CHAPTER 2

INTRODUCTION TO RCI

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The Roadway Characteristics Inventory (RCI) is the Florida Department of Transportation's (FDOT) enterprise system of record for multimodal transportation systems that include the following modes: roadway, bicycle, pedestrian, rail, and trail assets. The RCI is the FDOT's single source of truth of location and extent of roadway and travel way data and information that represents actual field conditions of existing infrastructure.

The purpose of the RCI Handbook is to provide an overview of the RCI system and detailed guidance on the features and characteristics that make up the database, program applications, field inventory procedures, data entry, and report processes.

2.1 Introduction to RCI

The Roadway Characteristics Inventory (RCI) is the Florida Department of Transportation's (FDOT) enterprise system of record for multimodal transportation systems that include the following modes: roadway, bicycle, pedestrian, rail, and trail assets. The RCI system allows FDOT to store data and information in a relational database environment for programming, analysis, estimates, and reporting systems. The RCI system is considered the single source of truth with respect to data for Central Office, District Offices and Florida Turnpike Enterprise. This data is used to provide information for state and federal reporting business requirements. The data is multi-sourced information on location, length, extent, administrative information, system performance, and condition of multimodal transportation systems. The data is derived from field data collection, official signed paperwork, as-built construction plans, transportation studies, GIS, and other sources. This data is maintained through routine data collection cycles and is reviewed using quality assurance and quality control processes to ensure FDOT provides highly confident data that is reliable, accurate, timely, and organized for data sharing.

2.1.1 History of RCI

The RCI system was originally developed in the 1970s to support the federal reporting requirements of the federal Highway Administration's (FHWA) Highway Performance Monitoring System (HPMS) which requires states to submit data that support the national reports to Congress. The legacy system architecture maintained by the Office of Information Technology (OIT) and the FDOT business offices is maintained by the web application and system upgrades over the course of a few decades and continues to be a core business system to feed other FDOT enterprise systems.

2.2 Organization of the RCI Handbook

The purpose of the RCI Handbook is to provide an overview of the RCI system and detailed guidance on the features and characteristics that make up the database, program applications, field inventory procedures, data entry and reporting processes.

The RCI Handbook also provides instructions and references for data entry and usage for areas of the FDOT's RCI system for which the Transportation Data and Analytics (TDA) Office is currently responsible. This edition of the handbook reflects the current RCI program application, other applications associated with RCI, and updates to previous versions of this handbook. Chapter 7 of the handbook covers all the features and characteristics in the RCI database, terminology, and code values. Users of the handbook are strongly encouraged to review the log of changes for this chapter to identify the significant updates made to each feature and characteristic.

2.2.1 RCI Handbook Chapters

The RCI Handbook is organized in the following chapters:

- *Chapter 1: Executive Summary* provides a summary of the handbook.
- *Chapter 2: Introduction to the RCI* provides a brief introduction to the RCI system at FDOT. This chapter covers the purpose and organization of the handbook, data governance that provides the authority for RCI, RCI system components, as well as the roadways and travel ways to be included in the RCI system.
- *Chapter 3: RCI Fundamentals* explains the basic terms used in the RCI database. This basic information will assist the reader in understanding the structure and terms found in the handbook.

- *Chapter 4: Data Collection Process* describes the general methods used to conduct an inventory for various roadway inventory types. This chapter first describes the general process used to collect data for RCI (pre-inventory, field inventory and post-inventory) and then provides detailed data collection steps for each inventory type for statewide consistency.

- *Chapter 5: RCI Procedures* focuses on the life cycle of a roadway ID and the many aspects of data collection procedures. The intent is to give guidance to the Districts to assist in unique data collection situations that may be encountered during field inventory or data input. The content of the chapter is streamlined by grouping the unique data collection situations into three categories—adding a new road, editing a road, and retiring a road.

- *Chapter 6: Linear Referencing System* provides an overview of FDOT's GIS Linear Referencing System (LRS) and the TDA Office's GIS applications which support RCI.

- *Chapter 7: RCI Features and Characteristics* documents all the related features and characteristic data events that are collected in relation to roadways and travel ways.

- *Chapter 8: RCI and DART Reports* documents the RCI data products that are distributed and reported to internal and external transportation data business users.

- *Chapter 9: DART Application/Edits* provides a list of validation edits that are required to maintain data integrity and consistency for reporting purposes.

- *Appendices* provide additional relevant and detailed information to the users.

2.3 Data Governance

2.3.1 Authority

Florida Statute § 20.23 (3)(a) directs the FDOT Central Office to develop polices, rules, procedures, and standards and to monitor the implementation of such policies, rules, procedures, and standards in order to ensure uniform compliance and quality performance by the districts and central office units that implement transportation programs. The RCI Handbook supports documentation of the data collection, management, and reporting processes which ensure the accountability and transparency business requirements are met by the Central Office, District Offices, and Florida Turnpike Enterprise. The RCI is the FDOT's single source of truth of location and extent of roadway and travel way data and information that represents actual field conditions of existing infrastructure.

Supporting Florida Statutes

- § 334.048(3) Legislative intent with respect to department management accountability and monitoring systems

- § 334.24 Compilation, maintenance, and provision of information relating to roads and road building and repair

- § 335.0415 Public road jurisdiction and transfer process

- § 335.01 Designation and systemization of public roads

- § 335.02 Authority to designate transportation facilities and rights-of-way and establish lanes; procedure for redesignation and relocation; application of local regulations
- § 335.065 Bicycle and pedestrian ways along state roads and transportation facilities
- § 335.08 Numbering public roads
- § 335.093 Scenic highway designation

Federal Regulations

- United States Code: Title 23 Highways
- 23 CFR 1.5—Information furnished by state highway departments
- 23 CFR 1.7—Urban area boundaries
- 23 CFR § Part 460 [§ 460.1—§ 460.3]—Public Road Mileage for Apportionment of Highway Safety Funds
- 23 CFR § Part 470—Highway Systems
- 23 CFR § Part 490—National Performance Management Measures
- 23 CFR § Part 490—Asset Management Plans
- 23 CFR § Part 500—Management and Monitoring Systems
- 23 CFR § Part 667—Periodic Evaluation of Facilities Repeatedly Requiring Repair and Reconstruction Due to Emergency Events

FDOT Procedures and Other References

The following procedures, policies, handbooks, manuals, and other documentation are listed here as a reference for users to understand how the RCI system and program are coordinated with other Department procedures and processes. FDOT utilizes several procedures and policies to establish RCI data governance to ensure coordination of stakeholders, data stewards or data custodians. Central Office, District offices, and the Florida Turnpike Enterprise share responsibilities of data collection, maintenance, management, reporting, and quality assurance and quality control. This information notes business procedures that reference data workflows around RCI to store and manage information for that business process.

- General Interest Roadway Data (GIRD) Procedure, Topic No. 525-020-310.
- Transportation System Designations and Road Jurisdiction Transfers Procedure, Topic No. 525-020-010.
- Urban Boundary and Functional Classification of Roadways, Topic No. 525-020-311.
- Project Traffic Forecasting, Topic No. 525-030-120.
- Traffic Monitoring, Topic No. 525-030-150.
- Quality Assurance Reporting, Topic No. 260-030-005.

- Data Governance, Topic No. 001-325-064.
- Roadway Characteristics Inventory Traffic Operations Data, Topic No. 750-000-001.
- Transportation Data Collection, Storage and Reporting, Topic No. 850-000-001.
- Complete Streets, Topic No. 000-625-017.
- Assignment of Access Management Classifications to the State Highway System, Topic No. 525-030-155.
- Handbooks and Manuals:
  - Transportation System Designations and Road Jurisdiction Transfers Handbook.
  - Urban Boundary and Functional Classification of Roadways Handbook.
  - Traffic Monitoring Handbook.
  - Routine Maintenance Cost Handbook.
  - Maintenance Rating Program Handbook.
  - Florida Design Manual.
  - Manual of Uniform Minimum Standards for Design, Construction and Maintenance (Florida Greenbook).
  - Plan Preparation Manual.
  - FDOT Context Classification Document.
  - FHWA HPMS Field Manual.
  - FHWA Traffic Monitoring Guide.
  - FHWA Highway Functional Classification Concepts, Criteria and Procedures.

2.3.2 Quality Management

FDOT treats its transportation data as an asset and requires data to be reliable, organized, timely, and accurate for data sharing with public users and local, state, and federal partners. The TDA Office has developed data quality management processes and methods to sustain a high confidence of quality in the data that is reported to users through the established policies, rules, procedures, and standards. As part of the Quality Assurance Reporting procedure Topic No. 260-030-005, the TDA Office and other Central Office units will perform monitoring activities to ensure the data collection processes and field validation methods are adhered to by Central Office, Districts, and the Florida Turnpike Enterprise.

Additionally, FDOT is responsible for reporting accurate and timely data to the FHWA through the HPMS. Under 23 CFR § Part 420, regulations outline responsibilities to provide FHWA adequate information for administering the federal-aid highway program. Per the HPMS Field Manual, the maintenance of a valid HPMS database is an

item of national significance and items of national significance must be adequately addressed in each state's annual work program. This extends beyond the simple reporting of data each year and includes taking actions to assure that all data are complete, current, and accurate. FDOT performs quality management to ensure the Department does not submit false transportation data which would be a violation under United States Code, Title 18, Section 1020. FHWA Florida Division is a partner to monitor the quality management processes and is required to annually review roadway sections, HPMS samples, and any transportation data which is collected and reported by the state.

2.3.3 Responsible FDOT Offices

The RCI system is managed by several FDOT offices that are responsible for sponsorship of their data housed in the RCI system, coordinating data needs with their staff and the District offices to ensure that RCI data is managed, business processes are coordinated, and staff and resources are trained adequately. The TDA Office is responsible for maintaining the handbook and procedures that cover most of the business processes to maintain the data governance and quality for state and federal mileage reports. TDA Office and the Office of Maintenance take the lead in performing RCI system application improvements and coordinating with the OIT to batch load data into the RCI.

The offices responsible for maintaining RCI data are:

- Transportation Data and Analytics Office.
- Office of Maintenance.
- Traffic Engineering and Operations Office.
- Systems Implementation Office.
- Freight and Rail Office.
- District Planning, Maintenance, and Operations Offices.

2.3.4 Business Users and Use Cases

RCI data is utilized by users internal and external to FDOT that require data and information on the location, extent of roadways and travel ways that are maintained and funded by FDOT, or of Department interest. FDOT devotes resources into tracking and providing location, extent of roadways and travel ways and related information, thus supporting the transportation business needs of the Department. The TDA Office is responsible for developing visual diagrams, maps, GIS analysis, web application tools, and business intelligence tools to disseminate the RCI data to users.

Historically, FDOT developed RCI to collect roadway inventory condition and performance for the FHWA HPMS data submittal. Since then, new use cases have been identified to support the planning of a safe, efficient, reliable multimodal transportation system. The following list of comprehensive RCI data use cases have been identified over the years as the transportation data needs for planning and engineering have grown beyond the original intent:

- Transportation Programming and Funding:
  - Federal Aid Reimbursement and Emergency Management Relief Efforts.

- Transportation System Designations:
  - Urban Boundary and Functional Classifications.
  - Roadway Ownership.
  - Roadway Designations.
- Asset Management:
  - Road Inventory.
  - Maintenance Budget Estimates.
- Project Development and Environment (PD&E).
- Design Quantity and Estimates (DQE).
- Long Range Estimates.
- Highway Performance Monitoring System:
  - Condition and Performance Reports to Congress.
  - Centerline Mileage Reporting.
  - Roadway Inventory Condition and Performance Data Reporting.
  - Traffic Monitoring.
  - Travel Time Analysis.
  - Pavement Condition Analysis.
- Multimodal Data Analysis:
  - Freight Analysis Framework.
  - Freight, Logistics, and Passenger Studies and Projects.
  - Freight Data Analysis.
  - Railroad Crossing Analysis.
  - Bicycle and Pedestrian Analysis.
  - SUN Trail Analysis.
- Safety Improvement Analysis:
  - Crash and Incident Mapping and Reporting.

- Transportation Performance Management:
  - Florida Transportation Commission's Transportation Authority Monitoring and Oversight report.
  - FDOT Performance Reports.
  - FDOT Source Book.
- Travel Demand Modeling.
- Straight Line Diagrams.
- FDOT Data Requests:
  - Historical Data Requests.
- GIS Systems:
  - Open Data Hub.
  - ArcGIS Online.
  - Linear Referencing Systems.
  - All Roads Network of Linear Referenced Data (ARNOLD).
  - GIS Shapefiles.

2.3.5 Transportation Funding

The RCI system supports the FDOT Work Program and Budget Office applications and the Five-Year Work programming by relating travel way or roadway IDs and the associated state or federal designations and classifications such as the National Highway System or Functional Classification Systems with financial project numbers. This process assists the FDOT by determining the prioritization of eligibility of transportation funding through the State Transportation Trust Fund (STTF) or federal-aid programs. The FHWA and U.S. Department of Transportation (U.S. DOT) require states to collect and report HPMS data to address various national transportation funding and planning needs.

These federal requirements are served through the inventory of RCI and HPMS data which is integrated with the annual submission of data to the HPMS system and reimbursement of funds from the Financial Management Information System (FMIS).

The HPMS data is also used by the FHWA to support the following federal programs:

- Support the apportionment of Federal-aid Highway Program funds.
- Identification of roadways eligible for federal aid.
- Estimates of highway investment requirements.

- Support for the FHWA's strategic planning efforts.
- Development of a National Highway System (NHS).
- Monitoring of the National Highway Performance Program.
- Transportation Performance Management (TPM).
- Transportation Asset Management Plan (TAMP).
- Transportation/air quality planning.

2.4 RCI System Components

The RCI System has several components maintained by the OIT, TDA Office, and Office of Maintenance to support the data collection, data management, and data distribution of RCI data. The RCI database resides on a mainframe computer system located in the state data center and is maintained by Department personnel. There are two main applications for accessing RCI data—the basic web-based RCI application and the Time Sharing Option (TSO) application. Security clearance or resource access control facility (RACF) gives users specific privileges in either or both areas and is assigned by security coordinators throughout the Department. The ability to add, update, or delete RCI data is assigned by area of responsibility (e.g., Planning, Traffic Operations, Office of Maintenance, etc.) and respective Districts.

2.4.1 RCI Web Application

The RCI web application, developed in 2004, provides access, data entry, and administration of the traditional RCI database. A separate RCI Application User Manual provides details on the use of the web-based RCI application, which is available at: https://www.fdot.gov/statistics/tsopubs.shtm.

2.4.2 RCI Database

RCI data is stored on the mainframe in a DB2 instance and integrates RCI data to other enterprise mainframe systems. Data is entered through the RCI web application in a live manner and the mainframe is refreshed/updated nightly through RCI extract tables are identified as RCI Table 01 and Table 02 extracts (also known as Superfiles) for other mainframe systems. The TDA Office performs copies of these extracts into its Oracle environment for other non-mainframe systems such as the GIS Enterprise which is reconciled and updated weekly. Other TDA Office systems that utilize the Oracle snapshots are:

- HPMS processing database.
- Roadway Inventory Tracking Application (RITA).
- Data Analysis and Reporting of Transportation (DART).
- Real Time Mileage (RTM) reporting application.
- GIS shapefile data factory.

2.4.3 RCI System Data

District and Central Offices are responsible for entering data into RCI from a variety of data sources and methods that provide and determine location, extent, performance, and condition. Roadways and travel ways are segmented in manageable sections post-construction. Construction plans, county or city boundaries, intersections, estimated right-of-way, and reference points from the field are utilized by the Districts to determine the start and end locations of sections by using one or more of the following methods:

- Distance Measuring Instruments (DMI).
- Global Positioning System (GPS) equipment.
- Terrestrial street-level imagery.
- Construction as-built plans.
- Official designation paperwork.
- Cartographical maps.
- Geographical Information Systems (GIS).
- Aerial imagery.

2.5 RCI Roadways and Travel Ways

One of the critical RCI functions is to manage roadway and travel way location segment records by unique IDs, also known as the roadway ID. A very important use of roadway ID involves providing the ID with joined features, characteristics, and financial information for system level summary reports for Work Program or performance reporting required by Florida's legislature. An equally important use of the roadway ID is to provide the related information to federal reporting processes required in federal law and monitored by the FHWA to perform state apportionment of transportation funds. This critical function of RCI allows the Department to meet its business data obligation amongst others which have grown since RCI's conception.

The roadways and travel ways assigned to a roadway ID in RCI include roads mainly related to the ownership, right-of-way, maintenance, preservation, mobility, and accessibility of the SHS (F.S. § 335.01) as well as county roads and city streets of interest to FDOT. These roads are commonly referred to as On-System roadways. Roadways and travel ways that are not owned or maintained by the Department are also included in the RCI system and referred to conversely as Off-System roadways. In either situation, these road statuses and their planned or existing locations are added and managed in RCI to track the changes and updates to provide the most up to date information for the business users. The locations are joined with the financial project management databases to track the construction project funding phases for the SHS. This helps to document FDOT's mission to support the responsibility of maintaining a safe, multimodal transportation system that ensures the mobility of people and goods. The locations of roadways or travel ways that are to be included or inventoried in RCI and represented in the LRS are:

- Roadways or travel ways that receive state or federal funding for construction projects through FDOT's Office of Work Program and Budget Financial Management (FM) Systems.

- Roads owned by the state or once owned by the state.
- On or proposed for the NHS.
- On or proposed for the National Highway Freight Network (NHFN).
- On or proposed for the Strategic Intermodal System (SIS) or SIS connector.
- Roadways functionally classified higher than local classification.
- Roadways that receive funding through Local Agency Programs (LAP).
- Roadways that receive funding for safety improvements.
- Roadways that are on, below, or around bridges.
- Frontage and service roads.
- Wayside parks.
- Rest areas.
- Weigh stations.
- Park and rides.
- Bicycle paths.
- Sidewalks and shared used paths.
- Trails.
- Shared used non-motorized trails.
- Railways.
- Multimodal intersections or railroad crossings.

The location of roadways eligible for federal-aid assistance programs is also critical to FDOT's mission. FDOT attributes roadways in the RCI with FHWA's Highway Functional Classification System designation code formats as part of the HPMS schema. The HPMS data is then submitted by FDOT to FHWA which is utilized to support the apportionment and eligibility of use of federal funds and to perform system extent, condition, and performance monitoring for reports to Congress to address infrastructure decision-making.

RCI roadways are also inventoried to track the historical life cycle information of roadways and travel ways that are owned by the state which may be transitioned by mutual agreement from the state to local ownership (by the city or county or vice versa). As roadway ownership changes are updated in RCI, other situations or events that involve improvements, realignments, reconstruction, closure, or removal are recorded in the RCI system by identifying the road inventory status.

Roadway and travel way section locations stored in RCI also contain the location of assets either on or off-set to the inventory direction as well as the features and characteristics of assets on that segment. These features and characteristics represent the roadway or travel way inventory, condition, and performance for state and federal reporting requirements.

A typical list of features or characteristics stored with the roadway section include the elements in the table below.Table 2.1

TABLE 2.1 | ROADWAY SECTION DESCRIPTION

Roadway Section Element	Explanation	Example
State Road System	State Road Number	SR-20
Roadway ID	Unique Identifier	60030000
BMP	Beginning Milepoint	21.659
EMP	Ending Milepoint	22.034
Functional Classification	FHWA Functional Classification Code	04
Lanes	Number of Lanes	2
TypeRoad	Type of Road	2
Status	Section Status Exception	02
Federal System	Federal System Code	5
AADT	Annual Average Daily Traffic	7700