of Counting	NMTMP in Central Office or District	N, U	O			
	NMYEREST (proposed)	Nonmotorized Year Station Established	NMTMP in Central Office or District	N, U				
	NMLATITD (proposed)	Nonmotorized Latitude	NMTMP in Central Office or District	N, U	M			

Table A-2, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
	NMLONGTD (proposed)	Nonmotorized Longitude	NMTMP in Central Office or District	N, U	M			
Office of Maintenance								
137 Maintenance Area Boundary	CCNUMBER	Cost Center Number	Dist. Maintenance	N, M		0.001 mile		
256 Turnouts	SUNTREVA (proposed)	SUN Trail Emergency Vehicle Access	Dist. Maintenance	N, L	M	0.001 mile (recommended) Min. height 1 inch Min. width 0.5 feet	X	Aerial images
Systems Implementation								
801 Trails	SUNTRTYP	SUN Trails Type	Systems Implementation/Dist. Planning	N, L				
	SUNTRDAT (proposed)	SUN Trails Date	Dist. Planning	N, L				
	SUNTRCOR	SUN Trails Corridor Name	Systems Implementation	N, L				
	SNTRBGPT (proposed)	SUN Trail Beginning Milepoint	Dist. Planning	N, L	M	0.001 mile (recommended)		Aerial imagery
	SNTRENPT	SUN Trail End Milepoint	Dist. Planning	N, L	M	0.001 mile (recommended)		Aerial imagery
	NEWTRDAT (proposed)	New SUN Trail Realignment Data	Dist. Planning	N, L				
	NSUNTRID (proposed)	Section/Sub-section of New SUN Trail Realignment	Dist. Planning	N, L				
	NSTRBGPT (proposed)	New SUN Trail Realignment Beginning Milepoint	Dist. Planning	N, L	M	0.001 mile (recommended		Aerial imagery

Table A-2, continued

FDOT RCI Feature by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
	NSTRENPT (proposed)	New SUN Trail Realignment End Milepoint	Dist. Planning	N, L	M	0.001 mile (recommended)		Aerial imagery
	OSUNTRID (proposed)	Old SUN Trail Alignment ID	Dist. Planning	N	Automatically Generated			
	OSTRBGPT (proposed)	Old SUN Trail Alignment Beginning Milepoint	Dist. Planning	N				
	OSTRENPT (proposed)	Old SUN Trail Alignment End Milepoint	Dist. Planning	N				
	SUNTROWN (proposed)	SUN Trail Land Ownership	Systems Implementation/Dist. Planning	N, L				
	SUNTRMOA (proposed)	SUN Trail Local Entity Responsible for Maintenance	Systems Implementation/Dist. Planning/Dist. Maintenance	N, M				

Table A-3: Matrix of Recommended SUN Trail Data for Additional Location Characteristics

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
Transportation Data & Analytics								
113 AASHTO	USBRNMBR (proposed)	US Bicycle Route Number	Dist. Planning, RCI Coordinator and Trail Coordinator	N, L				
124 Urban Classification	PLACECD	Census Place (City) Code	Dist. Planning	L, C				
138 Roadway Realignment	NALIGNDT	New Alignment Date	Dist. Planning	N, L				
	NALIGNID	Section/Subsection of the New Alignment	Dist. Planning	N, L				
	NALNBGPT	New Alignment Begin MP	Dist. Planning	N, L	M	0.001 mile		Aerial images
	NALNENPT	New Alignment End MP	Dist. Planning	N, L	M	0.001 mile		Aerial images
139 Old Alignment	OALIGNID	Section/Sub-section of Old Alignment	Dist. Planning	N, L	Automatically generated			
	OALNBGPT	Old Alignment Begin MP	Dist. Planning	N, L				
	OALNENPT	Old Alignment End MP{	Dist. Planning	N, L				
140 Section Status Exception	OSDATE	On or Off-System Date	Dist. Planning	N, L	M	0.001 mile (recommended)		
	STATEXPT (proposed add'l codes)	Segment Status	Dist. Planning	N, L				
141 Stationing Exceptions	BEGSCPT	Begin Section MP of Exception Field	Dist. Planning	N, L, C	M	0.001 mile		Aerial images
	ENDSECPT	End Section MP of Exception Field	Dist. Planning	N, L, C	M	0.001 mile		Aerial images
	RDWYID	County, Section, Sub-section	Dist. Planning	N, L, C				

Table A-3, continued

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
216 Bike Lanes/Pedestrian Sidewalk	BIKELNCD (proposed add'l codes)	Bicycle Lane	Dist. Planning	N, L, C	M O	0.001 mile		Aerial images
251 Intersection	BEGSECNM	Begin Roadway Section MP Description	Dist. Planning	L, S, C	M	0.001 mile		Aerial images
	ENDSECNM	End Roadway Section MP Description	Dist. Planning	L, S, C	M	0.001 mile		Aerial images
	SUNTRTRH (proposed)	SUN Trail Trailhead	Dist. Planning	L, C	O			
258 Structures	BRIDGENO	Bridge Number	Dist. Planning	L, M	O			
	BRIDGEVA (proposed)	SUN Trail Bridge Emergency Vehicle Access	Dist. Planning	N, L	M	0.001 mile Min. height 1 inch Min. width 0.5 feet Bridge load rating information provided by Design Office	X	Aerial images
	FACCROSS	Facility Crossed	Dist. Planning	L	M	0.001 mile		Aerial images
	UNDPASNO	Underpass Number	Dist. Planning	L	O			
320 Mile Marker Signs	MILEDECL (proposed)	Mile Marker Decal	Dist. Planning	N, L	M O	0.001 mile (recommended)		Aerial images
Office of Maintenance								
256 Turnouts	TRNOTPNP	Paved Turnouts Without Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		Aerial images
	TRNOTPPI	Paved Turnouts With Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		Aerial images
	TRNOTUNP	Unpaved Turnouts Without Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		Aerial images

Table A-3, continued

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
	TRNOTUPI	Unpaved Turnouts With Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		Aerial images
	SUNTRACP (proposed)	SUN Trail Access Point (Off-System)	Dist. Maintenance	L, C	M O	0.001 mile (recommended)		Aerial images
	SUNTREVA (proposed)	SUN Trail Emergency Vehicle Access	Dist. Maintenance	N, L	M	0.001 mile (recommended) Min. height 1 inch Min. width 0.5 feet	X	Aerial images
Systems Implementation								
801 Trails	SUNTRTYP	SUN Trails Type	Systems Implementation, Dist. Planning	N, L				
	SUNTRDAT (proposed)	SUN Trails Date	Dist. Planning	N, L				
	SUNTRCOR	SUN Trails Corridor Name	Systems Implementation	N, L				
	SNTRBGPT (proposed)	SUN Trail Beginning Milepoint	Dist. Planning	N, L	M	0.001 mile (recommended)		Aerial images
	SNTRENPT (proposed)	SUN Trail End Milepoint	Dist. Planning	N, L	M	0.001 mile (recommended)		Aerial images
	SUNTRLOC (proposed)	SUN Trail Local Name	Dist. Planning, Trail Coordinator	L	O			
	STROVRLP (proposed)	SUN Trail Overlap	Systems Implementation	L				
	BEGTRMPT (proposed)	Begin SUN Trail Overlap Milepoint	Systems Implementation	L	M	0.001 mile (recommended)		Aerial images
	ENDTRMPT (proposed)	End SUN Trail Overlap Milepoint	Systems Implementation	L	M	0.001 mile (recommended)		Aerial images
	NEWTRDAT (proposed)	New SUN Trail Realignment Date	Dist. Planning	N, L				

Table A-3, continued

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
	NSUNTRID (proposed)	Section/Subsection of New SUN Trail Realignment	Dist. Planning	N, L				
	NSTRBGPT (proposed)	New SUN Trail Realignment Beginning Milepoint	Dist. Planning	N, L	M	0.001 mile (recommended)		Aerial images
	NSTRENPT (proposed)	New SUN Trail Realignment End Miloepoint	Dist. Planning	N, L	M	0.001 mile (recommended)		Aerial images
	SUNTROWN (proposed)	SUN Trail Land Ownership	Systems Implementation, Dist. Planning	N, L				

Table A-4: Matrix of Recommended SUN Trail Data for Maintenance Characteristics

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
Transportation Data & Analytics								
230 Surface Description	PAVECOND	Pavement Condition	Dist. Maintenance or Dist. Planning	M	M O	0.001 mile		
	SURFNUM	Pavement Surface Type	Dist. Maintenance or Dist. Planning	M	M O	0.001 mile		
251 Intersection	SUNTRGAT (proposed)	SUN Trail Intersection Access Control	Dist. Planning or Dist. Maintenance	S, M	O			
258 Structures	BOXCULNO	Box Culvert Number	Dist. Planning	M	O			
	BRIDGENO	Bridge Number	Dist. Planning	L, M	O			
Traffic Engineering and Operations								
Office of Maintenance								
137 Maintenance Area Boundary	CCNUMBER	Cost Center Number	Dist. Maintenance	N, M	M	0.001 mile		
217 Sidewalks	SIDEWALK		Dist. Maintenance	M	M	0.001 mile		Aerial images
		Sidewalk Width	Dist. Maintenance	M	M	1 foot		
230 Surface Description	PAVECOND	Pavement Condition	Dist. Maintenance or Dist. Planning	M	M O	0.001 mile		
	SURFNUM	Pavement Surface Type	Dist. Maintenance or Dist. Planning	M	M O	0.001 mile		
241 Crossdrains	BOXCULHT	Box Culvert Height	Dist. Maintenance	M	M	1 foot	X	Mobile terrestrial LiDAR
	BOXCULLT	Box Culvert Width	Dist. Maintenance	M	M	1 foot		
	BXCULGTH	Box Culvert Length	Dist. Maintenance	M	M	2 feet		Mobile terrestrial LiDAR
	NOBXCULV	Number of Box Culverts	Dist. Maintenance	M	O			
	CRSDRLGH	Length of Crossdrain Pipes	Dist. Maintenance	M	M	2 feet		
	NOCRDRAN	Number of Crossdrain Pipes	Dist. Maintenance	M	O			

Table A-4, continued

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
	PIPEDIAM	Pipe Diameter	Dist. Maintenance	M	M	1 inch		
	PIPEHIGH	Non-Circular Pipe Height	Dist. Maintenance	M	M	1 inch	X	
	PIPETYPE	Type of Pipe	Dist. Maintenance	M	O			
	PIPEWIDTH	Non-Circular Pipe Width	Dist. Maintenance	M	M	1 inch		
242 Storm Sewers	MANHOLES	Number of Manholes	Dist. Maintenance	M	O			
	MDITCBAS	Number of Catch Basins	Dist. Maintenance	M	O			
248 Outfall Ditches	ODITHAND	Outfall Ditch by Hand Length	Dist. Maintenance	M	M	1 foot		
	ODITHAUL	Outfall Ditch by Hauled Length	Dist. Maintenance	M	M	1 foot		
	ODITPIPE	Outfall Ditch by Length Piped	Dist. Maintenance	M	M	1 foot		
	ODITSPR	Outfall Ditch Spread Length	Dist. Maintenance	M	M	1 foot		
256 Turnouts	TRNOTPNP	Paved Turnouts Without Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		Aerial images
	TRNOTPPI	Paved Turnouts With Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		Aerial images
	TRNOTUNP	Unpaved Turnouts Without Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		Aerial images
	TRNOTUPI	Unpaved Turnouts With Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		Aerial images
	WDTRNPNP	Average Width Turnout, Paved, No Pipe	Dist. Maintenance	M	M	1 foot		
	WDTRNPPI	Average Width Turnout, Paved With Pipe	Dist. Maintenance	M	M	1 foot		

Table A-4, continued

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
	WDTRNUNP	Average Width Turnout, Unpaved, No Pipe	Dist. Maintenance	M	M	1 foot		
	WDTRNUPI	Average Width Turnout, Unpaved, With Pipe	Dist. Maintenance	M	M	1 foot		
	SUNTRACP (proposed)	SUN Trail Access Point (Off-System)	Dist. Maintenance	L, C, M	M O	0.001 mile (recommended)		
	SUNTRACC (proposed)	SUN Trail ADA Access at Turnout	Dist. Maintenance	ADA, M	M O	0.001 mile (recommended)		
	SUNTRGTE (proposed)	SUN Trail Access Control	Dist. Maintenance	M	O			
	SUNTREVA (proposed)	SUN Trail Emergency Vehicle Access	Dist. Maintenance	N, L, M	M	0.001 mile (recommended) Min. height 1 inch Min. width 0.5 feet		
271 Guardrail	SPCGRAIL	Miscellaneous Guardrail Length	Dist. Maintenance	S, M	M	0.001 mile		
272 Fencing	OTHERFCS	Number of Other Types of Fences	Dist. Maintenance	S, M	M O	0.001 mile		
275 Miscellaneous Concrete Structures	RETWALL	Retaining Wall Length	Dist. Maintenance	M	M	1 foot within each 1 mi. increment		
	SLOPEPAV	Slope Paving Area Concrete	Dist. Maintenance	M	M	1 sq. yard within each one mi. increment		
411 Roadside Mowing	SMMACMOW	Small Machine Mowing Area	Dist. Maintenance	M	M	0.01 acre		
421 Roadside Ditch Cleaning	RDCANALS	Number of Roadside Canals	Dist. Maintenance	M	M O	0.001 mile		

Table A-4, continued

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
	RDITEXCA	Number of Roadside Ditches (Excavator)	Dist. Maintenance	M	M O	0.001 mile		
443 Delineators	BRDELIN	Number of Bridge End Delineators	Dist. Maintenance	S, M	O			
	DELINEAT	Number of Guide Posts/Hazard Marker Delineators	Dist. Maintenance	S, M	O			
451 Striping	SNGLLINE	Number of Stripes—Single White or Yellow	Dist. Maintenance	S, M	M O	0.001 mile		Aerial images
452 Symbols & Messages	PNTLETTR	Number of Letters	Dist. Maintenance	S, M	O			
	RADIUSMK	Radius Marking Area	Dist. Maintenance	S, M	O			
454 Stop Bars	STOPBR12 (proposed add'l code)	Number of 12 Foot Stop Bars	Dist. Maintenance	S, M	O			
480 Highway Signs	GRPSTL30	Number of Ground Sign Posts Less than 30 Square Feet	Dist. Maintenance	S, M	O			
	PANLLT30	Ground Panels Less Than 30 Square Feet	Dist. Maintenance	S, M	O			
Systems Implementation								
801 Trails	SUNTRMOA (proposed)	SUN Trail Local Entity Responsible for Maintenance	Systems Implementation/Dist. Planning/Dist. Maintenance	N, M				
	SUNTRFIN (proposed)	SUN Trail Final As-Built Construction Plans	Dist. Maintenance	M				

Table A-4, continued

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
	SUNTRPER (proposed)	SUN Trail Permits	Dist. Maintenance	M				

Table A-5: Matrix of Recommended SUN Trail Data for Measuring Utilization

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	FHWA TMAS Nonmotorized Count Station Description Record Field
Transportation Data & Analytics							
326 Traffic Monitoring Sites	NMSTATLR (proposed)	Nonmotorized Station/Location Record Identifier ('L')	NMTMP in Central Office or District	N, U			1
326 Traffic Monitoring Sites	NMSTFIPS (proposed)	Nonmotorized State FIPS Code ('12')	NMTMP in Central Office or District	N, U			2
326 Traffic Monitoring Sites	NMCOFIPS (proposed)	Nonmotorized County FIPS Code	NMTMP in Central Office or District	N, U			3
326 Traffic Monitoring Sites	NMSTATID (proposed)	Nonmotorized Station ID Number	Dist. Traffic Data Section, NMTMP	N, S, U			4
326 Traffic Monitoring Sites	NMFUNCLS (proposed)	Nonmotorized (Functional) Classification of Road (expanded)	NMTMP in Central Office or District	N, U			5
326 Traffic Monitoring Sites	NMDIRRTE (proposed)	Nonmotorized Direction of Route	NMTMP in Central Office or District	N, U			6
326 Traffic Monitoring Sites	NMFACTYP (proposed)	Nonmotorized Facility Type	NMTMP in Central Office or District	N, U	O		9
326 Traffic Monitoring Sites	NMINTRST (proposed)	Nonmotorized Intersection	NMTMP in Central Office or District	U	O		10
326 Traffic Monitoring Sites	NMMETHCT (proposed)	Nonmotorized Method of Counting	NMTMP in Central Office or District	N, U	O		12
326 Traffic Monitoring Sites	NMTYPSEN (proposed)	Nonmotorized Type of Sensor	NMTMP in Central Office or District	U	O		13
326 Traffic Monitoring Sites	NMYEREST (proposed)	Nonmotorized Year Station Established	NMTMP in Central Office or District	N, U			22
326 Traffic Monitoring Sites	NMYERDIS (proposed)	Nonmotorized Year Station Discontinued	NMTMP in Central Office or District	U			23
326 Traffic Monitoring Sites	NMNATLHS (proposed)	Nonmotorized National Highway System	NMTMP in Central Office or District	U			24
326 Traffic Monitoring Sites	NMLATITD (proposed)	Nonmotorized Latitude	NMTMP in Central Office or District	N, U	M		25
326 Traffic Monitoring Sites	NMLONGTD (proposed)	Nonmotorized Longitude	NMTMP in Central Office or District	N, U	M		26

Table A-5, continued

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	FHWA TMAS Nonmotorized Count Station Description Record Field
326 Traffic Monitoring Sites	NMPOSTRS (proposed)	Nonmotorized Posted Route Signing	NMTMP in Central Office or District	U	O		27
326 Traffic Monitoring Sites	NMPOSTRN (proposed)	Nonmotorized Posted Signed Route Number	NMTMP in Central Office or District	U	O		28
326 Traffic Monitoring Sites	NMLRSRID (proposed)	Nonmotorized LRS Route ID	NMTMP in Central Office or District	U			29
326 Traffic Monitoring Sites	NMLRSLOC (proposed)	Nonmotorized LRS Location Point	NMTMP in Central Office or District	U	M	0.001 mile	30
326 Traffic Monitoring Sites	NMSTATLC (proposed)	Nonmotorized Station Location	NMTMP in Central Office or District	U	O		31
326 Traffic Monitoring Sites	NMONOTES (proposed)	Nonmotorized Other Notes	NMTMP in Central Office or District	U			32
Traffic Engineering and Operations							
311 Speed Limits	MAXSPEED	Maximum Speed Limit (Posted Speed Limit)	NMTMP in Central Office or District	S, U	M O	0.001 mile	21
Office of Maintenance							
451 Striping	SNGLLINE	Number of Stripes—Single White or Yellow	Dist. Maintenance	S, M, U	M O	0.001 mile	Aerial imagery
Systems Implementation							

Table A-6: Matrix of Recommended SUN Trail Data for Measuring Safety

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
Transportation Data & Analytics								
214 Outside Shoulders	SHLDTYPE	Highway Shoulder Type	Dist. Planning	S	M O	0.001 mile		
	SLDWIDTH	Highway Shoulder Width	Dist. Planning	S	M	0.5 feet		
216 Bike Lanes/Pedestrian Sidewalk	BIKSLTCD	Bicycle Slot	Dist. Planning	S	M	0.001 mile		
	SDWLKBCD	Sidewalk Barrier Code	Dist. Planning	S	O			
	SHARDPTH	Shared Path Width and Separation	Dist. Planning	S	M	0.5 feet		
251 Intersection	BEGSECNM	Begin Roadway Section MP Description	Dist. Planning	L, S, C	M	0.001 mile		
	ENDSECNM	End Roadway Section MP Description	Dist. Planning	L, S, C	M	0.001 mile		
	INTSDIRx	Intersection Direction	Dist. Planning	S	O			
	SUNTRGAT (proposed	SUN Trail Intersection Access Control	Dist. Planning or Dist. Maintenance	S, M	O			
253 Railroads	CHKDIGIT	Check Digit	Dist. Planning	S	O			
	RRCROSNO	National Railroad Grade Crossing Number	Dist. Planning	S	O			
326 Traffic Monitoring Sites	NMSTATID	Nonmotorized Station ID Number	District Traffic Data Section, NMTMP	N, S, U				
Traffic Engineering and Operations								
311 Speed Limits	MAXSPEED	Maximum Speed Limit (Posted Speed Limit)	NMTMP in Central Office or the District	S, U	M O	0.001 mile		
322 Signals	SIGNALTY (proposed add'l codes)	Type of Traffic Signal	Dist. Traffic Ops.	S	O			

Table A-6, continued

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
256 Turnouts	TRNOTPNP	Paved Turnouts Without Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		Aerial images
	TRNOTPPI	Paved Turnouts With Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		Aerial images
	TRNOTUNP	Unpaved Turnouts Without Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		Aerial images
	TRNOTUPI	Unpaved Turnouts With Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		Aerial images
271 Guardrail	SPCGRAIL	Miscellaneous Guardrail Length	Dist. Maintenance	S, M	M	0.001 mile		
272 Fencing	OTHERFCS	Number of Other Types of Fences	Dist. Maintenance	S, M	M O	0.001 mile		
443 Delineators	BRDELIN	Number of Bridge end Delineators	Dist. Maintenance	S, M	O			
	DELINEAT	Number of Guide Posts/Hazard Marker Delineators	Dist. Maintenance	S, M	O			
451 Striping	SNGLLINE	Number of Stripes—Single White or Yellow	Dist. Maintenance	S, M	M O	0.001 mile		Aerial images
452 Symbols & Messages	PNTLETTR	Number of Letters	Dist. Maintenance	S, M	O			
	RADIUSMK	Radius Marking Area	Dist. Maintenance	S, M	O			
454 Stop Bars	STOPBR12 (proposed add'l code)	Number of 12 Foot Stop Bars	Dist. Maintenance	S, M	O			
480 Highway Signs	GRPSTL30	Number of Ground Sign Posts Less than 30 Square Feet	Dist. Maintenance	S, M	O			
	PANLLT30	Ground Panels Less Than 30 Square Feet	Dist. Maintenance	S, M	O			
Systems Implementation								

Table A-7: Matrix of Recommended SUN Trail Data for Measuring Connectivity

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
Transportation Data & Analytics								
124 Urban Classification	PLACECD	Census Place (City) Code	Dist. Planning	L, C				
126 Context Classification			Dist. Planning	C				
141 Stationing Exceptions	BEGSCPT	Begin Section MP of Exception Field	Dist. Planning	N, L, C	M	0.001 mile		
	ENDSECPT	End Section MP of Exception Field	Dist. Planning	N, L, C	M	0.001 mile		
	RDWYID	County, Section, Sub-section	Dist. Planning	N, L, C				
216 Bike Lanes/Pedestrian Sidewalk	BIKELNCD (proposed add'l codes)	Bicycle Lane	Dist. Planning	N, L, C	M O	0.001 mile		
251 Intersection	BEGSECNM	Begin Roadway Section MP Description	Dist. Planning	L, S, C	M	0.001 mile		
	ENDSECNM	End Roadway Section MP Description	Dist. Planning	L, S, C	M	0.001 mile		
	SUNTRTRH (proposed)	SUN Trail Trailhead	Dist. Planning	L, C	O			
Traffic Engineering and Operations								
Office of Maintenance								
256 Turnouts	TRNOTPNP	Paved Turnouts Without Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		
	TRNOTPPI	Paved Turnouts With Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		

Table A-7, continued

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
	TRNOTUNP	Unpaved Turnouts Without Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		
	TRNOTUPI	Unpaved Turnouts With Pipe (On-System)	Dist. Maintenance	L, C, S, M	M O	0.001 mile		
	SUNTRACP (proposed)	SUN Trail Access Point (Off-System)	Dist. Maintenance	L, C, M	M O	0.001 mile (recommended)		
Non-Motorized Way Features								
801 Trails	STRIVRLP (proposed)	SUN Trail Overlap	Systems Implementation	L, C				
	BEGTRMPT (proposed)	Begin SUN Trail Overlap Milepoint	Systems Implementation	L, C	M	0.001 mile (recommended)		
	ENDTRMPT (proposed)	End SUN Trail Overlap Milepoint	Systems Implementation	L, C	M	0.001 mile (recommended)		

Table A-8: Matrix of Recommended SUN Trail Data for ADA Characteristics

FDOT RCI Features by Owning Office	Characteristic	Description	Data collector	Recommended priority**	Requires measurement (M) and/or observation (O)	Measurement accuracy requirement*	Height measurement	Line of sight issue
Transportation Data & Analytics								
251 Intersection	SUNTRADA (proposed)	SUN Trail ADA Access	Dist. Planning	ADA	O			
Traffic Engineering and Operations								
Office of Maintenance								
256 Turnouts	SUNTRACC (proposed)	SUN Trail ADA Access at Turnout	Dist. Maintenance	ADA, M	M O	0.001 mile (recommended)		
Systems Implementation								

Appendix B: Descriptions of SUN Trail Proposed RCI Features and Characteristics

Presented below are features and characteristics proposed for use in the inventory of the SUN Trail network, listed according to the owning offices of Transportation Data and Analytics, Traffic Engineering and Operations, Maintenance, and Systems Implementation. Where it makes sense to do so, existing RCI Features and Characteristics already established for roadways are recommended to also be used for the SUN Trail network. In some cases, additional codes are proposed to be established within an existing characteristic, to contain data unique to the SUN Trail. In other cases, new characteristics specific to the SUN Trail network are proposed and described below, by party responsible for data collection, by method to measure or collect the data, and the values for the data to be coded into the RCI.

Owning Office: Transportation Data and Analytics

|| AASHTO - Feature 113 ||

Length feature.

PROPOSED CHARACTERISTIC, USBRNMBR, U.S. Bicycle Route Number. The Department has a policy on designated U.S. Bicycle Routes in Florida, Topic 000-525-060a, with guidance and criteria for specifying a U.S. Bicycle Route contained in FDM 223.6.1 U.S. Bicycle Route System. The policy provides that FDOT will establish such routes in the state, to connect to those in Alabama and Georgia.

FDOT will comply with the American Association of State Highway and Transportation Officials (AASHTO) "Purpose and Policy U.S. Numbered Bicycle Routes." There have been four initially identified corridors, considered for designation as a U.S. Bicycle Route, including Alternate U.S. BR CFG (Cross Florida Greenway) that follows the route of the Marjorie Harris Carr Cross Florida Greenway from Daytona Beach to Tampa Bay. Presently, U.S. BR 1 follows the east coast of Florida, from the Georgia border to Key West, following much of the East Coast Greenway. In the future, there may be other designated U.S. Bicycle Routes along the SUN Trail network. Identifying SUN Trail segments that also have a U.S. Bicycle Route designation may present coordination opportunities for public education and information. The nonprofit organization, Adventure Cycling Association, is the lead organization in a partnership of transportation agencies and bicycle organizations, creating an official U. S. cycling route network, the U. S. Bicycle Route System. Routes are nominated by state departments of transportation and approved by AASHTO.

Responsible Party for Data Collection: District Planning. The District Statistics Administrator or District RCI Coordinator would code or enter the data into the RCI. The District Trail Coordinator or District Bicycle and Pedestrian Coordinator would assist in gathering the information.

Figure B- 1. U. S. Bicycle Routes, including USBR 1 FL shown in red, USBR 90 FL shown in blue, and USBR 15 GA shown in purple.

Source: Maps © Thunderforest, Data © OpenStreetMap contributors Adventure Cycling Association.
https://www.adventurecycling.org/routes-and-maps/us-bicycle-route-system/maps-and-route-resources/

How to Gather this Data: In office. The Multimodal Data System Coordinator in TDA would add all U.S. Bicycle Routes to the Master Listing, if not already included. The U.S. Bicycle Route value would be selected from a drop down menu. Where there is overlap with a U.S. Bicycle Route, this feature is assigned to the section lengths of roadways and is estimated through the LRS and current roadway locations.

Where a designated SUN Trail segment also overlaps the same highway segment, the SUN Trail segment will be coded for Feature 141. The Adventure Cycling Association has downloadable GPS data for all U.S. Bicycle Routes. Accessed at https://www.adventurecycling.org/routes-and-maps/us-bicycle-route-system/maps-and-route-resources/

|| Urban Classification – Feature 124 ||

Length feature. Urban classification contains characteristics that indicate whether a highway segment is within urban limits. This is characteristic HWYLOCAL, Highway Location Code. A SUN Trail segment that is a bike lane or an On-System shared use path will be coded as a Stationing Exception -- Feature 141, and will be associated by its reference to the Roadway ID for the roadway with which it is parallel. The characteristic, PLACECD, documents a roadway or SUN Trail segment within an incorporated city. The characteristics URBAREA, Urban Area Number, and URBSIZE, Urban Size, document the urban size by population. Designated SUN Trail segments that are either a bike lane or a shared use path on a functionally classified roadway On- or Off-System, also will be associated with these characteristics.

Urban Classification – Features 124, PLACECD, Census Place (City) Code. SUN Trail segments that follow an independent alignment Off-System will not be associated with these characteristics by reference. It would be advantageous to create such a link in the RCI. For example, considering PLACECD, Census Place (City) Code, while this characteristic currently exists for all functionally classified roadways inside incorporated cities, establishing the mile points for Off-System SUN Trail segments within city limits can be useful, in conjunction with American Community Survey data for analysis in ArcGIS, to identify those trail segments for calculating a League of American Bicyclists Bicycle Equity Index. This is the extent to which the community is located within some defined buffer or distance from a trail access point. This could be useful for the Equity criterion for federal STP Set-Aside funds and for measuring connectivity.

Responsible Party for Data Collection: District Planning.

How to Gather this Data: In the Office. This characteristic would be assigned to trail segments as estimated through the SUN Trail LRS. Where the SUN Trail crosses over roadways, mile points may be established at intersection locations within the SUN Trail linear referencing system, if the city limits run along roadways. If city boundaries are not associated with roadway alignments, then boundaries may be associated with private property boundaries. Aerial imagery from the Florida County Digital Ortho Imagery Program (FCDOP) is used to map property boundaries for purposes of property tax collection. Official city maps, paired with similarly scaled FDOR aerial imagery also can be used to establish mile points, in the absence of tree canopy.

Value for Census Place (City) Code: Record the 4-digit number. 4 Bytes: XXXX

|| Context Classification – Feature 126 ||

Length feature. A Context Classification code will apply within the BMP and EMP for each segment. Assigning a Context Classification to SUN Trail segments can be used to evaluate the potential of SUN Trail to provide connectivity.

Responsible Party for Data Collection: District Planning.

How to Gather this Data: In the office. For On-System SUN Trail segments that are coded as a Stationing Exception – Feature 141, the context classification for the SUN Trail segment will be associated by its reference to the Roadway ID for the Context Classification of the highway segment of which it is a part or with which it is parallel. The Context Classification for the associated roadway section length is estimated through GIS/LRS and current roadway locations. A Context Classification for an Off-System SUN Trail segment can be determined and assigned in the office by examining the land use element of the local government comprehensive plan, zoning overlays, form-based codes, community redevelopment plans, or permitted development plans.

Value for Context Classification: Record the assigned code. 3 Bytes: XXX

Table B- 1. Context Classifications that Describe Adjacent Land Use

Context Classification		Description of Adjacent Land Use
C1	Natural	Lands preserved in a natural or wilderness condition, including lands unsuitable for settlement due to natural conditions
C2	Rural	Sparsely settled lands; may include agricultural land, grassland, woodland, and wetlands.
C2T	Rural Town	Small concentrations of developed areas immediately surrounded by rural and natural areas; includes many historic towns.
C3R	Suburban Residential	Mostly residential uses within large blocks and a disconnected/sparse roadway network.
C3C	Suburban Commercial	Mostly nonresidential uses with large building footprints and large parking lots. Buildings are within large blocks and a disconnected/sparse roadway network.
C4	Urban General	Mix of uses set within blocks with a well-connected roadway network. May extend long distances. The roadway network usually connects to residential neighborhoods immediately along the corridor or behind the uses fronting the roadway.
C5	Urban Center	Mix of uses set within small blocks with a well-connected roadway network. Typically concentrated around a few blocks and identified as part of a civic or economic center of the community, town, or city.
C6	Urban Core	Areas with the highest densities and with building heights typically greater than four floors within FDOT classified Large Urbanized Areas (population > 1,000,000). Many are regional centers and destinations. Buildings have mixed uses, are built up to the roadway, and are within a well-connected roadway network.

Source: FDOT Design Manual. Topic #625-000-002. (Tallashassee: FDOT, January 2019). Table 200.4.1 Context Classifications.

|| Roadway Realignment – Feature 138 ||

Length feature. Roadway Realignment captures information regarding the date that a roadway realignment has officially opened, the new Roadway ID for the realigned segment, and the BMP and EMP for the realigned segment. This feature also could be applied to On-System SUN Trail segments (bike lane or shared use path) that also are realigned as a result of the realignment of the roadway with which they are associated. The SUN Trail has its own LRS, so a SUN Trail segment representing the new alignment would be assigned a new Roadway (trailway) ID, and coded for Feature 141 with reference to the new realigned Roadway ID with which it is associated.

Roadway Realignment – Feature 138, NALIGNDT, New Alignment Date

Responsible Party for Data Collection: District Planning

How to Gather this Data: Record the date that the new Roadway ID for the realigned SUN Trail segment officially opened.

Value for New Alignment Date: 8 Bytes: MMDDYYYYY – Date realignment officially opened.

Roadway Realignment – Feature 138, NALIGNID, Section/Sub-section of New Alignment. This would contain the new Roadway ID for the realigned segment of the SUN Trail.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Code the 8-Bytes value for the new Roadway ID – County/section/sub-section.

Value for Section/Sub-section of New Alignment: 8 Bytes: XX931XXX

Roadway Realignment – Feature 138, NALNBGPT, New Alignment Begin MP.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Record the beginning mile point for the new alignment of the SUN Trail, using similar procedure as for a new roadway alignment.

Value for New Alignment Begin MP: 6 Bytes: XXX.XXX

Roadway Realignment – Feature 138, NALNENPT, New Alignment End MP.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Record the end mile point for the new alignment of the SUN Trail, using similar procedure as for a new roadway alignment.

Value for New Alignment End MP: 6 Bytes: XXX.XXX

|| Old Alignment – Feature 139 ||

Length feature. The Roadway ID and BMP and EMP of the old SUN Trail alignment would be automatically generated.

|| Section Status Exception – Feature 140 ||

Length feature.

Section Status Exception – Feature 140, OSDATE, On- or Off-System Date. This characteristic gives the date the Roadway ID or segment was taken off or added to the SHS, or the date of the last status change to the Roadway ID or segment to accommodate maintenance, bridge number assignment or other needs that require data to be entered into RCI. This characteristic also would be used for SUN Trail segments, including a bike lane that is a designated SUN Trail, and also a SUN Trail that is a shared use path parallel to and within a road right of way that is either being added or removed from the SHS.

OSDATE would contain the date that the SUN Trail segment was added or removed from the SHS.

Responsible Party for Data Collection: District Planning.

How to Gather this Data: The District Statistics Administrator or District RCI Coordinator would record the date of the status change.

Value for On-/Off-System Date: 8 Bytes: MMDDYYYY

Section Status Exception – Feature 140, STATEXPT, Segment Status, provides status for the Roadway ID or segment that was taken off or added to the SHS. This is required for all roadways. The designated SUN Trail segment Roadway ID, including bike lanes and shared used paths associated with a roadway that is being added or removed from the SHS, would carry the stationing exception under Feature 141, and reference the Roadway ID of the roadway facility with which it is associated. The BMP and EMP data would be associated with the Roadway ID for the roadway facility.

The proposed addition of a code 80 could be defined as Dropped SUN Trail GIS Route (Historical). Also, the proposed addition of a code 86 could be defined as Temporary Trail Closure, for repair, reconstruction, etc.

80 – Dropped SUN Trail GIS Route (Historical) **PROPOSED**
81 – Pending Trails
82 – Active Trails
84 – Inactive Trails
85 – Deleted Trails
86 – Temporary Trail Closure, for repair, reconstruction, etc. **PROPOSED**

A facility with the status of a SUN Trail will be apparent if there also are data in Feature 801 for that Roadway ID uniquely assigned to that SUN Trail segment. In addition, if Roadway ID section 931 is specific only to the SUN Trail and not other shared use paths, then the uniquely assigned Roadway ID will indicate status as a SUN Trail. Segments of SUN Trail that run along an independent alignment would not have coded data in Feature 140 associated with them, because such segments could not be added to or removed from the SHS. Instead, Trails — Feature 801, SUNTRTYP, SUN Trail Type, would contain the status information for trail segments with an independent alignment: pending, active, dropped, or deleted.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Record the status codes within the 80 series, under the Roadway ID for the roadway that the SUN Trail segment is associated with.

|| Stationing Exceptions – Feature 141 ||

Length feature. "A stationing exception (a.k.a. an exception) occurs when two or more active Roadway IDs overlap the same road. To avoid duplication in data, the data is only reported under one Roadway ID." (FDOT 2016b, 49) The Roadway ID with the higher hierarchy will reflect the roadway data. The Roadway ID with the lower hierarchy will have Feature 141 coded referencing the higher hierarchy Roadway ID.

The SUN Trail network has its own linear referencing system and each SUN Trail segment has a unique Roadway ID, including bike lanes and shared use paths within the right of way of a roadway. In these cases, the overlapping SUN Trail segment Roadway IDs would be coded for Feature 141. SUN Trail segments that follow an independent alignment would not be coded for Feature 141.

Stationing Exceptions – Feature 141, BEGSCPT, Begin Section MP of Exception Field. .
Responsible Party for Data Collection: District Planning

How to Gather this Data: Record the beginning lowest mile point for the SUN Trail segment, using the value for the BMP of the Exception.

Value for Begin Section MP of Exception Field: 6 Bytes: XXX.XXX

Stationing Exceptions – Feature 141, ENDSECPT, End Section MP of Exception Field.
Responsible Party for Data Collection: District Planning

How to Gather this Data: Record the ending highest mile point for the SUN Trail segment, using the value for the EMP of the Exception: 6 Bytes: XXX.XXX.

Value for End Section MP of Exception Field: 6 Bytes: XXX.XXX

Stationing Exceptions – Feature 141, RDWYID, County, Section, Sub-section.
Responsible Party for Data Collection: District Planning

How to Gather this Data: For the SUN Trail segment that is the exception, enter the Roadway ID for that segment with the value for the Roadway ID of the exception: 8 Bytes: XXXXXXXX

Value for County, Section, Sub-section: 8 Bytes: XXXXXXXX

|| Outside Shoulders – Feature 214 ||

Length feature.

Outside Shoulders – Feature 214, SHLDTYPE, Outside Shoulder Type. This could represent a portion of designated SUN Trail that is on the road. Code 1 is for Paved (including bike lanes). The RCI instructions provide that for designated bike lanes, also code Feature 216.

Responsible Party for Data Collection: District Planning

How to Gather this Information: Code according to instructions in the *RCI Features & Characteristics Handbook*. The Roadway ID for the roadway associated with the SUN Trail, also would contain the BMP and EMP.

Outside Shoulders – Feature 214, SLDWIDTH, Highway Shoulder Width. Feature 214 collects the width of the shoulder, including the bike lane, to the nearest 0.5 feet.

Responsible Party for Data Collection: District Planning

How to Measure: For paved shoulder, include the width of the designated bike lane in the shoulder width. It is recommended to collect this measurement, using Collector for ArcGIS on a mobile device. Another option is use of a measuring wheel or manual tape measure. Photogrammetry provided by a mobile mapping system also can collect this measurement.

Value for Highway Shoulder Width: 3 Bytes: XX.X – Record number of feet. Enter to nearest 6 inches (0.5 feet).

|| Bike Lanes/Pedestrian Sidewalk – Feature 216 ||

Length feature**.**

<u>Bike Lanes/Pedestrian Sidewalk – Feature 216, BIKELNCD, Bicycle Lane</u>.

Responsible Party for Data Collection: District Planning

How to Measure: The *RCI Features & Characteristics Handbook* provides instructions for measuring the BMP and EMP for the bike lane. For all characteristics under Feature 216, the Roadway ID of the roadway associated with the SUN Trail will contain the data. There is coding for the following:

1 – Designated
2 – Buffered
3 – Colored
4 – Both 2 and 3
5 – Sharrow

The SUN Trail facility that is On-System or Off-System, and on the roadway must be a designated bike lane. It is proposed to add the following codes for SUN Trail.

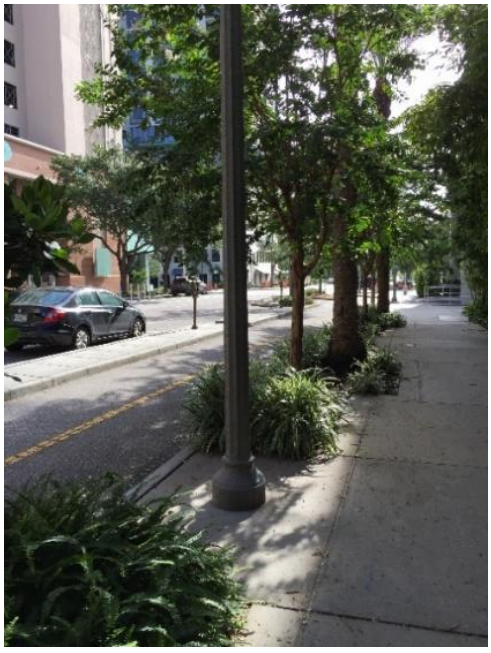
6 – SUN Trail designated
7 – SUN Trail buffered
8 – SUN Trail colored
9 – SUN Trail both 7 and 8

<u>Bike Lanes/Pedestrian Sidewalk – Feature 216, BIKSLTCD, Bicycle Slot</u>. This would describe a facility along a bicycle lane that is a designated SUN Trail.

Responsible Party for Data Collection: District Planning

How to Measure: The beginning milepoint is recorded for a bike slot where the taper for the auxiliary lane begins, and end milepoint is recorded where the lane striping ends.

Bike Lanes/Pedestrian Sidewalk – Feature 216, SDWLKBCD, Sidewalk Barrier Code. This also applies to shared paths that are designated as the SUN Trail.



Responsible Party for Data Collection: District Planning

How to Gather this Information: Record the type of barrier code 0 through 4.

Codes:
0 – No barrier
1 – On-street parking lane (with or without meters)
2 – Trees, planters, utility poles, etc. (less than 60 feet apart)
3 – Both 1 and 2
4 – Guardrail/traffic railing barrier/swale

Bike Lanes/Pedestrian Sidewalk – Feature 216, SHARDPTH, Shared Path Width & Separation.

Responsible Party for Data Collection: District Planning

How to Measure: Code the barrier type and distance of offset to the nearest 0.5 feet, from the outer edge of the roadway pavement to the closest edge of the shared path. Width of the shared path is measured to the nearest foot. It is recommended to collect this measurement, using Esri Collector for ArcGIS on a mobile device. Another option is use of a measuring wheel or manual tape measure. Photogrammetry provided by a mobile mapping system also can collect this measurement.

Value for Offset Distance: XXX.XX Record to the nearest 6 inches (0.5 feet). Record the distance from the outer edge of the pavement (pavement includes curb and gutter, if present) to the closest edge of the shared path.

Value for Shared Path Width: 3 Bytes: XXX – Record actual width of the shared use path to the nearest foot.

|| Surface Description – Feature 230 ||

Length feature.

Surface Description – Feature 230, PAVECOND, Pavement Condition. This feature is the responsibility of District Planning for all paved principal arterial system roadways, NHS routes, all paved HPMS samples, and all SIS related roadways. For characteristics under Feature 230, the Roadway ID of the roadway associated with a designated SUN Trail that is On-System will contain the data. Handbook instructions provide that where different lanes have different pavement condition ratings, then the worst condition is coded. For pavement condition on designated SUN Trail segments that are parallel to Off-System roadways as well as for SUN Trail segments that follow an independent alignment, the coding for these could be associated with the Roadway ID for the SUN Trail.

Responsible Party for Data Collection: District Planning

How to Gather this Information: Conduct a field inspection of the pavement condition and select, from the *RCI Features & Characteristics Handbook*, the code value to the nearest tenth within the applicable range, which matches pavement condition.

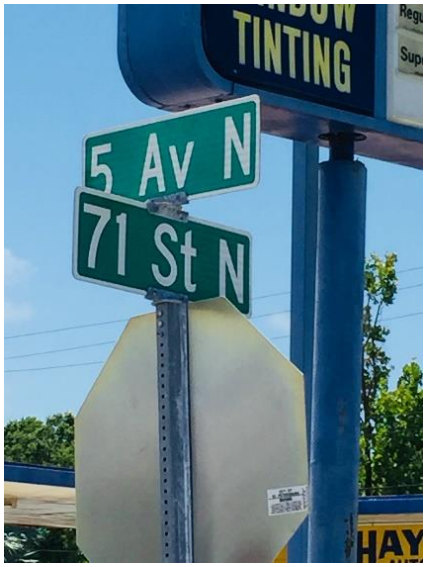
Surface Description – Feature 230, SURFNUM, Pavement Surface Type, while the FDOT Design Manual Chapter 224 calls for Standard Shoulder Pavement for the SUN Trail, pavement type might vary if it is an older SUN Trail segment built before the program began.

Responsible Party for Data Collection: District Planning

How to Gather this Information: Record surface type, using codes from the *RCI Features & Characteristics Handbook*, based on field visual inspection.

|| Intersection – Feature 251 ||

Point feature.



Intersection – Feature 251, BEGSECNM, Begin Roadway Section MP Description. This Intersection feature also could be used for the SUN Trail and may define a trailhead. This contains the name of the intersecting roadway or a description of the physical location. This also could be an intersection of the SUN Trail with another trail.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Record the name of the intersecting roadway or trail or boundary at the beginning milepoint of the SUN Trail being inventoried. Refer to Feature 114 for standard naming convention guidelines.

Value for BMP Description: 20 Bytes: XXXXXXXXXXXXXXXXXXXX

Intersection – Feature 251, ENDSECNM, End Roadway Section MP Description. This intersection feature also could be used for SUN Trail and may define a trailhead. This contains the name of the intersecting roadway or a description of the physical location. This also could be an intersection of the SUN Trail with another trail.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Record the name of the intersecting roadway or trail or boundary at the end of the section. Refer to Feature 114 for standard naming convention guidelines.

Value for EMP Description: 20 Bytes: XXXXXXXXXXXXXXXXXXXX

Intersection – Feature 251, INTSDIRx, Intersection Direction (x=1-9).
If the beginning SUN Trail section milepoint name occurs at an intersection, and/or if the ending SUN Trail section milepoint name occurs at an intersection, then INTSDIRx Intersection Direction also could be coded. This characteristic also may be important for safety analysis, including at intersections with the SUN Trail.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Determine the angle of intersection, choose the appropriate characteristics name, as provided in the *RCI Features & Characteristics Handbook*, then code the intersecting road name.

Value for the Intersection Roadway Name: 20 Bytes: XXXXXXXXXXXXXXXXXXXX

<u>Intersection – Feature 251, PROPOSED CHARACTERISTIC, SUNTRTRH, SUN Trail Trailhead</u>.

This new characteristic could be added to contain the name of the SUN Trail trailhead. It also could contain a code identifying the rail or bus stop number assigned by the transit agency, if a transit stop exists near this intersection. Knowing the trailhead name enables identifying the trailhead by name on mapping products. Transit agencies now have apps for automatic vehicle location in which customers specify the ID number of the transit stop. This characteristic is important for evaluating connectivity.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Code the name of the SUN Trail Trailhead. The District Trail Coordinator and/or the local entity responsible for maintenance would be sources of information.

Value for the Name of the SUN Trail Trailhead: 20 Bytes: XXXXXXXXXXXXXXXXXXXX

Code the nearest bus stop or rail station, if there is one within one quarter mile from the SUN Trail Trailhead. This would include the abbreviated name for the transit agency, and the number. Bus stop numbers are found on bus stop signs. Example under Code 01: LYNX1234

Code 01: Bus Stop Number
Code 02: Rail Station Number
Code 03: No transit stop

Value for the bus stop or rail station number: 20 Bytes: XXXXXXXXXXXXXXXXXXXX

Intersection – Feature 251, PROPOSED CHARACTERISTIC, SUNTRADA, SUN Trail ADA Access.

This new characteristic could be added to indicate the number of curb ramps and the number of locations with tactile surfaces connecting the SUN Trail to the roadway. Totals of such characteristics would be helpful for budgeting retrofitting and maintenance. This characteristic does not replace a detailed inventory of Americans with Disabilities Act (ADA) accessibility compliance per the 2010 ADA Standards for Accessible Design and the Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG).

Responsible Party for Data Collection: District Planning

How to Gather this Data: Count the number of curb ramps and the number of locations with tactile surfaces connecting the SUN Trail to the intersecting roadway or trail.

Value for Number of Curb Ramps: 2 Bytes: XX

Value for Number of Tactile Surfaces: 2 Bytes: XX

Intersection – Feature 251, PROPOSED CHARACTERISTIC, SUNTRGAT, SUN Trail Access Control. This new characteristic could be added to indicate the type of access control that is located at the intersection with the SUN Trail.

Responsible Party for Data Collection: District Planning
How to Gather this Data: Observe the SUN Trail access control at the intersection. Code for both sides of the intersection. The access control may differ on both sides of the intersection. Identify the milepoint of the location of the access control.

Code 01: Gate
Code 02: Bollards
Code 03: Split path
Code 04: Other
Code 05: None

|| Railroads – Feature 253 ||

Point feature.

Railroads – Feature 253, CHKDIGIT, Check Digit. This is a visual inspection of a railroad crossing identification number on a sign. It is recommended that this information also is useful for safety purposes for the SUN Trail where a railroad crosses the SUN Trail at-grade.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Record the alpha character at the end of the crossing number.

Value for Check Digit: 1 Byte: X

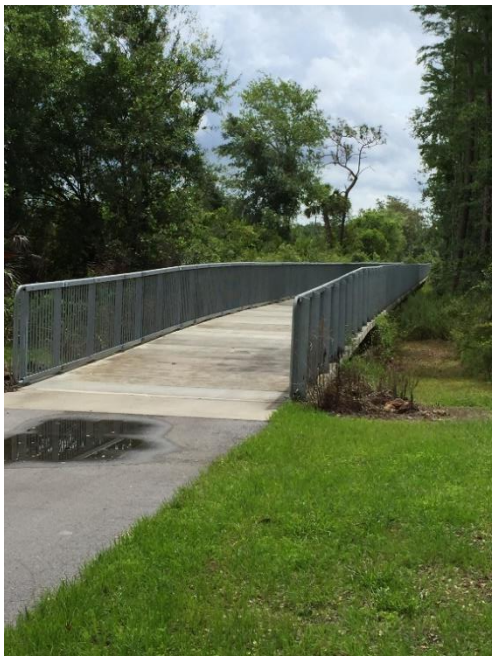
Railroads – Feature 253, RRCROSNO, National Railroad Grade Crossing Number. This is a visual inspection of a railroad crossing identification number on a sign. It is recommended that this information also is useful for safety purposes for the SUN Trail where a railroad crosses the SUN Trail at-grade.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Record the 6-digit ID number generally found on a power box or crossing pole adjacent to the at-grade railroad crossing, do not use the alpha character.

Value for Crossing Number: 6 Bytes: XXXXXX

|| Structures – Feature 258 ||



Length feature. Structures contains characteristics for the structure number, BMP and EMP for box culverts; the number, BMP and EMP for bridges; the name for the roadway, railroad, body of water that crosses under or over a structure; and underpass number. These characteristics all potentially apply to SUN Trail segments that follow an independent alignment.

Structures – Feature 258, BOXCULNO, Box Culvert Number.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Record the box culvert number, generally found on the right end of the wall.

Value for Box Culvert Number: 6 Bytes: XXXXXX – Record structure number.

Structures – Feature 258, BRIDGENO, Bridge Number.

Responsible Party for Data Collection: District Planning

How to Gather this Data: This is a bridge if there are multiple boxes spanning 20 feet or more along the direction of travel, code the bridge number shown on the structure.

Value for Bridge Number: 6 Bytes: XXXXXX0

Structures – Feature 258, FACCROSS, Facility Crossed.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Code the name of the facility, such as roadway, railroad, body of water, etc. which cross under or over the structure.

How to Measure: This is a length feature. Collect the approximate BMP and the EMP where the crossed facility begins and ends (not the BMP and EMP of the structure).

Value for the Name of Facility Crossed: 20 Bytes: XXXXXXXXXXXXXXXXXXXX

Structures – Feature 258, UNDPASNO, Underpass Number.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Record the underpass number of the overhead structure.

Value for Underpass Number: 6 Bytes: XXXXXX

Structures – Feature 258, PROPOSED CHARACTERISTIC, BRIDGEVA, SUN Trail Bridge Emergency Vehicle Access, would signify whether the bridge has the vertical clearance, width, and sufficient vehicular load rating to accommodate emergency vehicle access. FDM 266.2 Design Criteria provides that a minimum clear width for a shared use path structure is 12 feet, or match the bridge approach width if the approach sidewalk or path is wider. The desirable clear width should include an additional 2-foot wide clear area on each side. Minimum height is eight feet. Figure B-2 illustrates the measurement of the clear width.

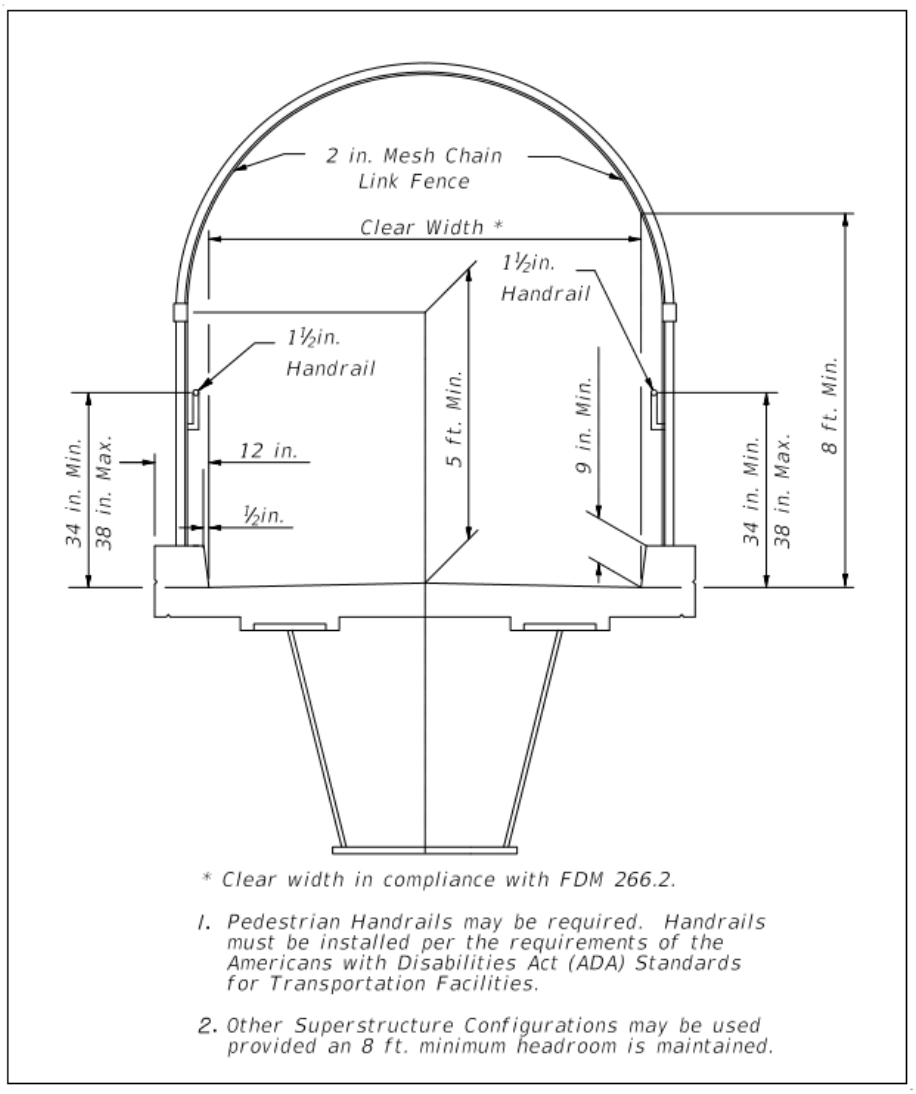


Figure B- 2. Illustration of the Measurement of the Clear Width.

Source: FDOT Design Manual, Topic #625-000-002, Figure 266.2.1 Pedestrian or Shared Use Path Bridge Typical Section, 266—Bicycle and Pedestrian Bridges. January 1, 2019. p. 3.

Responsible Party for Data Collection: District Planning

How to Gather this Data: Bridge load rating information provided by the District Design Office. For measuring bridge height, required accuracy for vertical clearance is one inch. There are three options for measuring height accurately. These include a mobile laser scanner, such as the Leica Pegasus; a mobile mapping system that includes LiDAR and photogrammetry; and a manual tape measure.

Code 01: Emergency vehicle access
Code 02: No access

|| Mile Marker Signs – Feature 320 ||

Point feature.

Mile Marker Signs – Feature 320, PROPOSED CHARACTERISTIC, MILEDECL, Mile Marker Decal.

It is recommended that a permanent marker, such as a SUN Trail logo decal, be permanently affixed to the pavement surface of SUN Trail segments that are Off-System and that follow an independent alignment, which may serve as the BMP for the SUN Trail. These decals should be located at the beginning of each MAPID corridor as well as at the BMP for other locations where it makes most sense to establish BMP 0.000. This also could be at the boundary along the SUN Trail where the maintenance responsibility of one local entity ends and another begins, or it could be established where the SUN Trail local name changes. The decal also could contain other information, such as a contact phone number for Maintenance.

Responsible Party for Data Collection: District Planning

How to Measure: Record the GPS coordinates where the milepoint for each SUN Trail segment equals 0.000.

|| Traffic Monitoring Sites – Feature 326 ||

Point feature. Traffic monitoring sites could be used to include information for permanent bicycle/pedestrian traffic monitoring stations along the SUN Trail system. For motor vehicle traffic monitoring sites, TDA's Traffic Data Section collects these data. Traffic station numbers are assigned in the Traffic Characteristics Inventory database, and a link is established between TCI and RCI to automatically update this characteristic, TRFSTANO, Traffic Station Number. Likewise, a link is established between the TCI and the RCI to automatically update the characteristic, TRSTATYP, Traffic Station Type.

A similar procedure could be applied for bicycle/pedestrian traffic monitoring stations, in support of the FDOT Non-Motorized Traffic Monitoring Program that is being included in the FDOT *Traffic Monitoring Handbook* (FDOT 2018c, 58-68). The FHWA Traffic Monitoring Analysis System accepts counts for nonmotorized travel. FHWA requires data relating to both the counts and for the Nonmotorized Count Station Description Records. For ease of reporting, it is recommended that FDOT replicate the FHWA Count Station Description codes within the RCI to the maximum extent practical. Each proposed characteristic below also provides the number of bytes for data coding, to replicate the data coding format.

It is recommended that the RCI contain 21 of 32 fields specified in the FHWA Traffic Monitoring Guide for the Nonmotorized Count Station Description Records. The other nine of 32 fields contain data that describes the counts and so this data would be more appropriate for the TCI or the FDOT Nonmotorized Statewide Data Repository (NMSDR). These 21 proposed new fields for the RCI are listed under the owning office, Transportation Data & Analytics in Appendix Table A-1, Master Matrix of Recommended SUN Trail Features and Characteristics, and in Appendix Table A-5, Matrix of Recommended SUN Trail Data for Measuring Utilization. These fields are explained in detail in the section on Recommended SUN Trail Utilization Characteristics. Data collection for characteristics for the nonmotorized traffic count stations will be conducted or overseen by Transportation Data & Analytics.

The explanatory information for the characteristics below is summarized from the descriptions for the data fields of Nonmotorized Count Station Description Records, as provided in two FHWA documents. These are Chapter 7 of the *Traffic Monitoring Guide*, updated October, 2016, and from Chapter 5 of *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format*, FHWA-HEP-17-011, November, 2016. To enable the reader to match each proposed RCI characteristic below, with the corresponding Nonmotorized Count Station Description Record field, the record field number is provided in the descriptions below, in parentheses.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMSTATLR, Nonmotorized Station/Location Record Identifier ('L'). (Field 1) This is an FHWA critical characteristic that can be collected in the office. The letter 'L' is always coded to indicate that this is a count station description/location record.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: One byte. Code the value: 'L'.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMSTFIPS, Nonmotorized State FIPS Code ('12'). (Field 2) This is an FHWA critical characteristic that can be collected in the office.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: Two bytes. Code the two-digit FIPS (Federal Information Processing Standards) state code. The Florida FIPS code is '12'.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMCOFIPS, Nonmotorized County FIPS Code. (Field 3) This is an FHWA critical characteristic that can be collected in the office.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: Three bytes. Code the three-digit FIPS county code. Current codes for U.S. counties are based on the original FIPS Publication 6. These are maintained by the U.S. Bureau of Census. FIPS county codes can be found at https://www.census.gov/geographies/reference-files/2018/demo/popest/2018-fips.html

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMSTATID, Nonmotorized Station ID Number. (Field 4) This is an FHWA critical characteristic that can be collected in the office. It is recommended to assign a unique Nonmotorized Station ID Number to each permanent sensor at the same location. This corresponds to the characteristic, Traffic Monitoring Sites – Feature 326, NMTYPSEN, Nonmotorized Type of Sensor, PROPOSED, which is discussed further below.

Responsible Party for this Information: Traffic Data Section, Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: The format for the non-Motorized traffic station ID numbers is under development by the FDOT Nonmotorized Traffic Monitoring Program. For motorized traffic, the RCI Traffic Monitoring Sites – Feature 326, Traffic Station Number, includes the 2-digit county code plus a 4-digit site number. The FHWA *Traffic Monitoring Guide* instructions require only that the nonmotorized Traffic Station Number be six digits and alphanumeric. The Department has tentatively agreed on a Traffic Station Number for the SUN Trail, containing the 2-digit county and 4-digit site number (beginning with N for Nonmotorized), unique for each county, as provided for RCI Feature 326 Traffic Monitoring Site.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMFUNCLS, Nonmotorized (Functional) Classification of Road (expanded). (Field 5) This is an FHWA critical characteristic that can be collected in the office.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: Enter the classification code according to the U.S. DOT functional classification system, shown in Table B-2 below. Table B-2 includes a Code 8 for Trail or Shared Use Path and a Code 9 for General Activity Counts for areas such as pedestrian malls. For an Off-System roadway, the functional classification can be obtained from the local agency. If the nonmotorized traffic count location is for a designated SUN Trail that is a bike lane or a shared use path within the road right of way, then the coding reflects the associated roadway. A second digit is either a 'U' for Urban or an 'R' for Rural.

Table B- 2. FHWA Functional Classification Codes for the Roadway Location of a Nonmotorized Traffic Count

Code	Classification
1	Interstate
2	Principal Arterial – Other Freeways and Expressways
3	Principal Arterial -- Other
4	Minor Arterial
5	Major Collector
6	Minor Collector
7	Local
8	Trail or Shared Use Path
9	General Activity Count

Source: U.S.DOT. *Traffic Monitoring Guide*. (Washington, D.C.: FHWA, updated October 2016), 7-73, Table 7-33 Classification Codes.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMDIRRTE, Nonmotorized Direction of Route. (Field 6) This is an FHWA critical characteristic that can be collected in the office. This is the geographic orientation of the main roadway. The Direction of Route establishes a single direction that is used in combination with subsequent fields as the basis for describing which side of the road or trail the count was taken on (Field 7 of the FHWA Count Station description) and which direction the counted travelers were moving (Field 8 of the FHWA Count Station description). It is recommended that both Fields 7 and 8 be data fields collected by the FDOT Traffic Characteristics Inventory (and not the RCI), because these two fields relate more to the nature of the counts rather than the physical attributes of the traffic monitoring station.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: One byte. Enter the direction of route code according to the FHWA Traffic Monitoring Guide codes, shown in Table B-3 below. For detailed guidance on how to inventory Nonmotorized Direction of Route, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016. p. 7-74, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, pp. 12-13.

Table B- 3. FHWA Nonmotorized Direction of Route Codes

Code	Direction
0	East-West or Southeast-Northwest combined (volume stations only)
1	North
2	Northeast
3	East
4	Southeast
5	South
6	Southwest
7	West
8	Northwest
9	North-South or Northeast-Southwest combined (volume stations only)

Source: U.S.DOT. *Traffic Monitoring Guide*. (Washington, D.C.: FHWA, updated October 2016), 7-74, Table 7-34, Direction of Code Routes.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMFACTYP, Nonmotorized Facility Type. (Field 9) This is an FHWA critical characteristic that would be collected in the field. This indicates the type of nonmotorized facility for which the traffic monitoring station is permanently positioned to collect count data.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: One byte. Enter the Facility Type Count Code according to the FHWA *Traffic Monitoring Guide* codes, shown in Table B-4 below. Most designated SUN Trail facilities will be coded either "0", "4", or "8". For detailed guidance on how to inventory Nonmotorized Facility Type, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016. pp. 7-75 to 7-76, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, pp. 17-21.

Table B- 4. FHWA Nonmotorized Facility Type Count Codes

Code	Facility Type
0	On a trail not intended for on-road motor vehicles and not within the right of way of an adjacent road
1	In roadway right of way (the roadway may designate a trail potentially open to motor vehicles such as a fire road in a national forest)
2	Exclusively in a crosswalk
3	On a sidewalk intended primarily or exclusively for pedestrians
4	In a striped (painted) bicycle lane (with no physical barrier separating adjacent motorized traffic)
5	On an overpass intended to allow nonmotorized traffic to pass over a roadway
6	In an underpass intended to allow nonmotorized traffic to pass under a roadway
7	In a physically separated bicycle lane (separated by curb, bollards or other structure from an immediately adjacent motorized roadway lane)
8	On a sidepath intended for bicycles or bicycles and pedestrians, occurring in a roadway right of way or immediately adjacent to a roadway (distinguished from "3" by explicitly allowing bicycles; distinguished from "0" by being associated with a roadway, distinguished from "7" by being separated by landscaping or unpaved area from the adjacent roadway
9	General area (for general area count, with no facility explicitly designated)

Source: U.S. DOT. *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. (Washington, D.C.: FHWA, November 2016), 18-19, Table 5, Facility Type Count Codes.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMINTRST, Nonmotorized Intersection. (Field 10) This is an FHWA optional characteristic that would be collected in the field. It indicates whether the nonmotorized traffic monitoring station is located at an intersection for the purpose of counting people moving through an intersection.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: One byte. Enter the Intersection type code according to the FHWA *Traffic Monitoring Guide* codes, shown in Table B-5 below. For detailed guidance on how to inventory Nonmotorized Intersection, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, p. 7-76, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, p. 22.

Table B- 5. FHWA Intersection Codes

Code	Intersection
0	Count is NOT taken at an intersection
1	Count is taken at an intersection (but not an intersection with a roundabout)
2	Count is taken at an intersection with a roundabout

Source: U.S. DOT. *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. (Washington, D.C.: FHWA, November 2016), 22, Table 6, Intersection Codes.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMMETHCT, Nonmotorized Method of Counting. (Field 12) This is an FHWA critical characteristic that would be collected in the field. This characteristic would indicate the method used to conduct the count, whether by human observation, portable traffic recording device or permanent count station. In the case of FDOT, if it is decided to install all permanent count stations, then the coding for this characteristic could be automatically generated.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: Enter the Method of Counting code type according to the FHWA *Traffic Monitoring Guide* codes, shown in Table B-6 below. For detailed guidance on how to inventory Method of Counting, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, p. 7-76, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, pp. 23-24.

Table B- 6. FHWA Codes for Method of Counting

Code	Method of Counting
1	Human observation (manual)
2	Portable traffic recording device
3	Permanent continuous count station (CCS)

Source: U.S. DOT. *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. (Washington, D.C.: FHWA, November 2016), 24, Table 8, Method of Counting Codes.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMTYPSEN, Nonmotorized Type of Sensor. (Field 13) This is an FHWA optional characteristic that would be collected in the field. This is a proposed characteristic that is separate from TRSTATYP, Traffic Station Type, for motorized traffic counts, because the same letter codes are used for both the RCI and for the FHWA Nonmotorized Count Station Descriptions, while signifying different things. For example, in the RCI, under TRSTATYP, the Code I signifies 'Inactive', but the FHWA Sensor Code I signifies 'Passive Infrared.' To prevent confusion, this new separate characteristic that describes sensor types for nonmotorized count stations is proposed. Table 7 below assigns a particular code to the different types of sensors, as listed in the FHWA *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.*

The FHWA document specifies that if a particular sensor technology is always used to conduct the count described in the records for that station, the sensor type is then indicated. If the sensor technology varies at that station, then it is coded '9'. Regardless, the sensor technology used for each record of a count (not the count station) is always specified. It is anticipated that there may be multiple sensor types at nonmotorized count stations along the SUN Trail. The FDOT Statewide Non-Motorized Traffic Monitoring Program Coordinator advises documenting each sensor separately in the RCI, including those at the same location, to maintain a record of the vendor source for each sensor device.[5] As a result, use of the FHWA Sensor Code '9' may be inadequate for FDOT's purposes. It is recommended to assign a unique Station ID to each sensor, including for two or more sensors positioned at the same location. In this way, the information for each sensor can be individually documented under Traffic Monitoring Sites – Feature 326, NMSTATID, Nonmotorized Station ID Number, PROPOSED. In addition, the information about the vendor source for each sensor device could be stored in the characteristic, Traffic Monitoring Sites – Feature 326, NMNOTES, Nonmotorized Other Notes, PROPOSED. This is discussed further below.

Responsible Party for this Information: Nonmotorized Traffic Monitoring Program in Central Office of the District.

How to Gather this Data: For detailed guidance on how to inventory Type of Sensor, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, pp. 7-76 to 7-77, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, pp. 24-25.

[5] Florida Department of Transportation. Eric Katz, Statewide Non-Motorized Traffic Monitoring Program Coordinator, Transportation Data and Analytics Office. Email communication. February 20, 2019.

Table B- 7. FHWA Codes for Type of Sensor

Code	Type of Sensor	Code	Type of Sensor
9	Multiple	S	Sonic/acoustic
H	Human observation	T	Tape switch
I	Passive infrared	3	Pressure sensor/mat
2	Active infrared	U	Ultrasonic
K	Laser/LiDAR	V	Video image with automated or semi-automated reduction
L	Inductive Loop	1	Video image with manual reduction at a later time
M	Magnetometer	W	Microwave (radar)
P	Piezoelectric	X	Radio wave (radar)
Q	Quartz piezoelectric	Z	Other
R	Air tube		

Source: U.S. DOT. *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. (Washington, D.C.: FHWA, November 2016), 25, Table 9, Type of Sensor Codes.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMYEREST, Nonmotorized Year Station Established. (Field 22) This is an FHWA critical characteristic that can be collected in the office.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: Enter the 4-digit year in which data at this Station ID was first collected. For detailed guidance on how to inventory Year Station Established, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, p. 7-78, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, p. 26.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMYERDIS, Nonmotorized Year Station Discontinued. (Field 23) This is an FHWA optional characteristic that can be collected in the office.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: Four bytes. Enter the 4-digit year in which this Count Station was discontinued. For detailed guidance on how to inventory Year Station Discontinued, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, p. 7-76, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, p. 22.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMNATLHS, Nonmotorized National Highway System. (Field 24) This is an FHWA optional characteristic that can be collected in the office. This characteristic is only relevant for SUN Trail facilities that are On-System. Code 'Y'= Yes, if the SUN Trail segment is located on a facility that is part of the National Highway System. Code 'N' = No, if the SUN Trail segment is not located on the National Highway System.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: One byte. For detailed guidance on how to inventory National Highway System, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, p. 7-78, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, p. 27.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMLATITD, Nonmotorized Latitude. (Field 25) This is an FHWA critical characteristic that would be collected in the field. This is the latitude of the station location, and an implied decimal place. The eight characters are understood as XX.XXX XXX.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Measure: Enter the GPS coordinates of the location where the SUN Trail data collection master device that is logging or storing the data, is placed. The FHWA *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format* document makes the distinction that this is not the location of the individual sensor. If the location of the data collection master device is not available, then enter the coordinates for the roadway, or SUN Trail, center point at the sensor location.

How to Gather this Data: Eight bytes. For detailed guidance on how to inventory Latitude, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, p. 7-78, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, p. 27.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMLONGTD, Nonmotorized Longitude. (Field 26) This is an FHWA critical characteristic that would be collected in the field. This is the longitude of the station location. The field interpretation implies a minus sign to indicate degrees west of the prime meridian, and a decimal place. The longitude -107.324 200 would be coded as 107324200.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: For detailed guidance on how to inventory Longitude, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, p. 7-78, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, p. 27.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMPOSTRS, Nonmotorized Posted Route Signing. (Field 27) This is an FHWA optional characteristic that can be collected in the field. Code the highest classification route number appearing on signs posted along the facility. The codes in Table B-8 below are based on the Route Signing codes in the 2012 *HPMS Field Manual*, Data Item 18 in HPMS Sections dataset, with extension for bicycle routes.

Responsible Party for this Information: Nonmotorized Traffic Monitoring Program in Central Office or the District.

Table B- 8. FHWA Posted Route Signing Codes

Code	Posted Route Signing
1	Not signed
2	Interstate
3	U.S.
4	State
5	Off-Interstate Business Marker
6	County
7	Township
8	Municipal
9	Parkway Marker or Forest Route Marker
10	U.S. Bicycle Route
11	State or Local Bicycle Route
12	None of the above (signed differently)

Source: U.S. DOT. *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. (Washington, D.C.: FHWA, November 2016), 28, Table 11, Posted Route Signing Codes.

How to Gather this Data: Two bytes. For detailed guidance on how to inventory Posted Route Signing, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, pp. 7-78 to 7-79, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, p. 28.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMPOSTRN, Nonmotorized Posted Signed Route Number. (Field 28) This is an FHWA optional characteristic that would be collected in the field. However, this field would be required by FHWA if Field 27 (NMPOSTRS above) indicates a specific type of signage and can be entered as all zeroes if Field 27 is coded as '12' (signed differently). Leave this field blank if Field 27 Code is blank or '1'. There are eight columns for this field in the TMAS Nonmotorized Count Station Description Record (requiring eight bytes in the RCI).

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: Eight bytes. Record the route number appearing in the corresponding posted sign (Field 27, RCI Characteristic NMPOSTRS, Nonmotorized Posted Route Signing), if applicable. For detailed guidance on how to inventory Posted Signed Route Number, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, p. 7-79, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, p. 28.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMLRSRID, Nonmotorized LRS Route ID. (Field 29) This is an FHWA optional characteristic that can be collected in the office. This field is useful if this is a roadway segment for which motorized counts are also collected for HPMS. If consistent LRS data is available for a trail not associated with a motorized roadway, such as for the SUN Trail, it may also be supplied in this field.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: 60 or 120 bytes. The LRS identification, if reported, must be the same as the LRS identification reported in the HPMS for the section of roadway where the count station is located. The LRS identification is a 60-character, right-justified value. The LRS Route ID can be alphanumeric, but must not contain blanks; any leading zeroes should be coded. No blanks are allowed unless the entire field is left blank.

For detailed guidance on how to inventory LRS Route ID, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, p. 7-79, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, pp. 28-29. More information concerning the LRS may be found in Chapter III

of the *HPMS Field Manual* (September 2010), Linear Referencing System Requirements. If the HPMS LRS identifier is more than 60 characters, then only the first 60 characters should be recorded. According to the 2015 HPMS Addendum, states are allowed 120 characters instead of the 60 allowed in the coding instructions. If FDOT uses more than 60 characters in this Field 29, then enter the 60 rightmost characters.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMLRSLOC, Nonmotorized LRS Location Point. (Field 30) This is an FHWA optional characteristic that would be collected in the field. The Location Point is the LRS milepoint location for the count station on the route named by the LRS Route ID in Field 29. This is comparable to the LRS BMP and EMP in the HPMS.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Measure: The milepoint for the count station must be within the range of the BMP and EMP for the HPMS roadway section upon which the count station is located. It is coded in miles, to the nearest thousandth of a mile, with an implied decimal after the fourth character (xxxx.xxx) that should not be coded. Any blank digits should be zero-filled.

How to Gather this Data: Eight bytes. For detailed guidance on how to inventory LRS Location Point, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, p. 7-79, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, p. 29.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMSTATLC, Nonmotorized Station Location. (Field 31) This is an FHWA optional characteristic that would be collected in the field.

Responsible Party for this Information: Non-Motorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: 50 bytes. This is a short English text field that can be used to provide brief notes about the location, such as the nearest major intersecting route or street name and city, state border, or landmark and distance and direction from the landmark. It also can be used to provide additional information about how the Direction of Route (Field 6, NMDIRRTE) was determined. Abbreviate and left-justify the data. For detailed guidance on how to inventory Station Location, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, p. 7-79, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, p. 29.

Traffic Monitoring Sites – Feature 326, PROPOSED CHARACTERISTIC, NMNOTES, Nonmotorized Other Notes. (Field 32) This is an FHWA optional characteristic that can be collected in the office and/or in the field. It is recommended that FDOT can use this characteristic to document the vendor source and file location of more specific information about each sensor that has a uniquely assigned Station ID. The FHWA *Traffic Monitoring Guide* suggests that Other Notes also could be used to describe use of Factor Groups or any special circumstances that can explain travel characteristics, such as seasonal trail closures.

Responsible Party for this Information: Nonmotorized Traffic Monitoring Program in Central Office or the District.

How to Gather this Data: 51 bytes. For detailed guidance on how to inventory Other Notes, please refer to FHWA's *Traffic Monitoring Guide.* Updated October 2016, pp. 7-7 to 7-80, and to FHWA's *Coding Nonmotorized Station Location Information in the 2016 Traffic Monitoring Guide Format.* FHWA-HEP-17-011. November 2016, p. 30.

Owning Office: Traffic Engineering and Operations

|| Speed Limits – Feature 311 ||

Length feature.

Speed Limits – Feature 311, MAXSPEED, Maximum Speed Limit. The *RCI Features & Characteristics Handbook* provides that District RCI staff is responsible for collecting and maintaining this information for all HPMS Off-System samples and speed limits are used for estimating running speed and delay. It may be possible to use this characteristic for another altogether different purpose. As part of the FHWA Traffic Monitoring Analysis System (TMAS), state DOTs must collect certain data for nonmotorized travel characteristics. These include data for the Nonmotorized Count Station Description Records. Field 21 in this TMAS dataset contains Posted Speed Limit. This data is optional to report to FHWA and would be collected in the field.

The Posted Speed Limit data is similar in format (XX – Record 2-digit number) to that collected for RCI Feature 311 MAXSPEED, and therefore Feature 311 could be used for containing this data. Nonmotorized Count Stations of interest to FHWA are those facilities installed along roadways in addition to nonmotorized shared use paths. FHWA instructions provide that posted speed limits below 5 miles per hour should be left blank. There are posted speed limit signs along designated SUN Trail segments in some areas, such as along the Fred Marquis Pinellas Trail. In this case, the purpose is not for estimating running speed and delay but for safety. For example, there may be a mix of user types on the SUN Trail at the same time, including confident adult bicyclists that may be riding at higher speeds, and those strolling or children on bicycles who may be riding at much slower speeds.

Party Responsible for Data Collection: Non-Motorized Traffic Monitoring Program in District Traffic Operations or in District Planning.

How to Gather this Data: Two bytes. Indicate the posted speed limit in miles per hour. If the SUN Trail facility is a bike lane, then it is a stationing exception and the posted speed limit for that segment of SUN Trail will be coded for the Roadway ID for the roadway segment that it overlaps.

If the SUN Trail facility is a shared use path on an independent alignment, then indicate the speed limit if it is posted, and the BMP and EMP for the SUN Trail segment for which the speed limit applies.

|| Signals – Feature 322 ||

Point feature.

Signals – Feature 322, SDESRET. Side Street Name. Traffic signals may be located along designated SUN Trail segments where they cross busy streets. In these cases, for On-System roadways, the data may be collected by the District Traffic Operations Office as part of the inventory for the On-System roadway, where the characteristic SDESTRET, Side Street Name, could be used to identify the name of the SUN Trail.

Signals – Feature 322, SIGNALTY, Type of Traffic Signal.

Figure B- 3. Pedestrian hybrid beacon mounted on a mast arm at intersection of Palatka to St. Augustine State Trail and SR 207. Photo courtesy FDOT.

This characteristic could provide expanded code types to cover any other signal type present at SUN Trail crossings with streets, for which existing codes do not apply, or a code for a SUN Trail signal. Figure B-3 illustrates a pedestrian hybrid beacon where a SUN Trail segment crosses a state road.

Codes:
01 – Intersection Control Beacon
02 – Intersection Control Signal
03 – Mid-Block Pedestrian Control
04 – Emergency Signal
05 – Intersection Control at School
06 – Bicycle Actuated Signal **PROPOSED**
07 – SUN Trail Signal **PROPOSED**

Responsible Party for Data Collection: District Traffic Operations Office

How to Gather this Information: Enter the SUN Trail name where it intersects as a side street with a roadway. Choose the code to describe the traffic signal type.

Owning Office: Office of Maintenance

|| Maintenance Area Boundary – Feature 137 ||

Length feature.

Maintenance Area Boundary – Feature 137, CCNUMBER, Cost Center Number. This length feature is required for the SHS, Active Exclusive (ramps, frontage roads), and managed lanes, with measured BMP and EMP. On-System shared use paths and bike lanes that are designated as part of the SUN Trail network would be under the responsibility of a Maintenance Unit cost center. It is proposed to use this feature also for Off-System SUN Trail segments, as a means to allocate responsibility to the appropriate FDOT Maintenance Unit cost center for tracking compliance by the local entities to carry out the maintenance duties stipulated in the Maintenance Memoranda of Agreement (MMOA), as well as submitting the annual SUN Trail inspection reports required of the local entities. In some cases, it is anticipated that FDOT will also enter into a Maintenance Memorandum of Agreement with a local entity for the maintenance of selected On-System SUN Trail segments.

Responsible Party for Data Collection: District Maintenance

How to Gather this Data: For SUN Trail segments that are On-System, the cost center number is assigned to the Roadway ID that carries the exception information for the SUN Trail Roadway IDs. For designated SUN Trail segments that are bike lanes or shared use paths parallel to an Off-System public road, in addition to SUN Trail segments that run along an independent alignment, it is proposed that the District Office of Maintenance assign responsibility for each SUN Trail segment Roadway ID to a Maintenance Unit cost center, and code the 3-Byte value for the cost center number.

|| Sidewalks – Feature 217 ||

Length feature.

Only those facilities that are the maintenance responsibility of FDOT are inventoried under Feature 217. There may be segments of designated SUN Trail On-System, which remain under the maintenance responsibility of FDOT. Paved bike paths adjacent to but not part of the roadway are included in the sidewalk inventory. Inventoried facilities also include boardwalks over a ditch or obstacle.

Responsible Party for Data Collection: District Maintenance

How to Measure: Measure the length from the beginning to the end milepoint. The SUN Trail has its own separate LRS. Use milepoints relative to the SUN Trail LRS to measure exact milepoints where the shared use path begins and ends. Facilities are recorded as continuous through driveways in curb and gutter sections and through intersections and turnouts.

Sidewalks – Feature 217, SIDEWALK, Sidewalk Width. Width of the paved path is measured in one mile increments unless the width changes within the one mile increment.

Responsible Party for Data Collection: District Maintenance

How to Measure: For a designated SUN Trail that is a bike path adjacent to but not part of the roadway, measure width of the shared use path to the nearest foot in one mile increments, unless the width changes within the one mile increment. It is recommended to collect this measurement, using Collector for ArcGIS on a mobile device. Another option is use of a measuring wheel or manual tape measure. Photogrammetry provided by a mobile mapping system also can collect this measurement.

|| Crossdrains – Feature 241 ||

Point feature. All characteristics within Feature 241 potentially apply to the SUN Trail and it is recommended to be collected for all Off-System SUN Trail segments with alignments that are independent of a roadway. Use instructions in the *RCI Features & Characteristics Handbook.*

The *FDOT Design Manual* (FDM), Chapters 223 and 224 regarding bicycle facilities and shared use paths, respectively, do not discuss drainage. However, the AASHTO *Guide for the Development of Bicycle Facilities* (2012) does discuss drainage under circumstances where a shared use path is constructed on the side of a slope that has runoff.

> …a ditch of suitable dimensions should be placed on the uphill side to intercept the slope's drainage. Such ditches should be designed so that the potential for injury to errant bicyclists is limited. Where needed, catch basins with drains should be provided to carry the intercepted water under the path. Bicycle-compatible drainage grates and manhole covers should be located to the side of the pathway. (AASHTO 2012, 5-28)

In locations where the SUN Trail is located in rolling terrain, potentially in central and northwest Florida, this situation might be encountered.

Crossdrains – Feature 241, BOXCULHT, Box Culvert Height.

Responsible Party for Data Collection: District Maintenance

How to Measure: Using dimensional accuracy standards contained in the *RCI Features & Characteristics Handbook*, enter the box height to the nearest foot. Options for measuring this dimension were explored for this study. Photogrammetry cannot measure height. LiDAR can measure height; however, the equipment that transports a mobile laser scanner or LiDAR unit cannot go off the road or shared use path to measure height of culverts that are typically not directly observed from the travel way. This might be an application for an unmanned aerial vehicle (drone) to transport a laser scanner. There are various challenges to the use of drones. Where it is safe to do so, it is recommended to use a manual tape measure that is able to traverse features in the field.

Dimensional Accuracy: One foot.

Value for Box Culvert Height: 3 Bytes: XX.X

Crossdrains – Feature 241, BOXCULLT, Box Culvert Width.

Responsible Party for Data Collection: District Maintenance

How to Measure: Using dimensional accuracy standards contained in the *RCI Features & Characteristics Handbook*, enter the box width to the nearest foot. Options for measuring this dimension were explored for this study. The equipment that transports a mobile mapping system, laser scanner or LiDAR unit cannot go off the road or shared use path to measure width of culverts that are typically not directly observed from the travel way. It is recommended to use Collector for ArcGIS on a mobile device or, where it is safe to do so, use a manual tape measure that is able to traverse features in the field.

Dimensional Accuracy: One foot.

Value for Box Culvert Width: 3 Bytes: XX.X

Crossdrains – Feature 241, BXCULGTH, Box Culvert Length.

Responsible Party for Data Collection: District Maintenance

How to Measure: Measure the box length from outside headwall to outside headwall. Enter the box length to the nearest two feet. It is recommended to use Collector for ArcGIS on a mobile device, or a measuring wheel.

Dimensional Accuracy: Two feet.

Value for the Box Culvert Length: 3 Bytes: XXX

Crossdrains – Feature 241, NOBXCULV, Number of Box Culverts.

Responsible Party for Data Collection: District Maintenance

How to Measure: Count and enter the number of box culverts having a sum of openings totaling less than 20 feet. Use the instructions in the *RCI Features & Characteristics Handbook*. The data can be entered in the field using Collector for ArcGIS on a mobile device.

Value for Number of Box Culverts: 2 Bytes: XX

Crossdrains – Feature 241, CRSDRLGH, Length of Crossdrain Pipes.

Responsible Party for Data Collection: District Maintenance

How to Measure: Measure the crossdrain length from outside headwall to outside headwall. Enter the length of the crossdrain to the nearest two feet. It is recommended to use Collector for ArcGIS on a mobile device to measure the crossdrain length and enter the data. An alternative is a measuring wheel.

Dimensional Accuracy: Two feet

Value for Length of Crossdrain Pipes: 3 Bytes: XXX

Crossdrains – Feature 241, NOCRDRAN, Number of Crossdrain Pipes.



Responsible Party for Data Collection: District Maintenance

How to Measure: Count and enter the number of crossdrains into Collector for ArcGIS.

Value for Number of Crossdrain Pipes: 2 Bytes: XX

Crossdrains – Feature 241, PIPEDIAM, Pipe Diameter.
Responsible Party for Data Collection: District Maintenance

How to Measure: Measure and enter the circular pipe diameter in inches. It is recommended to use Collector for ArcGIS on a mobile device to measure the diameter. Another option is a manual tape measure that is able to traverse features in the field.

Value for Pipe Diameter: 3 Bytes: XXX

Crossdrains – Feature 241, PIPEHIGH, Non-Circular Pipe Height.

Responsible Party for Data Collection: District Maintenance

How to Measure: Enter the non-circular pipe height in inches. Options for measuring this dimension were explored for this study. Photogrammetry cannot measure height. LiDAR can measure height; however, the equipment that transports a mobile laser scanner or LiDAR unit cannot go off the road or shared use path to measure height of non-circular pipes that are typically not directly observed from the travel way. This might be an application for an unmanned aerial vehicle (drone) to transport a laser scanner. There are various challenges to the use of drones. Where it is safe to do so, it is recommended to use a manual tape measure that is able to traverse features in the field.

Value for Non-Circular Pipe Height: 3 Bytes: XXX

Crossdrains – Feature 241, PIPETYPE, Type of Pipe.

Responsible Party for Data Collection: District Maintenance

How to Gather this Data: Using the codes supplied in the *RCI Features & Characteristics Handbook*, enter the type of material from which the pipe is constructed.

Crossdrains – Feature 241, PIPEWDTH, Non-Circular Pipe Width.

Responsible Party for Data Collection: District Maintenance

How to Measure: It is recommended to enter the non-circular pipe width in inches using Collector for ArcGIS to measure and to enter the data.

Value for Non-Circular Pipe Width: 3 Bytes: XXX

|| Storm Sewers – Feature 242 ||

Total feature.

Storm Sewers – Feature 242, MANHOLES, Number of Manholes. Manholes that are part of the FDOT storm sewer system are counted if they are within the highway right of way. If there are FDOT-maintained storm sewer facilities on segments of the SUN Trail Off-System, then these facilities should likewise be inventoried. For roadways, manholes are counted according to their location on sidewalks, behind sidewalks, or in the roadway. For the SUN Trail Off-System, the manholes would be located either on the paved shared use path, or off the path.

Responsible Party for Data Collection: District Maintenance

How to Gather the Data: Count the total number of maintained manholes on the SUN Trail paved shared use path and off the paved path.

Value for Number of Manholes: 3 Bytes: XXX

Storm Sewers – Feature 242, MDITCBAS, Number of Catch Basins. Catch basins within the highway right of way would be counted as part of the inventory for the highway, including those serving designated SUN Trail segments that are On-System. It is recommended to use this characteristic to count the number of catch basins serving the SUN Trail Off-System.

Party Responsible for Data Collection: District Maintenance

How to Gather the Data: Count and enter the total number of catch basins found as part of the SUN Trail Off-System infrastructure.

Value for Number of Catch Basins: 3 Bytes: XXX

|| Outfall Ditches – Feature 248 ||



Point feature. Outfall ditches may be found along segments of SUN Trail Off-System. All outfall ditch characteristics along the SUN Trail Off-System should be inventoried. The RCI should contain the link or reference number to easement agreements, if the Department does not own the outfall ditch right of way. Outfall ditches are point features, and only the beginning milepoint of its location is entered. The value for the outfall ditch characteristics indicate that the length can be 1,000 feet or more. It is recommended to use Collector for ArcGIS to measure and enter these length characteristics.

Outfall Ditches – Feature 248, ODITHAND, Outfall Ditch by Hand Length.

Party Responsible for Data Collection: District Maintenance

How to Measure: Code the length, to the nearest foot, of the outfall ditch.

Value for Outfall Ditch by Hand Length: 4 Bytes: XXXX

Outfall Ditches – Feature 248, ODITHAUL, Outfall Ditch by Hauled Length.

Party Responsible for Data Collection: District Maintenance

How to Measure: Code the length, to the nearest foot, of the outfall ditch.

Value for Outfall Ditch by Hauled Length: 4 Bytes: XXXX

Outfall Ditches – Feature 248, ODITPIPE, Outfall Ditch by Length Piped.

Party Responsible for Data Collection: District Maintenance

How to Measure: Code the length, to the nearest foot, of the piped outfall ditch.

Value for Outfall Ditch by Length Piped: 4 Bytes: XXXX

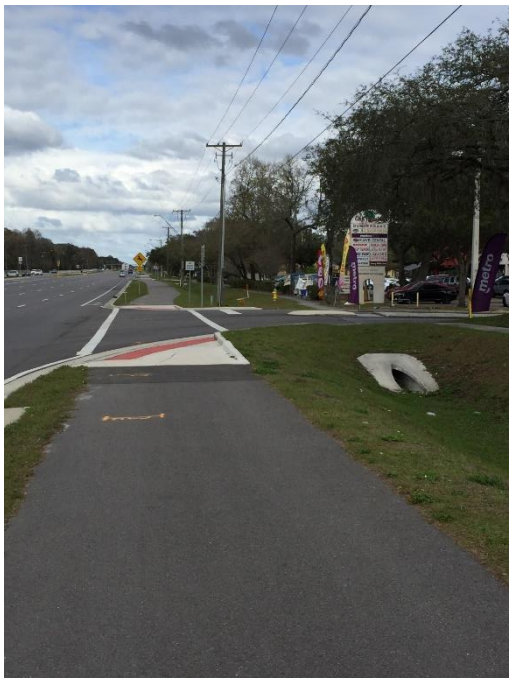
Outfall Ditches – Feature 248, ODITSPR, Outfall Ditch Spread Length.

Party Responsible for Data Collection: District Maintenance

How to measure: Code the length, to the nearest foot, of work to be performed by mechanical means to clean an outfall ditch and spread the excess material.

Value for Outfall Ditch by Spread Length: 4 Bytes: XXXX

|| Turnouts – Feature 256 ||



Total feature. Turnouts describes the number of dedicated access points to the street being inventoried, according to surface type (paved/unpaved), average width, presence of drainage (with pipe/no pipe), and on which side of the street the turnout is located. Although Turnouts—Feature 256 is listed as a Total Feature, for which total numbers of characteristics along the roadway are counted, the *RCI Features & Characteristics Handbook* instructs that for each turnout along a roadway that is entered individually, the exact milepoint should be entered for each turnout. In the case of turnouts along the On-System Sun Trail, as is the case for turnouts along the roadway, it is recommended that each turnout along the On-System SUN Trail should be entered individually with an exact milepoint.

All eight existing characteristics for Turnouts – Feature 256, apply to designated SUN Trail segments that are On-System, located within the right of way and parallel to a roadway. These SUN Trail segments will be linked to these turnouts because these will be coded for Feature 141 with reference to the Roadway ID for the highway that carries the data.

The number and location of access points to the SUN Trail would be valuable to collect; however, the existing defined characteristics for Feature 256 may not adequately describe all the types of SUN Trail access points, especially for those Off-System.

Aside from trailheads, the locations of which could potentially be defined by Intersection – Feature 251, other common access points to trails are where paved residential streets end, and an unpaved walkway, or sidewalk with curb ramp and detectable warning surfaces are provided to connect from the dead end street to the trail. In the case of turnouts along the Sun Trail, as is the case for turnouts along the roadway, it is recommended that each turnout along the Off-System SUN Trail should be entered individually with an exact milepoint.

Four proposed new characteristics under Turnouts – Feature 256, are described below.

Turnouts – Feature 256, PROPOSED CHARACTERISTIC, SUNTRACP, SUN Trail Access Point.

These characteristics would provide the name of the nearest street at its corresponding SUN Trail milepoint. If there is no name of street, then a brief description of the location could be provided, such as the name of a subdivision or RV park. It also could contain a code identifying the rail or bus stop number assigned by the transit agency, if a transit stop exists within one quarter mile of this access point.

Code the side of the SUN Trail on which the access point is located.

Code the nearest bus stop or rail station, if there is one within one quarter mile from the SUN Trail Access Point. This would include the abbreviated name for the transit agency, and the number. Bus stop numbers are found on bus stop signs. Example under Code 01: LYNX1234

Code 01: Bus Stop Number
Code 02: Rail Station Number
Code 03: No transit stop

Value for the bus stop or rail station number: 20 Bytes: XXXXXXXXXXXXXXXXXXXX

Turnouts – Feature 256, PROPOSED CHARACTERISTIC, SUNTRGTE, SUN Trail Access Control.

This new characteristic could be added to indicate the type of access control that is located at the turnout with the SUN Trail.

Responsible Party for Data Collection: District Maintenance

How to Gather this Data: Code the type of SUN Trail access control at the turnout.

Code 01: Gate
Code 02: Bollards
Code 03: Split Path
Code 04: Other
Code 05: None

Turnouts – Feature 256, PROPOSED CHARACTERISTIC, SUNTREVA, SUN Trail Emergency Vehicle Access,

It also would be useful to know which additional access points are wide enough to accommodate emergency vehicle access. Corresponding to each SUN Trail Access Point, a code could signify whether access to the SUN Trail by emergency vehicle is possible. It is possible that some trail access points may be controlled by gates.

Code 01: Emergency vehicle access
Code 02: No access

Turnouts – Feature 256, PROPOSED CHARACTERISTIC, SUNTRACC, SUN Trail ADA Access at Turnout. This new characteristic could be added to indicate the number of curb ramps and the number of locations with tactile surfaces connecting the SUN Trail to each access point. This characteristic does not replace a detailed inventory of Americans with Disabilities Act (ADA) accessibility compliance per the 2010 ADA Standards for Accessible Design and the Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG).

Responsible Party for Data Collection: District Planning

How to Gather this Data: Count the number of curb ramps and the number of locations with tactile surfaces connecting the SUN Trail to the access point.

Value for Number of Curb Ramps: 2 Bytes: XX

Value for Number of Tactile Surfaces: 2 Bytes: XX

|| Guardrail – Feature 271 ||

Total feature.

Guardrail – Feature 271, SPCGRAIL, Miscellaneous Guardrail Length. This feature potentially applies to the SUN Trail and serves a safety function. The FDOT Design Manual, Topic #625-000-002 (January 1, 2018), Section 224.15 discusses drop-off hazards for shared use paths, and railing is listed as an option, particularly intended for urbanized areas, locations attaching to bridge rail, as illustrated in Figure B-4, or along concrete walkways.

Metal pedestrian/bicycle railings (Standard Plans, Index 515 Series) are adequate for shielding drop-offs but are generally intended for use on drop-off greater than 60 inches. Pipe Guiderail (Standard Plans, Index 515-070 and 515-080) is adequate for shielding drop-offs which are 60 inches or less. This feature also would record sections of boardwalk.

Responsible Party for Data Collection: District Maintenance

How to Measure: Code the length, to the nearest thousandth of a mile, guardrail and type. Record separate entries for the right and left side of the trail. A mobile mapping system using photogrammetry could measure this data. This data also could be collected using Collector for ArcGIS on a mobile device, a distance measuring instrument, or a measuring wheel.

Pedestrian/Bicycle Railing (Steel), Standard Plan Index 515-052
Pedestrian/Bicycle Railing (Aluminum), Standard Plan Index 515-062
Pipe Guiderail (Aluminum), Standard Plan Index 515-070
Pipe Guiderail (Steel), Standard Plan Index 515-080

Value for Miscellaneous Guardrail Length: 4 Bytes: X.XXX

|| Fencing – Feature 272 ||

Length feature.

<u>Fencing – Feature 272, OTHERFCS, Number of Other Types of Fences</u>. This feature potentially applies to the SUN Trail and serves a safety function. The FDOT Design Manual, Topic #625-000-002 (January 1, 2018), Section 224.15 discusses drop-off hazards for shared use paths, and fencing also is an option. Fencing is generally used in rural areas along paths and trails.

Responsible Party for Data Collection: District Maintenance

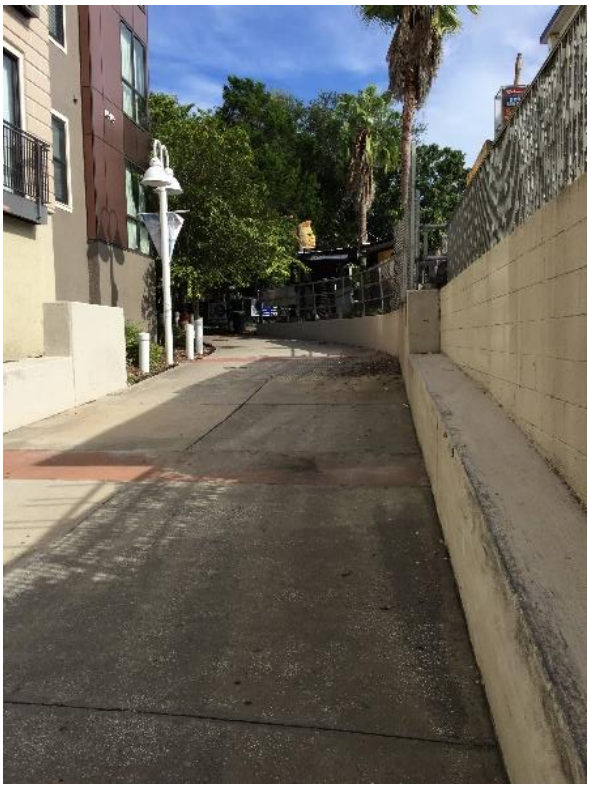
How to Measure: Code the number of other types of fences along the trail. Record separate entries for the right and left side of the trail.

Value for Number of Other Types of Fences: 1 Byte: X

|| Miscellaneous Concrete Structures – Feature 275 ||

Total feature. Miscellaneous Concrete Structures codes length of retaining walls, and square yardage of slope paving. This feature potentially applies to the SUN Trail and serves a safety and preservation function. While the Maintenance MOA Language for Multi-Use Trail Project within FDOT's Right-of-Way, Section 2 specifies that the local government shall maintain and repair gravity walls and other specified features of the trail, and that the local government must conduct an annual safety inspection (Section 7), the agreement also implies that FDOT will follow up and enforce the terms of the agreement. In order to do that, some record would need to be kept identifying what SUN Trail facilities exist, especially those features required for safety. In addition, if the local government fails to maintain the SUN Trail up to standard, according to the MOA, then FDOT has the option to perform the maintenance and invoice the local government. In order to estimate the maintenance and repairs required, which would require programming into the maintenance budget, there would need to be some record identifying what SUN Trail facilities are there. As a result, while FDOT is not maintaining the SUN Trail, the local entity is committed to that, FDOT will maintain the SUN Trail under extenuating circumstances and so would need an inventory of facilities requiring maintenance for purposes of budgeting.

Miscellaneous Concrete Structures – Feature 275, RETWALL, Retaining Wall Length.



Responsible Party for Data Collection: District Maintenance

How to Gather this Data: Code the length of the retaining wall to the nearest foot within each one mile increment. Record separate entries for the left and right sides of the SUN Trail. A mobile mapping system using photogrammetry could measure this data. This data also could be collected using Collector for ArcGIS on a mobile device, or a measuring wheel.

Value for Retaining Wall Length: 4 Bytes: XXXX

Miscellaneous Concrete Structures – Feature 275, SLOPEPAV, Slope Paving Area Concrete.

Responsible Party for Data Collection: District Maintenance

How to Gather this Data: Code the total yards of concrete to the nearest square yard for the concrete slope within each one mile increment. Record separate entries for the left and right sides of the SUN Trail. It is recommended to use Collector for ArcGIS on a mobile device to measure slope paving area.

Value for Concrete Slope Paving Area Square Yardage: 4 Bytes: XXXX

|| Roadside Mowing – Feature 411 ||

Total feature.

Roadside Mowing – Feature 411, SMMACMOW, Small Machine Mowing Area. This characteristic may apply to the SUN Trail system because the MMOA template for shared use paths On-System provides that FDOT shall mow within the trail project, as defined in Section 2, according to the Maintenance Rating Program (MRP) Manual. For FDOT maintenance Work Program budgeting purposes, one will need to know the total number of acres, to the nearest 1/100 acre, of small machine mowing for cutting a width of 40 inches or less on both sides of the sidepath of an On-System SUN Trail. This information could be contained for SUN Trail in SMMACMOW, Small Machine Mowing Area.

|| Roadside Ditch Cleaning – Feature 421 ||

Length feature. Roadside ditch cleaning notes the number and length of roadside ditches. The feature characteristics note whether the ditch is cleaned by a dragline or by a ditch excavator. The values for these are the number of roadside ditches or canals between the BMP and EMP. Grader cleaned ditches are computed as a factor of shoulder miles in the RCICIA program.

This feature is included in the discussion of the SUN Trail because it is assumed that the SUN Trail network will require a variety of drainage treatments along various segments that span the range of topography and hydrology statewide. The selected drainage treatment will depend upon the circumstances, although the range of design of these drainage treatments will not be known until the SUN Trail network is completely constructed. While maintenance of the SUN Trail is the responsibility of the local entity, the MMOA document anticipates the case in which the local entity might fail to keep its maintenance commitment. Under that circumstance, FDOT may choose to perform the maintenance and then invoice the local entity for the cost. In order to be prepared to step in and do the maintenance, FDOT will need to know what facilities exist, including the number and length of ditches to be cleaned, to compute an estimate of the upfront cost to FDOT to perform the work.

Roadside Ditch Cleaning – Feature 421, RDCANALS, Number of Roadside Canals.

Responsible Party for Data Collection: District Maintenance

How to Gather this Data: Code the total number of trailside canals between a BMP and EMP, maintained by an excavator or a grader, adjacent to the trail.

Value: 1 Byte: X

Roadside Ditch Cleaning – Feature 421, RDITEXCA, Number of Roadside Ditches.

Responsible Party for Data Collection: District Maintenance

How to Gather this Data: Code the total number of trailside ditches between a BMP and EMP, maintained by excavator, adjacent to the trail.

Value: 1 Byte: X

|| Delineators – Feature 443 ||

Total feature.

Delineators – Feature 443, BRDELIN, Number of Bridge End Delineators. This characteristic is included because of its safety value for marking hazards along the SUN Trail, including at bridge ends.

Responsible Party for Data Collection: District Maintenance

How to Gather this Data: Record the number of markers installed, in one mile increments, for each side of the SUN Trail, according to the instructions in the *RCI Features & Characteristics Handbook*.

Value for Number of Bridge End Delineators: 3 Bytes: XXX

Delineators – Feature 443, DELINEAT, Number of Guide Posts/Hazard Marker Delineators.

Responsible Party for Data Collection: District Maintenance

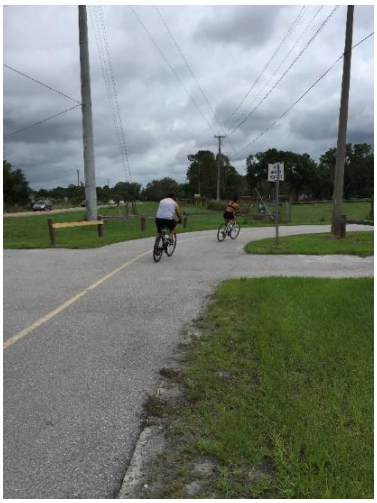
How to Gather this Data: Code the total number of markers installed between a beginning and end milepoint, in one mile increments, along the SUN Trail, according to the instructions in the *RCI Features & Characteristics Handbook*.

Value for Number of Guide Posts/Hazard Marker Delineators: 3 Bytes: XXX

|| Striping – Feature 451 ||

Length feature.

Striping – Feature 451, SNGLLINE, Number of Stripes – Single White or Yellow. A length feature. This characteristic lists the type and number of stripes being counted. While it is not anticipated that most SUN Trail segments will have striping, under the circumstance where trails experience heavy usage, a single white stripe may be laid as a centerline to separate opposing traffic. The presence of a centerline also is a requirement to run FHWA's Shared Use Path LOS Calculator related to performance metrics addressing crowding and user conflicts. This could be used to address the performance criterion, utilization, from the FDOT *Multimodal Mobility Performance Source Book*.



Responsible Party for Data Collection: District Maintenance

How to Gather this Data: Code the milepoint and number of single stripes along the trail. Similarly to roadways, record striping in the center of the trail to the right (Roadside R/L).

Value for Number of Stripes – Single White or Yellow: 1 Byte: X

|| Symbols & Messages – Feature 452 ||

Total feature.

Symbols & Messages – Feature 452, PNTLETTR, Number of Letters. It is anticipated that the SUN Trail may have painted symbols in some areas. The *RCI Features & Characteristics Handbook* instructs to count bike lane letters as one for every two in the field, and to code this number within each one mile increment. Bike lane symbols are counted separately for the left and right side of the roadway. Bike lane symbols may be found in bike lanes that are designated as part of the SUN Trail system. Because this is an on-road facility, these may be counted as part of the roadway inventory and may not need to be done as part of the SUN Trail inventory.

Responsible Party for Data Collection: District Maintenance

How to Gather this Data: For segments of SUN Trail that are Off-System, code the number of painted symbol letters and arrows within each one mile increment.

Value for Number of Letters: 2 Bytes: XX

Symbols & Message – Feature 452, RADIUSMK, Radius Marking Area.

Other on-road lane markings related to designated SUN Trail bike lanes may include diamond symbols, cyclist symbols, bike lane painted buffers, and bike boxes at intersections.

These other symbols also may be inventoried as part of the roadway inventory. However, there may be these other symbols applied to the Off-System SUN Trail, which are not otherwise inventoried elsewhere.

Responsible Party for Data Collection: District Maintenance

How to Gather this Data: For segments of SUN Trail that are Off-System, code the amount of square feet of material used along the SUN Trail, which is placed with small machine applicators, and which are not inventoried elsewhere. Within each one mile increment, compute the number of square feet, using the instructions in the *RCI Features & Characteristics Handbook*.

Value for Radius Area Square Feet: 4 Bytes: XXXX

|| Stop Bars – Feature 454 ||

Total feature.

Stop Bars – Feature 454, STOPBR12, Number of 12 Foot Stop Bars.

Defines the procedure for counting the number of stop bars maintained by FDOT, under the approximate length. The number of stop bars are coded for each one mile increment. Painted stop bars have been observed on trail segments within the SUN Trail system. The templates for the MMOAs for both On-System and Off-System state in Section 2 that the local government will maintain pavement markings. However, an inventory of stop bars that serve a safety purpose should be considered for inventory by FDOT, in the event that the terms of the MMOAs are not met and FDOT decides to perform the maintenance. In this case, an inventory of the number of stop bars will enable budgeting by the District Maintenance Office. Standard width of the SUN Trail is 12 feet. For this purpose, the characteristic STOPBR12, Number of 12 Foot Stop Bars, can be used.

Responsible Party for Data Collection: District Maintenance

How to Gather this Data: For shared use paths that run parallel to a roadway On-System, there may be numerous street crossings and keeping count of the stop bars using a one mile increment may be most appropriate. However, for Off-System shared use paths, the SUN Trail segment may cross fewer streets. In this case, the increment could be a count of the number of stop bars per SUN Trail segment Roadway ID number, to be maintained by each local entity. An additional code type to contain these values may be needed.

Value for Number of 12 Foot Stop Bars: 2 Bytes: XX

|| Highway Signs – Feature 480 ||

Total feature. This feature includes the inventory of signs that serve a safety purpose, such as stop signs at cross streets. State law provides that the Department shall establish construction standards and a uniform system of signing for bicycle and pedestrian ways (Section 335.065(2), F.S.). FDOT is responsible for safety signage.

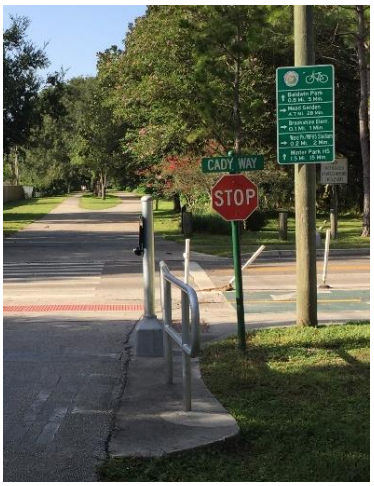
Highway Signs – Feature 480, GRPSTL30, Number of Ground Sign Posts Less than 30 Square Feet.

Responsible Party for Data Collection: District Maintenance

How to Gather this Data: For the SUN Trail On-System, this signage may be coded as part of the roadway. For Off-System SUN Trail segments, code the number of posts that support small signs less than or equal to 30 square feet. Record separate entries for the left and right side of the SUN Trail.

Value for Number of Ground Sign Posts Less Than 30 Square Feet: 3 Bytes: XXX

Highway Signs – Feature 480, PANLLT30, Ground Panels Less Than 30 Square Feet.



Responsible Party for Data Collection: District Maintenance

How to Gather this Data: For the SUN Trail Off-System, code the number of object marker signs, yellow and black striped and diamond shaped. Separate entries are made for the right and left sides of the trail.

Value for Ground Panels Less Than 30 Square Feet: 4 Bytes: XXXX

Owning Office: Systems Implementation

|| Trails - Feature 801 ||

Secured feature. According to the *RCI Planning Data Handbook*, August 2016, p. 5, in reference to Trails—Feature 801, "Only TranStat personnel can update data elements. The District Offices will notify TranStat when changes to secured features are needed." Accordingly, the discussion below about characteristics for the SUN Trail network within Trails—Feature 801 presents suggestions about data that may be supplied by District Offices to the Systems Implementation Office, under the subheading, Responsible Party for Data Collection. It is recommended that once the SUN Trail inventory process becomes established, then Transportation Data & Analytics may consider turning over the responsibility for most data collection to the District Planning or Maintenance Offices.

Trails - Feature 801, SUNTRTYP, SUN Trail Type, identifies Shared Use Nonmotorized (SUN) Trail segments within the designated SUN Trail Network, and others. It provides the status for the Roadway ID of the SUN Trail segment.

This characteristic is similar to Section Status Exception – Feature 140, STATEXPT, Segment Status, which is proposed would also apply to designated SUN Trail segments that are bike lanes and shared used paths associated with a roadway that is being added or removed from the SHS. It is proposed that SUNTRTYP would apply to SUN Trail Off-System segments that follow an independent alignment. Segments of SUN Trail that run along an independent alignment would not have coded data in Feature 140 associated with them, because such segments could not be added to or removed from the SHS. Instead, Trails—Feature 801, SUNTRTYP, SUN Trail Type, would contain the status information for trail segments with an independent alignment. There are four codes that describe trail status. These are Code 1: Active Trail; Code 2; Pending Trail; Code 3: Dropped SUN Trail GIS Route (Historical); and Code 4: Deleted, Physical Removal of Infrastructure.

An On-System facility with the status of a SUN Trail will be apparent if there also are data in Feature 801 for that Roadway ID uniquely assigned to that SUN Trail segment. In addition, if Roadway ID section 931 is specific only to the SUN Trail and not other shared use paths, then the uniquely assigned Roadway ID will indicate status as a SUN Trail.

Responsible Party for Data Collection: Systems Implementation Office. District Planning could supply data for all New Construction/Pending SUN Trail segments. District Planning also could supply data for inventories upon Notification of Contract Status Changes to Final Acceptance, and after any change to the RCI characteristic, as well as for the five-year re-inventory.

How to Gather this Data: Enter the code value assigned to the route.

1 – Active trails
2 – Pending trails
3 – Dropped SUN Trail GIS route (historical)
4 – Deleted, physical removal of infrastructure
5 – Temporary trail closure, for repair, reconstruction, etc. **PROPOSED**

Trails – Feature 801, PROPOSED CHARACTERISTIC, SUNTRDAT, SUN Trail Date.

This characteristic gives the date the Roadway ID of the SUN Trail segment was added to the SUN Trail network, and corresponds to the latest status change for that segment, coded in SUNTRTYP.

Responsible Party for Data Collection: Systems Implementation Office, with assistance from District Planning.

How to Gather this Data: The District Statistics Administrator or District RCI Coordinator would supply the date of the status change.

Trails - Feature 801, SUNTRCOR, SUN Trail Corridor Name.

Associated with the name for the Shared Use Nonmotorized (SUN) Trail corridor facilities.

Responsible Party for Data Collection: Systems Implementation Office.

How to Gather this Data: Enter the MAPID codes assigned to the facility.

How to Measure: Identify the Corridor name (see codes from the *RCI Features & Characteristics Handbook*) and record the beginning and end milepoints.

Trails - Feature 801, PROPOSED CHARACTERISTIC, SNTRBGPT, SUN Trail Beginning Milepoint.

SNTRBGPT and SNTRENPT (description following this characteristic) are similar to Station Exceptions—Feature 141, BEGSECPT and ENDSECPT, and provide at way to show data just once for the location where two facilities overlap. This method is considered to be replaced with GIS technology. These two proposed characteristics are recommended for FDOT programs to consider.

Responsible Party for Data Collection: Systems Implementation Office, as supplied by District Planning.

How to Measure: In the field. Record the beginning milepoint for the SUN Trail segment.

Value for SUN Trail Beginning Milepoint: 6 Bytes: XXX.XXX

Trails - Feature 801, PROPOSED CHARACTERISTIC, SNTRENPT, SUN Trail End Milepoint.

Responsible Party for Data Collection: Systems Implementation Office, as supplied by District Planning.

How to Measure: In the field. Record the end milepoint for the SUN Trail segment. 6 Bytes: XXX.XXX.

Value for SUN Trail End Milepoint: 6 Bytes: XXX.XXX

Trails – Feature 801, PROPOSED CHARACTERISTIC, SUNTRLOC, SUN Trail Local Name, for On-System and Off-System SUN Trail segments. This is the local name of the trail used by the local entities. While the SUN Trail corridor names come from data from the FDEP Office of Greenways and Trail, through the life cycle of a trail project, segment names become more refined.

Responsible Party for Data Collection: Systems Implementation Office, as supplied by District Planning, the District Trail Coordinator

How to Measure: In the field. If there is signage on the trail, then record the name on the sign exactly as it appears in the field, then apply naming convention edits as described under Local System – Feature 114 Local Name of Facility, for consistency. The BMP and EMP may already be established at intersection locations within the SUN Trail linear referencing system. In the absence of tree canopy that may obscure line of sight, aerial imagery also can be used to establish BMP and EMP.

How to Gather this Data: In the office. Where there are no signs or markers found in the field, use name as found in official city or county bicycle master plan. The District Trail Coordinator also may know if the local entities that originally prepared the Request for Funding for the SUN Trail funds, uses a local name when it refers to this trail segment.

Value for SUN Trail Local Name: 20 Bytes: XXXXXXXXXXXXXXXXXXXX

Trails – Feature 801, PROPOSED CHARACTERISTIC, STROVRLP, SUN Trail Overlap, to define the extent to which trails of other designations overlap with the SUN Trail. This is for purposes of identifying opportunities for joint stewardship and marketing. For example, as illustrated in Figure B-5 below, the Florida National Scenic Trail, designated by the USDA Forest Service overlaps the SUN Trail network along the Lake Okeechobee Scenic Trail Corridor. It is proposed that this characteristic also can contain which trail segments are included as part of the Coast to Coast Trail and the St. Johns River-to-Sea Loop within the SUN Trail network.

Responsible Party for Data Collection: Systems Implementation Office.

How to Gather this Data: Enter the code for the name of the other trail designation.

Code:
01: Florida National Scenic Trail
02: East Coast Greenway
03: SUN Trail Coast to Coast
04: SUN Trail St. Johns River-to-Sea Loop

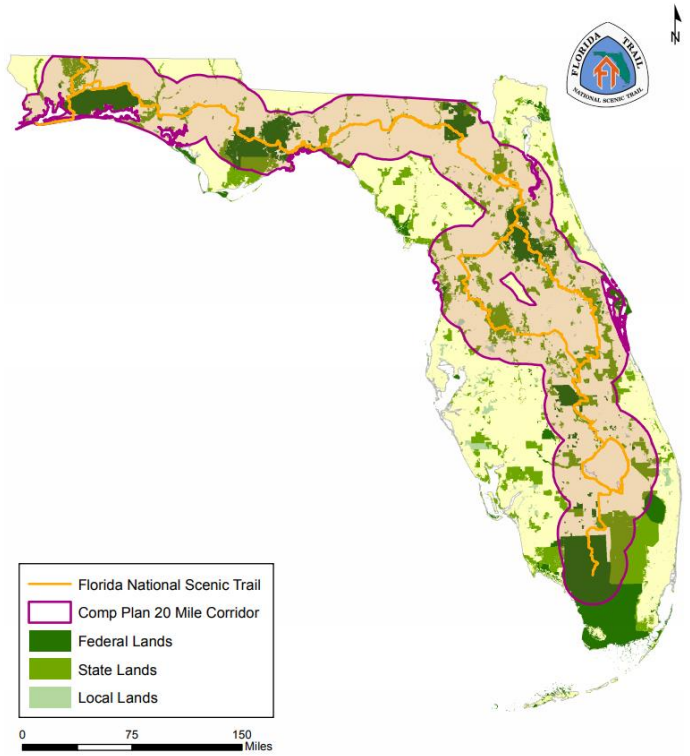


Figure B- 5. 2018 Florida National Scenic Trail 20-Mile Planning Corridor

Source: USDA Forest Service, National Forests in Florida, and the Florida Trail Association. 2018. Florida National Scenic Trail Program, Strategic Plan Implementation Guide: A Companion Guide to the Florida National Scenic Trail Strategic Plan; Connecting Florida's Public Lands. Version 2.0. September. p. 33.

Trails – Feature 801, PROPOSED CHARACTERISTIC, BEGTRMPT, Begin SUN Trail Overlap Milepoint.

Responsible Party for Data Collection: Systems Implementation Office

How to Gather this Data: In the office. Use mapping resources available from partner entities. For example, the USDA Forest Service has recently made available an ArcGIS Online map for the Florida Scenic Trail. (Source: https://www.fs.usda.gov/fnst).

This is presently a beta version, intended for planning and management of the Florida Trail and is being updated regularly to reflect the most recent GIS data, including land management boundaries and designated trailheads. Record the beginning lowest mile point for the SUN Trail segment, where the overlap with a trail of another designation begins.

Value for Begin SUN Trail Overlap Milepoint: 6 Bytes: XXX.XXX

Trails – Feature 801, PROPOSED CHARACTERISTIC, ENDTRMPT, End SUN Trail Overlap Milepoint.

Responsible Party for Data Collection: Systems Implementation Office

How to Gather this Data: In the office. Record the end highest mile point for the SUN Trail segment, where the overlap with a trail of another designation ends.

Value for End SUN Trail Overlap Milepoint: 6 Bytes: XXX.XXX

Trails – Feature 801, PROPOSED CHARACTERISTIC, NEWTRDAT, New SUN Trail Realignment Date, captures information regarding the date that a SUN Trail segment realignment has officially opened, the new Roadway ID for the realigned segment, and the BMP and EMP for the realigned segment. For segments of existing SUN Trail that follow an independent alignment and which have been realigned, this characteristic (similar to Feature 138) contains the date for the new Roadway ID for the realigned SUN Trail segment.

Responsible Party for Data Collection: Systems Implementation Office, as supplied by District Planning.

How to Gather this Data: Record the date that the new Roadway ID for the realigned SUN Trail segment officially opened.

Value for New SUN Trail Realignment Date: 8 Bytes: MMDDYYYY

Trails – Feature 801, PROPOSED CHARACTERISTIC, NSUNTRID, Section/Sub-section of New SUN Trail Realignment. This would contain the new Roadway ID for the realigned segment of the SUN Trail.

Responsible Party for Data Collection: Systems Implementation Office, in coordination with District Planning.

How to Gather this Data: Code the 8-Byte value for the new SUN Trail segment Roadway ID – County/section/sub-section.

Value for Section/Sub-section of New SUN Trail Realignment: 8 Bytes: XX931XXX

Trails – Feature 801, PROPOSED CHARACTERISTIC, NSTRBGPT, New SUN Trail Realignment Beginning Milepoint, this would contain the beginning milepoint for the realigned segment of the SUN Trail.

Responsible Party for Data Collection: Systems Implementation Office, as supplied by District Planning.

How to Gather this Data: Record the beginning mile point for the new alignment of the SUN Trail, using similar procedure as for a new roadway alignment.

Value for New SUN Trail Realignment Beginning Milepoint: 6 Bytes: XXX.XXX

Trails – Feature 801, PROPOSED CHARACTERISTIC, NSTRENPT, New SUN Trail Realignment End Milepoint, this would contain the end milepoint for the realigned segment of the SUN Trail.

Responsible Party for Data Collection: Systems Implementation Office, as supplied by District Planning.

How to Gather this Data: Record the end mile point for the new alignment of the SUN Trail, using similar procedure as for a new roadway alignment.

Value for New SUN Trail Realignment End Milepoint: 6 Bytes: XXX.XXX

Trails – Feature 801, PROPOSED CHARACTERISTIC, OSUNTRID, Old SUN Trail Alignment ID, this characteristic would automatically generate when NEWTRDAT, New SUN Trail Realignment Date, is coded. It contains the Roadway ID for the old SUN Trail segment alignment.

Responsible Party for Data Collection: Systems Implementation Office.

How to Gather this Data: Records automatically the Roadway ID for the old alignment of the SUN Trail segment.

Value for Old SUN Trail Alignment ID: 8 Bytes. XX931XXX

Trails – Feature 801, PROPOSED CHARACTERISTIC, OSTRBGPT, Old SUN Trail Alignment Beginning Milepoint, this characteristic would automatically generate when NEWTRDAT, New SUN Trail Realignment Date, is coded.

Responsible Party for Data Collection: Systems Implementation Office.

How to Gather this Data: Records automatically the old SUN Trail segment beginning milepoint.

Value for Old SUN Trail Alignment Beginning Milepoint: 6 Bytes. XXX.XXX

Trails – Feature 801, PROPOSED CHARACTERISTIC, OSTRENPT, Old SUN Trail Alignment End Milepoint.

This characteristic would automatically generate when NEWTRDAT, New SUN Trail Realignment Date, is coded.

Responsible Party for Data Collection: Systems Implementation Office

How to Gather this Data: Records automatically the old SUN Trail segment end milepoint.

Value for Old SUN Trail Alignment End Milepoint: 6 Bytes. XXX.XXX

Trails – Feature 801, PROPOSED CHARACTERISTIC, SUNTROWN, SUN Trail Land Ownership.

Responsible Party for Data Collection: Systems Implementation Office, as supplied by District Planning, District Trail Coordinator.

How to Gather this Data: For Off-System SUN Trail. Provide owner name and link or reference number to right-of-way or easement agreements.

Value for SUN Trail Land Ownership: 20 Bytes: XXXXXXXXXXXXXXXXXXXX
Code reference number. Enter active link.

Trails – Feature 801, PROPOSED CHARACTERISTIC, SUNTRMOA, SUN Trail Local Entity Responsible for Maintenance.

Responsible Party for Data Collection: Systems Implementation Office, as supplied by District Maintenance.

How to Gather this Data: Provide link or reference number to MMOA.

Value for SUN Trail Local Entity Responsible for Maintenance: 20 Bytes:
XXXXXXXXXXXXXXXXXXXX
Enter active link.

Trails – Feature 801, PROPOSED CHARACTERISTIC, SUNTRFIN, SUN Trail Final As-Built Construction Plans.

Responsible Party for Data Collection: Systems Implementation Office, as supplied by District Maintenance.

How to Gather this Data: Provide link or reference number to the plans.

Trails – Feature 801, PROPOSED CHARACTERISTIC, SUNTRPER, SUN Trail Permits.

Responsible Party for Data Collection: Systems Implementation Office, as supplied by District Maintenance.

How to Gather this Data: Provide links or reference number to location of permits and other separate documentation.