



Railroad Crossing Inventory Data Governance Framework

July 16, 2025 Version 1.0



NORTH CAROLINA
Department of Transportation



Table of Contents

1. Introduction	3
1.1 Objective of this Document.....	3
1.2 Background	4
1.3 Intended Audience.....	4
1.4 References	5
1.5 Revision History.....	6
1.6 Rail Crossing Stakeholders and Data Sources	7
2. Data Governance Program Goals and Objectives	9
2.1 Program Vision, Scope, and Key Performance Indicators.....	9
2.2 Objectives & Key Performance Indicators (KPIs)	10
3. Discovery Meeting & Follow Up Remote Calls	11
4. Railroad Crossing Inventory Workflow	15
5. Team Roles and Responsibilities.....	18
6. Summary and Future Direction:	19
Appendix A.....	21
Meeting Minutes	21
Appendix B.....	44
Stakeholder PowerPoint Presentation	44
Appendix C	49
NCDOT Inventory Form Fields with Responsibility.....	49
Appendix D	53
List of Rail Operators	53

1. Introduction

The North Carolina Department of Transportation (NCDOT) Rail Division, in collaboration with Arora Engineers, LLC, and supported by a State Transportation Innovation Council (STIC) grant from the Federal Highway Administration (FHWA), has developed a Data Governance Framework to enhance the management of railroad crossing data. The initiative aims to improve the quality, accessibility, and sustainability of data used for planning, safety, and operational decision-making. The framework addresses critical needs around data collection, integration, validation, reporting, and dissemination of railroad crossing data.

1.1 Objective of this Document

The objective of this report is to provide the North Carolina Department of Transportation, Rail Division with a preliminary data governance foundation to support their evolving Railroad Crossing Inventory and Federal Railroad Administration (FRA) reporting requirements. In January 2015, FRA released a revised Crossing Inventory form with instructions and a data file structure for reporting crossing inventory data to the FRA by states and railroads utilizing a Grade Crossing Inventory System (GCIS). A railroad crossing is a location where a public or private roadway or pathway crosses one or more railroad tracks, either at-grade or grade separated. Each location has an assigned U.S. DOT crossing identification number. The State files Form 6180.71 for each crossing ID which details location and classification information, railroad information, highway and pathway traffic control device information, physical characteristics, and/or public highway information.

The primary goals are to:

- Establish transparent, sustainable data management practices
- Improve data quality and update frequency
- Enable efficient federal and stakeholder reporting
- Support safety and investment decisions through data-driven insights

This report has been designed to document the workflow processes and procedures to capture requirement details from onsite inspection and inventory of at-grade crossings along railroads in North Carolina.

The intent is to provide a preliminary framework for continued process improvement of this program which includes methods to streamline third-party data requests and migration, automated quality control techniques, and the implementation of a mobile ArcGIS Field Maps data collection procedure.

The data governance workflow includes the use of Geographic Information Systems (GIS) which link geospatial data, or representations of the location of railroad crossings,

with additional characteristics of these features stored as attributes and information with additional data elements summarized as metadata. Although the GIS helps people find information, conduct analyses, and print maps/reports, it is also a system that benefits from prerequisites of data standards, defined staff roles/responsibilities, data maintenance workflows, etc.

1.2 Background

As noted above, the FRA hosts the National Rail-Highway Crossing Inventory database (also known as Grade Crossing Inventory System or GCIS). The largest and most significant freight rail carriers in the U.S are Class I railroads which are required to maintain a separate database for crossings on their respective systems and to submit crossing inventory data electronically to FRA. Class III railroads (also known as Short Line Railroads) may or may not maintain a separate database for those crossings on their respective systems and may submit data electronically or in other formats as described by FRA.

Class I railroads, due to their size and complexity, have developed comprehensive systems to maintain and distribute crossing data, while Short Line railroads tend to have proportionally simpler means of compiling their data. Thus, for NCDOT Rail Division, it is important to compile all available data on rail-highway and pedestrian crossings from all sources and incorporate this information into their Crossing Safety processes. Crossing Inventory is not only a means of collecting data for North Carolina DOT but also serves as a basis for project prioritization and providing data to others depending on the accuracy and reliability of this data for crossing safety. The Rail Division actively shares data with all relative agencies and continually evaluates the reliability and accuracy of the data maintained in the Statewide Authoritative Railroad and Highway (SARAH) database. The SARAH crossing inventory database is equipped to communicate electronically with FRA and to provide reports as appropriate to all railroad companies and customers of NCDOT Rail Division.

1.3 Intended Audience

The Governance Document is primarily intended for NCDOT Rail staff and consultants who are directly overseeing and managing the RR Crossing Inventory and GCIS reporting process. Specific NCDOT staff include applicable Directors, Supervisors, and Managers of the organization, as well as other team members from the GIS Unit, FRA, Federal Highway Administration (FHWA), and NC Department of Information Technology (NCDIT). Consultants include Project Managers, Data Maintainers, Developers, and Subject Matter Experts (SMEs). These individuals will require the most in-depth familiarity with the document.

1.4 References

1.4.1 Normative References

Normative resources are those that refer to standards and technical specification documentation that provide requirements that are considered essential for agencies to follow in order to be compliant with the main standard. These are to be tied to specific FRA policies and procedures.

- 2016 Federal Railroad Administration Guide for Preparing U.S. DOT Crossing Inventory Forms
- 2019 FRA FHWA Highway Crossing Handbook v3
- 2019 FRA Instructions for Electronic Submission of U.S. DOT Crossing Inventory Data Grade Crossing Inventory System (GCIS) v2.9.0.0
- 2019 FRA Web User Guide Grade Crossing Inventory System (GCIS) v2.9.0.0
- 2020 Grade Crossing Inventory System (GCIS) Release Notes v2.10.1.0

1.4.2 Informative References

Informative references are resources to be used as suggestions and guidance to expand upon or help clarify information in this document. This includes standards and technical documents that can help fulfill Rail Division business goals.

- 2019 NCDOT Rail Division Inventory Manual Update
- 2021 FRA Compilation of State Laws-7th Edition
- 2023 MUTCD 11th edition
- SARAH Field Data Types and Lengths
- SARAH TABLES

1.5 Revision History

Name	Date Modified	Version
Thomas Tiner (Arora)	July 16, 2025	Version 1.0

1.6 Rail Crossing Stakeholders and Data Sources

This section includes a list of rail crossing stakeholders with data points for their participation in the continuous update and improvement of data associated with the rail crossing records.

GIS Unit/NCDOT Road Inventory

- Connecting to the Linear Reference System (LRS) data to validate highway route information and maintenance responsibilities
- Ongoing processes to validate and rectify errors in the LRS, which may also impact rail crossing data.
- Coordinating on electronic field inventory
- Submitting railroad reference layer geodatabases, including crossing layers, for publication

Traffic Engineering

- Obtaining highway vehicle counts over public railroad crossings, primarily through tube counts
- Counts are actually performed at the crossings which may provide a more accurate measurement of traffic traveling over the crossing than counts up- or downstream which may have roads or driveways adding or removing vehicles
- The currently established methodology for requesting crossing counts is part of Traffic Engineering's larger contract and can be somewhat restrictive and cumbersome for Rail Division needs
- Not all crossing locations are suitable for standard tube counts
- Alternatives are being considered, including the use of AADT modeling software such as StreetLight

School Bus Data (ITRE/UNCC Urban Institute)

- Annual datasets received and used to populate school-bus related fields
- Received data is compiled from datasets submitted by individual school districts and lacks consistency. Received data is also questionable and/or out of date for many areas and difficult to resolve.

Next Gen 911/PSAPs

- Shapefiles of railroad crossings provided for use as reference in emergency responder dispatching

Railroads/FRA

- Is responsible for the data assorted “rail-responsibility” fields, including train speeds and movement volumes, on the crossing inventory form obtained from the FRA crossing database or directly from the railroads as available; similarly, “state-responsibility” data submitted to the FRA crossing database or directly to the railroads
- Railroad-provided data may be questionable, including inconsistencies between data points along a railroad, discrepancies between the data and known field conditions, etc. Unfortunately, the data is also difficult to validate.

2. Data Governance Program Goals and Objectives

2.1 Program Vision, Scope, and Key Performance Indicators

NCDOT desires to continue and enhance stakeholder collaboration as described in Section 1.2, to streamline and perform continual process improvements to ensure the timeliness, accuracy and integrity of railroad crossing data entered into both the SARAH and FRA GCIS databases.

2.1.1 Vision To organize and consolidate NCDOT Railroad Crossing data into a sustainable Enterprise framework that meets business requirements and goals in a consistent, reliable, and timely manner through the delivery of geospatial applications and data migration services.

2.1.2 Scope The activities that are conducted to establish and sustain this program are organized into the following three tracks with key activities.

- **Data Track:**
 - Consolidate data into a central repository, with database(s) architected and implemented
 - Create standards, templates, and procedures for development and maintenance of data
- **Technology Track:**
 - Specify and implement technical architecture with hardware, software, and other components
 - Document design and configuration parameters to support the technical architecture
 - Facilitate the integration of various sources of authoritative crossing data to establish dynamic data validation, reporting, and reconciliation and to maintain high confidence in crossing data.
- **Governance Track:**
 - Establish, develop, and maintain documented business process workflows and organizational structure to guide and prioritize process improvement
 - Develop, execute, and enforce policies and procedures to effectively guide NCDOT staff and other stakeholders to continue meet FRA reporting requirements
 - Define and describe the resources used to manage these business processes (SARAH, GIS desktop web apps, Mobile Apps, and Reports/Dashboards) and note that the legacy paper process can be used as backup to technology challenges
 - Design training program to educate and facilitate staff support and adoption of technology

2.2 Objectives & Key Performance Indicators (KPIs)

Progress towards achieving the goals described above should be tracked with Key Performance Indicators (KPIs). KPI examples can be categorized as follows. Qualitative “Low, Medium, High” indicators can be assessed for each KPI initially and later refined into more quantitative metrics as the program matures.

Overall Benefits

Communication

- Continual collaboration with stakeholders to facilitate data exchange and reporting compliance

Efficiency

- Existing tasks can now be performed quicker

Enhanced Capability

- New capabilities that provide a measurable benefit to the organization
- Implementation of mobile inventory solution

Quality of Data

- Implementation of automated data validation procedures
- Data quality as measured by comparison of the crossing record data set to other authoritative data sources

Program Performance

- Number of tasks behind schedule (compared to baseline schedule)

SMART Criteria

Each objective/KPI should meet SMART criteria, which is a well-established method of effective project management. SMART is an acronym meaning:

- **Specific** - target a specific area for improvement.
- **Measurable** - quantify or at least suggest an indicator of progress
- **Achievable** – how realistic is the objective, based on other constraints/factors
- **Relevant** – does the objective match NCDOT’s other efforts and business needs
- **Time-bound** – specify when the result(s) can be achieved

The KPIs established to monitor the success of this program are to be selected and defined based on these SMART criteria.

3. Discovery Meeting & Follow Up Remote Calls

The focal point of this data governance project was to schedule a series of onsite and virtual/remote working sessions with key stakeholders to understand and document the entire railroad crossing inventory workflow.

Internal and external stakeholders, including the NCDOT GIS unit, traffic and structures teams, school transportation groups, railroads (Class I and short lines), and federal agencies were engaged to ensure a collaborative approach. Monthly meetings and stakeholder interviews helped define roles, capture workflows, and gather essential input and data.

The following is a list of the meeting dates with a high-level summary of the discussion content. Complete meeting minutes can be found in Appendix A.

September 5, 2024 – Discovery (Onsite)

The meeting focused on the management and governance of Rail crossing GIS data and inspection procedures. Discussions included various aspects of managing and updating railroad crossing data, particularly in relation to the Federal Railroad Administration (FRA) database, which included data validation, state and railroad responsibilities, discrepancies in data, and the use of different tools and processes for data collection and management.

Key points included the use of ArcGIS Online for data sharing, the transition from paper-based to mobile-based inventory management, and the integration of highway and railroad data. The team discussed the importance of accurate data validation and the need for continuous updates to the FRA database. They also highlighted the challenges of managing public and private crossings and the potential for collaboration with railroads to improve data accuracy.

Crossings are inspected on a three-year cycle with regions divided to balance workload. At this time, paper forms are still created for field assessments and used to manually update the SARA database. The team has developed and is testing a mobile application which is anticipated to replace the paper-based system once successful testing of data collection and validation are completed.

October 30, 2024 – Input Data Sources (Virtual)

The focus of this meeting was to gather details on input data sources that were referenced during the onsite visit 9/5/24. The call started with a brief discussion on 9/5/24 meeting minutes submitted which were revised based on feedback and posted to the project SharePoint site on 10/30/24.

Data sources which were discussed included the following:

- School Bus route data
- NCDOT linear referencing system (LRS)
- Federal Highway Administration's Highway Performance Monitoring System (HPMS)
- Bridge structure data – related to rail crossing
- Annual Average Daily Traffic (AADT) counts
- Tube counts
- Traffic Signal Preemption
- Emergency Service Routes
- Railroad specific details including a list of operators and those which NCDOT has delegated authority for data entry into FRA's GCIS

December 12, 2024 – Workflow Diagram Review (Virtual)

The meeting focused on reviewing the initial draft workflow diagram, updates on crossing records, data management, and future steps related to inspections and data integration. Key discussions revolved around data reconciliation, the use of technology in data collection, and planning for subsequent stakeholder engagement.

January 15, 2025 – Railroad Crossing Updates (Virtual)

The meeting focused on improving the workflow for managing railroad crossing data and updates. Key discussions revolved around the creation and updating of crossings, the integration of school bus data, and enhancing communication with stakeholders.

Challenges in obtaining updated school bus data from counties and managing routing information were highlighted. Integrating data from highway traffic signals and structures units was also discussed to ensure comprehensive record-keeping. Additionally, the idea of including resurfacing information in the crossing records was considered.

The team emphasized the importance of documenting the process of creating new crossings, primarily handled by railroads unless delegated to the department.

The group outlined the need for clear templates for state and railroad operator data to facilitate efficient data management. The next steps include finalizing the workflow document, setting up internal stakeholder meetings, and developing an outline for a technical report on data updates and integration processes.

This meeting set the stage for improved coordination among different entities and a clearer process for managing railroad crossing data, which is vital for safety and infrastructure planning.

February 2, 2025 – New Crossing Process (Virtual)

The meeting focused on discussions surrounding the process of creating new railroad crossing records, updating workflows, and integrating data into the FRA and internal databases. Arora reviewed the overall RR Crossing workflow diagram and the group agreed that the diagram reflected the current business process.

Christopher Raichle provided a demonstration on creating new crossing records in the system, explaining the responsibilities of railroads versus state authorities in submitting data. He reviewed a process outline (New Crossing Creation.docx) drafted earlier in the week.

The team discussed challenges in syncing data between the FRA and internal databases, particularly the need for improved future automation via an Application Programming Interface (API).

The importance of validating crossing data, including latitude/longitude corrections and ensuring state-required fields are populated, was emphasized. The group also touched on GIS data publication and its integration with external entities, such as the Next Gen 911 system. Future discussions should include refining the workflow documentation, finalizing integration processes, and exploring GIS-related updates. The meeting concluded with a plan for follow-ups, including reviewing the shared document on the crossing process and a future discussion on GIS data management.

February 20, 2025 – GIS Application Review (Virtual)

The purpose of this meeting was to review the GIS update and maintenance process for railroad crossings and tracks and discuss data submission to the North Carolina Department of Transportation (NCDOT) GIS unit. This assisted in understanding the importance and process of maintaining GIS datasets and their integration with the SARAH database.

One of the future enhancement goals of the Rail Division is to automate the movement of data between SARAH and GIS, as well as support the continued development and implementation of a complete mobile inventory solution with real-time field data entry.

February 25, 2025 – Structures and Signal Teams (Virtual)

The meeting focused on data governance for railroad crossing inventory, particularly regarding signals and structures. Key discussions revolved around improving data integration between the crossing inventory database (SARAH), signals, and structures databases. Attendees explored opportunities for better validation processes, enhanced data sharing, and tracking changes to ensure accurate record-keeping.

Highway traffic signals and structures teams discussed current database structures, challenges with linking crossing data, and potential solutions, such as implementing structured identifiers for crossings within their databases. Highway traffic signals representatives highlighted the need for accurate preemption data, while structures representatives clarified their data's scope and upcoming transition from Oracle to SQL Server.

Action items included obtaining schema details from both highway traffic signals and structures teams and evaluating ways to integrate their data with the crossing inventory system. The meeting emphasized the importance of continuous validation processes and potential future API integrations to streamline updates.

April 24, 2025 – Stakeholder Presentation (Virtual)

Arora and the Rail Division co-presented the goals and objectives as well as the preliminary results of this data governance process. A copy of the PowerPoint presentation can be found in Appendix B. A summary has been provided below.

The NC Department of Transportation Rail Division, with support from Arora Engineering and FHWA funding, developed a Data Governance Framework to improve the management of railroad crossing data. The project objectives are to enhance data quality, accessibility, and sustainability through standardized processes for data collection, validation, integration, and reporting. Key stakeholders include internal DOT teams, school transportation authorities, and railroad operators.

Core elements include the use of the SARAH system, integration with the Linear Reference System (LRS), and the adoption of automated workflows and validation methods. The framework supports data federalization, allowing decentralized data to be accessed via centralized systems leveraging APIs.

Future goals include deploying mobile tools for field data collection, improving communication with stakeholders, increasing public data access via GIS platforms,

and supporting continuous process improvement. This initiative serves as a model for expanding data governance practices across NCDOT.

Outside stakeholder participants included the following:

NCDOT

- GIS Unit – Erin Lesh and Michael Schoen
- Traffic Signal Managers – Zachary Little, Richard Zinser

NCDIT

- Structures Unit – Timothy Barrera

FRA

- Crossing Contact – James Dahlem

School Bus Data Managers

- Drew McGomery, Kevin Harrison

Railroads

- Norfolk Southern Railway – Joe Bamert
- Carolina Coastal Railway – Alan Bridgers

FHWA

- Brad Hibbs

4. Railroad Crossing Inventory Workflow

Results from the Discovery and subsequent virtual follow up meetings were the development of a comprehensive business process railroad crossing inventory workflow diagram as illustrated on page 14 of this report.

There are currently approximately 3,700 public, open gate, at-grade rail crossings throughout the state and therefore an associated three (3) years inspection cycle has been designed and used for scheduling the crossing inspections.

Securing input data from external sources to load into the rail crossing database is extremely important to ensure that associated crossing data fields are populated, at a minimum, annually (i.e., bus route data). AADT traffic count data is supplemented with NCDOT pneumatic tube counts at predetermined crossing locations based on age of AADT data, establishing a new crossing, areas exhibiting substantial growth, and other prioritization parameters. Roadway details of at-grade-crossings is provided by NCDOT's Linear Referencing System (LRS) which includes state route, milepost, and other roadway specific characteristics associated with the crossing inventory records.

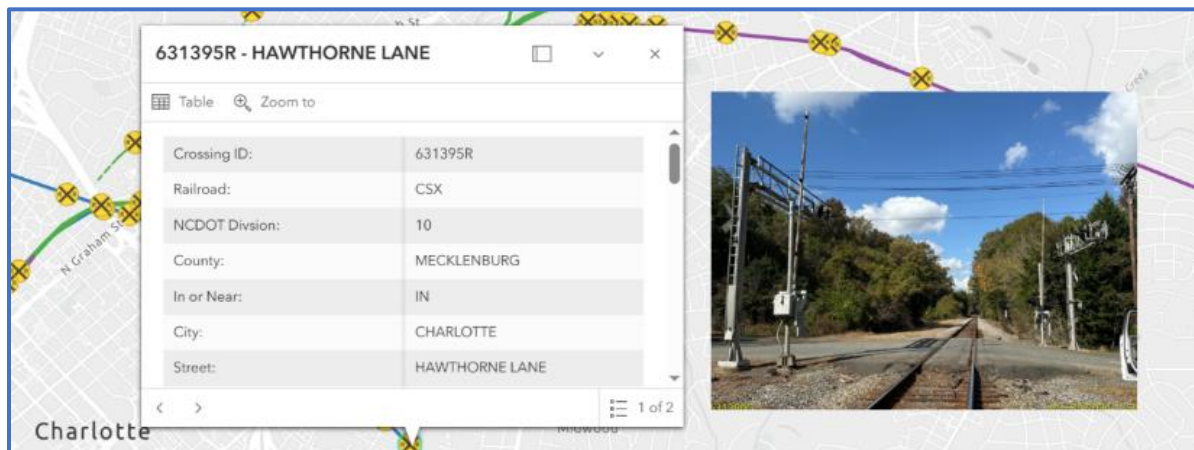
The SARAH database is NCDOT's container of authoritative crossing data as well as other details about the highway network intersecting with the rail lines. Currently crossing inspection forms are printed from the SARAH database for use and update during field inspections. The Rail Division has automated the process of capturing required crossing pictures using a

mobile application. Photos are published through a transfer service and links to access photos are included in GIS datasets.

Additional general rail crossing information is also available to the public through this application which is provided as a quarterly updated map service from NCDOT's ArcGIS Online Portal.

<https://ncdot.maps.arcgis.com/apps/mapviewer/index.html?webmap=352556db969240c99a06a179f56b8403>

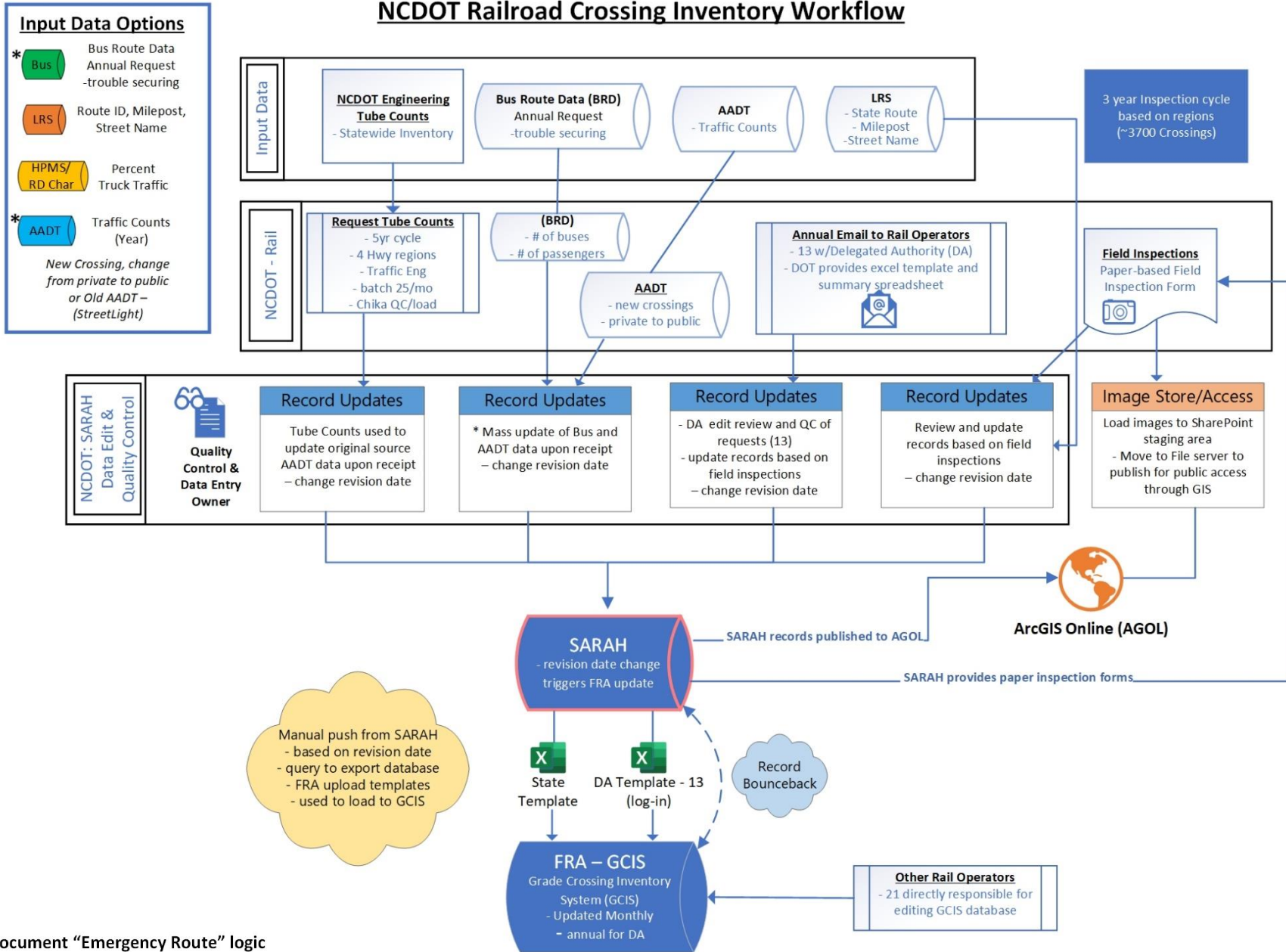
Prior to loading updated records into SARAH, a series of both manual and automated quality control procedures are performed to validate the updated records. Once approved, records with a change in revision date are uploaded into SARAH. On a monthly basis records are queried and extracted, based on revision dates for export using an FRA provided Excel template established as the mechanism to upload these records into FRA's GCIS. In a similar fashion, this is performed for thirteen (13) short-line railroad operators where NCDOT operates as their delegated authority for record updates. A complete list of rail operators is listed in Appendix D.



If issues occur during the GCIS validation process and/or a record is identified as non-compliant, NCDOT will receive a report and reconcile that record accordingly.

The following business process workflow diagram illustrates three (3) swim lanes of data integration, processing, and validation to document the flow of data from outside sources, and field-based inspections, to resulting record-based updates which are loaded into the SARAH database and subsequently uploaded into the FRA GCIS database for program compliance.

NCDOT Railroad Crossing Inventory Workflow



Document "Emergency Route" logic

Railroad Crossing Data Governance

5. Team Roles and Responsibilities

Roles and responsibilities are fundamental to effective data governance to ensure clarity, accountability, and consistency in how data is managed, protected, and used. The following are best practice characteristics:

1. **Accountability:** Clearly defined roles assign ownership of data-related tasks, such as data entry, validation, maintenance, and access control. This helps ensure data is accurate and up to date.
2. **Consistency:** With designated responsibilities, data is handled uniformly across departments and systems, reducing duplication, conflicts, and errors.
3. **Efficiency:** Knowing who is responsible for what streamlines workflows, decision-making, and communication, especially in cross-functional teams or when responding to data issues.
4. **Security & Compliance:** Assigning roles helps enforce data privacy, security policies, and compliance with legal and regulatory requirements by controlling who can access or alter sensitive data.
5. **Sustainability:** As staff change or systems evolve, documented roles ensure continuity and institutional knowledge retention.
6. **Collaboration:** Defined responsibilities foster better coordination among stakeholders, both internal and external, improving data sharing and integration.

In the context of the NC Railroad Crossings project, assigning roles to stakeholders such as DOT units, school districts, and railroads ensures that all parties contribute effectively to maintaining high-quality, reliable crossing data.

The following are defined roles for the NC Rail Division team:

Data Analysis and Inventory Manager

Oversees vision, team dynamics, and resource allocation to streamline business process changes and implement innovative solutions.

Data Analysis Engineer

Oversees data analysis, reporting and prioritization models for the Division. This includes crossing inventory, Amtrak Passenger/Trip and rail incident data.

Crossing Inventory Engineer

Oversees Crossing Inventory data collection, document management QA/QC, short line railroad communications and discrepancy updates.

Inventory Technician

Administers Inventory assessment QA/QC, office managed data such as AADT counts, and NCDOT crossing closure reporting.

Senior GIS Specialist

Oversee our internal and external GIS presence including rail managed data layers and web experiences using ArcGIS Online. Supports mapping and data analysis projects using GIS and other Geospatial applications used by partner business units (RTC, Rail Traffic Controller).

6. Summary and Future Direction:


This pilot initiative sets the foundation for a broader NCDOT data governance strategy. By institutionalizing structured, collaborative, and technologically advanced data management practices, the Rail Division aims to improve the accuracy and utility of railroad crossing data for safety and operational efficiency statewide.

This report was designed to document current data stakeholders, processes and identify opportunities for the enhancement of data quality, accuracy, accessibility, and consistency across internal teams and external stakeholders.

The framework defines clear roles and responsibilities, introduces structured workflows, and supports data federalization—allowing decentralized data to be accessed centrally through tools like APIs. Key components include the SARA system (the state’s authoritative railroad-highway database), integration with the Linear Reference System (LRS), quality control protocols, and mobile field inspection enhancements using Esri products.

Conclusions:

- Effective data governance is essential for maintaining accurate, timely railroad crossing data to support safety, planning, and compliance.
- Stakeholder collaboration and regular communication are critical for sustainable data integration and continuous improvement.
- Documented workflows and automation will increase efficiency and reduce errors in data collection and reporting.



Next Steps and Planned Enhancements:

- Implement API integrations and mobile field data collection tools.
- Expand stakeholder engagement, especially with school districts and other internal agencies
- Continue improving data quality through automated validation and process enhancements.
- Increase public access to updated data via GIS platforms.

Appendix A

Meeting Minutes

9/05/24



Arora Engineers, Inc.

aroraengineers.com

Meeting Title:	NCDOT – Data Governance Discovery Meeting	Date:	9/05/2024	
Location:		Time: (EST)	From:	To:
			9:00am	3:00pm

Organization/Role	Name
Arora/MottMac Consultant	Tom Tiner (A) Matt Baker (A) Paul Worley (M)
NCDOT/Customer	Todd Meyer David Mathern Chris Raichle Andrew Freeland Joshua Lowry Chicka Maduabuchukwa Jahmal Pullen

MEETING MINUTES:

Overview - The meeting focused on the management and governance of Rail crossing GIS data and inspection procedures. Discussions included various aspects of managing and updating railroad crossing data, particularly in relation to the Federal Railroad Administration (FRA) database, which included data validation, state and railroad responsibilities, discrepancies in data, and the use of different tools and processes for data collection and management.

Key points included the use of ArcGIS Online for data sharing, the transition from paper-based to mobile-based inventory management, and the integration of highway and railroad data. The team discussed the importance of accurate data validation and the need for continuous updates to the FRA database. They also highlighted the challenges of managing public and private crossings and the potential for collaboration with railroads to improve data accuracy.

Crossings are inspected on a three-year cycle with regions divided to balance workload. At this time, paper forms are still created for field assessments and used to manually update the SARA database. The team has developed and is testing a mobile application which is anticipated to replace the paper-based system once successful testing of data collection and validation are completed.

The meeting concluded with plans to develop data governance workflows and further explore integration with other state databases.

Rethinking Infrastructure®





The following meeting minutes are structured into separate topic areas which will be used as the foundation for the Railroad Crossing Data Governance technical memorandum. Some additional content has been added based on research materials reviewed post meeting.

1. **DATA** – All Rail data is stored and updated in the SARAH (State Authoritative Railroad And Highway) Database. State agencies provide updated data to the FRA (Federal Railroad Administration) database on a monthly basis. The state can only push data for certain attribute fields designated by the FRA and has no access to update fields the FRA deems to be railroad data. Data within the FRA database is checked manually for discrepancies between the state and railroad data. The state works with the railroads to update information. Data needs to be cleaned up and managed before integration with other systems.
 - Rail Crossing Layer - Maintains FRA/State attribute data for active/inactive/closed crossings as a point feature
 - Track Layer - Maintains attribute data for currently active/inactive track as a linear feature
 - Facilities Layer - Maintains known and active rail yard/intermodal/station facility locations as a point feature
 - Historic Track Layer – Maintains records of disconnected tracks for historical reference
 - Petitions and DE letters – used for updating the state highways system (more details to be requested)
 - Latitude/longitude of the crossing point should be validated using GIS to confirm proper locational alignment
 - Data sources to investigate and determine frequency of integration
 - School bus route data to update crossing records
 - NCDOT linear referencing system (LRS)
 - LRS Route ID
 - Street names (how to gather street name changes from municipalities)
 - LRS milepost
 - Highway Performance Monitoring System (HPMS)
 - Number of traffic lanes at crossing
 - Estimate of percentage truck traffic
 - Functional Classification
 - NCDOT – Bridge Structure Data (municipal bridges)
 - Railroad details (POC, contact info)
 - Need list of all active railroad agencies (CSX, Norfolk Southern, etc.)
 - State cannot update this information so coordination with Railroad agencies is required
 - Track charts
 - Traffic Count data (AADT)
 - Frequency of data incorporation





- Additional traffic counts perform specifically for crossings
 - How does DOT determine locations?
 - Traffic Signal Preemption Data
 - Only 3 in the state
 - Emergency Services Routes
- 2. SYSTEMS –**
- a. State Authoritative Rail and Highway (SARAH) database – Oracle based, custom developed application containing rail crossing, project and maintenance schedule reports. Cross referenced to the Federal Railroad Administration (FRA) public database.
 - b. FRA Database – Grade Crossing Inventory System (GCIS)
 - c. Crossing Forms – in paper format, but a mobile application has been developed and being tested
 - i. Field Maps and Survey 123
 - d. Photo Repository - SharePoint -> Shared File server
 - e. Rail Crossing Document Library - Shared File Server
 - f. Brief discussion on data discrepancy dashboard to visualize the comparison of State data to the FRA data
 - g. Bridge Structure Data (Future integration)
 - h. Highway Signal Data (Future Integration)
 - i. Highway LRS (Integration)
 - j. StreetLight Data for traffic counts
- 3. ORGANIZATIONAL –**
- a. Owns and maintains the SARAH application and Rail Division GIS Services
 - b. Crossing inventory field assessments
 - c. State agency updates to FRA
 - d. Short line railroad updates
 - e. Track reported crashes at crossings and trespasser incidents along the rail corridors
 - f. Rail data analysis and reporting
 - g. Validation Routines for Railroad and State required attributes
 - i. Spatial queries to determine connectivity between attributes as applicable
 - ✓ County
 - ✓ City/Municipality
 - h. Analysis to support rail crossing improvements via TIP
 - i. Need to establish method to track updates (ledger of history)
 - i. How to handle exceptions
 - j. Need to document current paper-based to manually entered data through to pushing data to FRA (via spreadsheets, portal, or API) – then document the process via mobile data collection





4. Additional details from the meeting –

- a. GCIS is used for managing railroad data, not available to all entities as of right now.
- b. The use of Field Maps, Survey 123, and Esri quick capture are used for data collection, navigation, and taking and managing photos. The mobile app includes functionalities for form filling and photo documentation.
- c. Photos are stored in SharePoint and then transferred to the file server during QA/QC

Conclusion - The meeting highlighted the complexities of managing railroad crossing data and the importance of accurate, up-to-date records. Continued collaboration between state agencies, railroads, and the FRA, along with the use of advanced tools and processes, is essential for effective data management.

PARKING LOT ITEMS

- Use of track charts
- Closed Crossings – historic and due to Hurricane Helene
- Bridge Structure Data (Municipal bridges)
- Public Use / Private Crossings
 - What information is captured related to private crossings (reported to FRA?)
 - More details needed on Camp Lejeune and Sunny Point
- Funded Project – changes to be tracked
- Railroad vs State data attributes within the FRA database
- Oversize/Overweight permits

ACTION ITEMS:

- Gather details on inspection regions
- NCDOT to set up SharePoint site for project related documentation
- Set up follow up meetings – State vs Railroad data updates
 - Discuss access and integration of external data sources
 - LRS/HPMS -retire/new routes
 - Petition packages
 - Division of Engineering (DE) letters
 - Railroad database
 - Traffic Count
 - Preemption
 - School bus routes
 - Emergency Services routes
 - Domain values and validation procedures





| Arora Engineers, Inc. |

| aroraengineers.com |

- Details on private crossings - Camp Lejeune and Sunny Point
- Status and demo of Field Maps application

Rethinking Infrastructure®





Meeting Title:	Follow up – Input Data Sources	Date:	10/30/24
Location:	Teams call	Time: (EST)	From: 11:00am To: 11:30pm

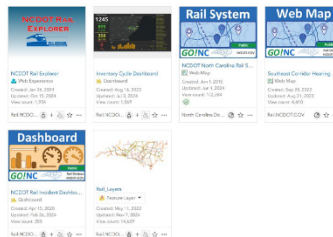
Organization/Role	Name
Arora/MottMac Consultant	Tom Tiner (A) Matt Baker (A) Paul Worley (M)
NCDOT/Customer	Todd Meyer David Mathern Chris Raichle Andrew Freeland Joshua Lowry Chicka Maduabuchukwa Jahmal Pullen

MEETING MINUTES:

Overview – Focus of this meeting was to gather details on input data sources that were referenced during the onsite visit 9/5/24. The call started with a brief discussion on 9/5/24 meeting minutes submitted which were revised based on feedback and posted to the project SharePoint site on 10/30/24 (NCDOT_Meeting Minutes_2409005_v1.docx).

Data points captured during the call below.

- Faith group HSIP (Highway Safety Improvement Program)
 - o Chris submits rail characteristics to Faith Group for the report
 - o HSIP includes the Railway-Highway Crossing Program (RHCP) – Section 130 - which is a set-aside of funds for eliminating hazards and installing protective devices at public railway-highway crossings.
- David Mathern provided links in the chat to GIS data layers and road characteristics data
 - o Data will be downloaded and reviewed
- Arora confirmed that we have access to the following AGOL content



Rethinking Infrastructure®





DATA – Data sources to investigate and determine frequency of integration

- School bus route data to update crossing records
 - Requested annually but not always provided
 - Excel format spreadsheet
 - Need to constantly follow up to have data submitted
 - Monthly updates to FRA database
 - Specific question asked about how school bus data is updated in FRA if only received annually
 - SARAH database has rule established pushes data to FRA monthly based on “revision date”
 - As Chicka updates inventory records this includes updating the “revision date”
 - Todd provided link in chat to 2016 Transportation Information Management System (TIMS) website – school bus reference [Transportation Information Management System](#)
- NCDOT linear referencing system (LRS)
 - Functional Class
 - LRS Route ID
 - Street names (how to gather street name changes from municipalities)
 - LRS milepost
- Highway Performance Monitoring System (HPMS)
 - All required information is provided via the LRS so no need for HPMS data
 - Discussion about if percentage truck traffic is available in HPMS
 - Percentage of truck traffic is captured within HPMS database
 - Currently Rail only captures this data through tube counts but is interested if HPMS provides this information (Tom to email Erin Lesh at NCDOT)
 - Arora did some research and item 24 contains truck percentage values
 - NHS – National Highway System
 - IH – Interstate Highways
 - OFE – Other Freeways & Expressways
 - OPA – Other Principal Arterials
 - MiA – Minor Arterials
 - MaC – Major Collectors
 - MiC - Minor Collectors
 - Local – Local Roads





Item 24: AADT_Combination (Combination Truck AADT)

Description: Annual Average Daily Traffic for Combination Trucks.

Use: For investment requirements modeling to estimate pavement deterioration and operating speeds, in the cost allocation pavement model, the truck size and weight analysis process, and freight analysis.

Extent: All NHS and Sample Panel sections; optional for all other non-NHS sections beyond the limits of the Sample Panel.

Functional System	Section							
	NHS	1	2	3	4	5	6	7
Rural	FE	FE	SP	SP	SP	SP		
Urban	FF	FF	SP	SP	SP	SP		

FE = Full Extent SP = Sample Panel Sections

- NCDOT – Bridge Structure Data (municipal bridges)
 - Not discussed
- Railroad details (POC, contact info)
 - Need list of all active railroad agencies (CSX, Norfolk Southern, etc.)
 - Chris to provide a list of operators and note those that NCDOT is delegated authority to update Railroad fields (ADM, etc.)
 - State cannot update this information so coordination with Railroad agencies is required
 - Delegated authority (act as railroad) to update information
 - Class 1 and a handful of short lines manage data in the (Grade Crossing Inventory System (GCIS)
 - If issue is found NCDOT will communicate to the Railroad and they would need to update the crossing record
 - Need to make Railroad operator aware of other changes to state fields or these may be overwritten by the Railroad
 - Additional discussion required to finalize this workflow
 - How can Railroads overwrite State entered data in FRA?
 - Should only be able to update their required fields
 - Track charts – not discussed
- Traffic Count data (AADT)
 - Secures data via StreetLight
 - When crossing is added or very old AADT data
 - Estimate of percentage truck traffic is a challenge – investigating HPMS as source
- Tube counts are done on a 5-year cycle through Traffic Engineering
 - Interest in other alternatives to secure traffic count information for crossings
 - David has one license of StreetLight and uses this to gather AADT for new crossings or those that changed from private to public
 - When first purchased, Street Light data was compared to tube counts and it was determined that tube counts were more accurate. Over the past couple of years, the algorithms used for StreetLight have become more reliable





- Determination of location for tube counts is based on regions
 - Traffic Engineering has 4 regions and separate contractors for each region
 - Each month Chris provides recommended locations (~25) to each region as he knows which districts are in which region
 - Chicka enters the counts upon receipt and QC of the spreadsheet/PDF from each region
 - Tom requested a copy of a monthly reports
- Traffic Signal Preemption Data – not discussed
 - Only 3 in the state
- Emergency Services Routes
 - Chris – FRA guide is vague and open-ended.
 - NCDOT spoke with FRA and requested criteria several years ago and have not received an answer – should circle back with FRA on this item
 - Default for the field is “Yes”
- From Crossing Inventory
 - Number of traffic lanes collected in field – no need for HPMS data

PARKING LOT ITEMS

- Use of track charts
- Closed Crossings – historic and due to Hurricane Helene
- Bridge Structure Data (Municipal bridges)
- Public Use / Private Crossings
 - What information is captured related to private crossings (reported to FRA?)
 - More details are needed on Camp Lejeune and Sunny Point
- Funded Project – changes to be tracked
- Railroad vs State data attributes within the FRA database
- Oversize/Overweight permits
- Domain values and validation procedures
- Details on private crossings - Camp Lejeune and Sunny Point
- Status and demo of Field Maps application

ACTION ITEMS:

- NCDOT to provide Arora will copy of monthly tube count report and spreadsheet
- Chris to provide a list of operators and note those that NCDOT is delegated authority to update Railroad fields
- Tom to email Erin Lesh (NCDOT) regarding access to HPMS data for truck percentage
- Set up a follow-up meeting
 - Goal to review draft workflow diagram to track updates from the field or input sources to SARAH and FRA on a monthly basis.





Meeting Title:	Follow up – Input Data Sources	Date:	
		12/12/24	
Location:	Teams call	Time: (EST)	
		From:	To:
		11:00am	12:00pm

Organization/Role	Name
Arora/MottMac Consultant	Tom Tiner (A) Matt Baker (A) Paul Worley (M)
NCDOT/Customer	Todd Meyer David Mathern Chris Raichle Tony Nowak

AGENDA:

- Overview of Workflow Documentation
- Discussion on Delegated Authority and Data Updates
- Tube Counts and Traffic Data Collection
- Inspection Process and Mobile Solutions
- Discrepancy Dashboard and Data Reconciliation
- Future Steps and Stakeholder Engagement

MEETING MINUTES:

The meeting focused on discussing the workflow documentation, updates on crossing records, data management, and future steps related to inspections and data integration. Key discussions revolved around data reconciliation, the use of technology in data collection, and planning for stakeholder engagement.

Key Discussion Points

1. Overview of Workflow Documentation

- Tom provided an update on documenting workflows for data management.
- The focus is on updating records for railway crossings, with specific emphasis on tube counts, delegated authority, and inspection processes.

2. Discussion on Delegated Authority and Data Updates

- Todd and Christopher discussed the process of receiving data from delegated railroads and updating records.
- Annual requests are sent to railroads for data validation and updates.
- The data is typically received in Excel format, focusing on specific fields that need updates.
- Information is requested but not often received without follow up communication





3. Tube Counts and Traffic Data Collection

- Discussion on the process of collecting tube counts for crossings, which is done in batches of 25.
- Traffic engineering teams conduct the counts, and the process is limited by scheduling constraints.
- Tube count data is primarily used to update traffic volumes in crossing records.

4. Data Upload to FRA

- Chris explained the process of uploading crossing data to the FRA, including the use of templates for data submission. The team discussed the importance of correct data to minimize bounce backs.

5. Inspection Process and Mobile Solutions

- The process for selecting crossings for inspection was discussed, primarily based on the time since the last inspection and other situational factors.
- Inspections are conducted based on a schedule divided into three cycles across the state.
- The move to a potential mobile solution for data collection was also highlighted, though the process currently is reliant on paper forms.
- The transition to mobile data collection is pending integration with existing systems.
- Todd mentioned the readiness of the front-end mobile solutions and the pending backend integration with GIS for dynamic data management.

6. Discrepancy Dashboard and Data Reconciliation

- The discrepancy dashboard in ArcGIS Online is updated bi-monthly to track and resolve data discrepancies.
- Focus areas include position, purpose, type, and lat-long discrepancies.
- Efforts are underway to reduce discrepancies and improve data accuracy.

6. Future Steps and Stakeholder Engagement

- The team discussed the importance of scheduling a stakeholder meeting to ensure alignment and obtain input on the workflow and data management processes.
- Emphasis on documenting processes and identifying future enhancements for data management.
- The team discussed potential integration with other datasets, like highway signals and structures.

Action Items:

- Todd to send screenshots of current systems for documentation
- Tom to coordinate the scheduling of the next meeting and stakeholder engagement session.
- Tom to continue refining the workflow document and addressing any outstanding items





Meeting Title:	Follow up – Input Data Sources	Date:			
		1/15/25			
Location:	Teams call	Time: (EST)			
		From:	10:00am	To:	11:00am

Organization/Role	Name
Arora/MottMac Consultant	Tom Tiner (A)
	Matt Baker (A)
	Paul Worley (M)
NCDOT/Customer	Todd Meyer
	David Mathern
	Chris Raichle
	Josh Lowry
	Chika Madaubuchukwu

MEETING MINUTES:

The meeting focused on improving the workflow for managing railroad crossing data and updates. Key discussions revolved around the creation and updating of crossings, the integration of school bus data, and enhancing communication with stakeholders.

Challenges in obtaining updated school bus data from counties and managing routing information were highlighted. Integrating data from signals and structures units was also discussed to ensure comprehensive record-keeping. Additionally, the idea of including resurfacing information in the crossing records was considered.

The team emphasized the importance of documenting the process of creating new crossings, primarily handled by railroads unless delegated to the department.

The group outlined the need for clear templates for state and railroad operator data to facilitate efficient data management. The next steps include finalizing the workflow document, setting up internal stakeholder meetings, and developing an outline for a technical report on data updates and integration processes.

This meeting set the stage for improved coordination among different entities and a clearer process for managing railroad crossing data, which is vital for safety and infrastructure planning.

Key Discussion Points

- 1. Creation of New Crossings:**
 - Responsibility primarily falls on the railroads unless delegated.
 - Importance of documenting the process.





2. **GIS Application Updates:**
 - Frequency of updates (e.g., monthly) and the interest to document the workflow.
3. **School Bus Data:**
 - Challenges in obtaining up-to-date data from counties and other entities.
 - Potential integration with the routing tool managed by UNC Charlotte and Institute for Transportation Research and Education (ITRE).
4. **Data Integration:**
 - Discussion on integrating data from other units (signals, structures, etc.).
 - The possibility of adding resurfacing information to the records.
5. **Delegated Authority for Railroads:**
 - Different processes for state fields and railroad fields in SARAH.
 - Use of FRA templates for state and rail operator data.
 - Chris to provide schema for SARAH and sample templates
6. **New Crossings Workflow:**
 - Importance of documenting the process of creating new crossings.
 - Communication with railroads for the assignment of crossing IDs.
7. **Stakeholder Meetings:**
 - Plan to hold internal and external stakeholder meetings.
 - Setting up calls with stakeholders focused on signal and structure teams and then those responsible for providing the bus routing data
 - Medium term – scheduled overall stakeholder meeting for all group (focus on education related to the importance of their active participation in providing requested data to support the RR Crossing records
 - Ensuring thorough documentation for communication.
8. **Technical Report Development:**
 - Outlining the report structure, including data samples, update frequency, and challenges.
 - Agreement to create a schema distinguishing state responsibilities from FRA responsibilities to streamline data handling.
 - Need to model out the process for creating new crossings and updating the GIS application as part of the project documentation.

Decisions Made:

- Conduct separate meetings for different stakeholder groups, starting with internal stakeholders.
- Develop a clear workflow for updating the GIS application and creating new crossings.
- Compile and provide templates for state and rail operator data for better data management.

Action Items:

- Chris to provide Arora with SARAH schema and sample FRA template for state and rail operator data entry (delegated authority)
- Todd to coordinate and schedule call with signal and structural teams
- Tom to work with Todd to schedule call to discuss and document the workflow for a “New” crossing and then draft GIS workflow
- Todd to send screenshots of current systems for documentation
- Tom to continue refining the general workflow document and addressing any outstanding items





Meeting Title:	Discussion on New Crossing Workflow	Date:			
		2/5/25			
Location:	Teams call	Time: (EST)			
		From:	10:30am	To:	11:00am

Organization/Role	Name
Arora/MottMac Consultant	Tom Tiner (A)
	Matt Baker (A)
	Paul Worley (M)
NCDOT/Customer	Todd Meyer
	David Mathern
	Chris Raichle
	Josh Lowry
	Chika Madaubuchukwu

MEETING MINUTES:

The meeting focused on discussions surrounding the process of creating new railroad crossing records, updating workflows, and integrating data into the FRA and internal databases. Tom reviewed the overall RR Crossing workflow diagram and the group agreed that the diagram reflected the current business process.

Christopher Raichle provided a demonstration on creating new crossing records in the system, explaining the responsibilities of railroads versus state authorities in submitting data. Chris reviewed a process outline (New Crossing Creation.docx) that he drafted earlier in the week.

The team discussed challenges in syncing data between the FRA and internal databases, particularly the need for improved future automation via an API.

The importance of validating crossing data, including latitude/longitude corrections and ensuring state-required fields are populated, was emphasized. The group also touched on GIS data publication and its integration with external entities, such as the Next Gen 911 system. Future discussions will include refining the workflow documentation, finalizing integration processes, and exploring GIS-related updates. The meeting concluded with a plan for follow-ups, including reviewing the shared document on the crossing process and a future discussion on GIS data management.

Key Discussion Points

1. Workflow Documentation & Updates
 - o Revised workflow diagram reviewed, and approved as final.
 - o Review of Chris’s new crossing outline
 - o Tom to work on drafting a workflow diagram based on outline provided





2. New Railroad Crossing Record Creation
 - Process overview for railroad-initiated and state-initiated crossings.
 - Data validation for new crossings, including spatial accuracy of crossing placement.
 - FRA reporting responsibilities were clarified.
3. System & Database Synchronization
 - Discrepancies between FRA and internal SARAH database was discussed.
 - Potential future API integration to automate data transfers.
4. GIS & Data Integration
 - Discussion on public-facing GIS data updates and management.
 - Coordination with external entities like NCDIT for Next Gen 911.
 - Plan for follow-up with GIS lead, David Mathern.
5. Next Steps & Follow-Ups
 - Review and provide feedback on shared workflow document.
 - Future meeting on GIS data integration and publication.
 - Meeting with signals and structures team scheduled for February 25, 2025.

List of Decisions Made During the Call

1. Finalization of Workflow Diagram
 - The revised workflow diagram was reviewed and considered the final draft, pending any minor last-minute changes for the overall report.
2. Process for New Railroad Crossing Records
 - Confirmed the two types of crossing creation processes:
 - Railroad-Initiated Crossings: The railroad submits the record to the FRA, and the team enters it into the internal Sarah database.
 - State-Initiated Crossings: The team contacts the railroad to confirm if a crossing number exists; if not, they assist in creating one.
3. Data Validation and FRA Synchronization
 - Regular data validation will continue to ensure correct crossing records, particularly geographic accuracy (latitude/longitude corrections).
 - A monthly FRA download will be used to compare and identify discrepancies between the FRA and Sarah databases.
4. Future API Integration Consideration
 - The team acknowledged the potential need for an API to automate data transfers between FRA and SARAH, but no immediate implementation plan was set.
5. GIS and Public Data Integration
 - Agreed that a follow-up discussion will be scheduled to review GIS data updates and integration processes.
 - David Mathern will provide insights into how GIS data is currently managed and shared with external entities like the Next Gen 911 system.
6. Confirm Data Sharing with External Entities
 - Document any additional external data sharing requirements or special requests for RR cCrossing data.
 - Identify key contacts for external integration efforts, such as the crash database managed by the DMV.





Action Items

- Tom will draft a new crossing workflow diagram and submit to the team for review and feedback.
- A separate meeting with the signals and structures team is scheduled for February 25, 2025.
 - Ensure relevant materials and discussions from this meeting are prepared for integration into the signals and structures discussions.
 - Identify any additional data sets or integration points that should be included in the upcoming meeting.
- Tom will sync with David Mathern separately to discuss GIS data management.





Meeting Title:	GIS App Review	Date:			
		2/20/25			
Location:	Teams call	Time: (EST)			
		From:	3:00pm	To:	3:30pm

Organization/Role	Name
Arora/MottMac Consultant	Tom Tiner (A)
	Matt Baker (A)
NCDOT/Customer	Todd Meyer
	David Mathern (WGI)

MEETING MINUTES:

Purpose of Meeting

- Review the GIS update and maintenance process for railroad crossings and tracks.
- Discuss data submission to the North Carolina Department of Transportation (NCDOT) GIS unit.
- Understand the process of maintaining GIS datasets and their integration with the SARAH database.

GIS Data Updates & Submission Process

- GIS data updates are submitted quarterly to the NCDOT GIS unit.
- Updates include crossings, tracks, and facilities.
- Data is submitted as a file geodatabase and processed by the GIS unit.
- The data includes:
 - Railroad crossings (subset of SARAH data)
 - Track and facility updates
- Imagery is used to identify disconnected tracks.
- Facilities data is updated only when specifically requested as there is no consistent source for updates.

Data Processing & Quality Control

- Feature comparison tools are used to track dataset changes between quarters.
- Changes are compiled into a spreadsheet for review.
- Internal meetings review updates before submission.
- Updates to attributes are minimal, with occasional additions (e.g., county field, track types).

Internal GIS Tools & Dashboards

- Data is made accessible via the Rail System Map, a public-facing ArcGIS Online application.
- Internal dashboards track inventory cycles and changes over time.
- GIS feature services support internal inventory management, moving towards automation.





Future Improvements & Automation

- Goal to automate data movement between SARAH and GIS.
- Development of a mobile application for real-time field data entry is on hold but remains a long-term goal.
- Python scripts currently automate GIS dataset generation and processing.
- Integration with the Linear Referencing System (LRS) to improve highway number accuracy.

Next Steps

- Todd to lead an upcoming meeting with the structures team.
- Tom to begin outlining the report based on the discussion.
- Further discussions on improving data automation and mobile applications should be included as recommendation





Meeting Title:	Discussion with Structures and Signal Teams	Date:			
		2/25/25			
Location:	Teams call	Time: (EST)			
		From:	3:00pm	To:	4:00pm

Organization/Role	Name
Arora/MottMac Consultant	Tom Tiner (A)
	Matt Baker (A)
	Paul Worley (M)
NCDOT/Customer	Todd Meyer - RR
	David Mathern - RR
	Chris Raichle - RR
	Chika Madaubuchukwu – RR
	Levi Regalado
	Mohan Palleti – Resource Management Associates
	Cary Clemmons – Structures
	Zach Little – Eastern Region Signals Engineer
Nick Zinser – Western Region Signals Engineer	

AGENDA

1. Introduction
2. Overview of the SARAH Database and Crossing Inventory
3. Data Governance Discussion
4. Structures and Signals Data Integration
5. Action Items and Next Steps

MEETING MINUTES:

The meeting focused on data governance for railroad crossing inventory, particularly regarding signals and structures. Key discussions revolved around improving data integration between the crossing inventory database (Sarah), signals, and structures databases. Attendees explored opportunities for better validation processes, enhanced data sharing, and tracking changes to ensure accurate record-keeping.

Signals and structures teams discussed current database structures, challenges with linking crossing data, and potential solutions, such as implementing structured identifiers for crossings within their databases. Signals representatives highlighted the need for accurate preemption data, while structures representatives clarified their data’s scope and upcoming transition from Oracle to SQL Server.

Action items included obtaining schema details from both signals and structures teams and evaluating ways to integrate their data with the crossing inventory system. The meeting emphasized the importance of continuous validation processes and potential future API integrations to streamline updates.





Introduction

- Todd Meyer introduced the purpose of the meeting: to discuss data governance for the crossing inventory and potential integration with signals and structures data.
- Team members introduced themselves and their roles.

Overview of the SARAH Database and Crossing Inventory

- Todd Meyer provided an overview of SARAH, an Oracle-based system supporting crossing inventory data.
- The database includes project and maintenance schedules but primarily focuses on crossing inventory.
- Data is linked to the Federal Railroad Administration (FRA) database and published in the NCDOT GIS system.
- SARAH integrates crossing data with various datasets, such as LRS and traffic counts.

Data Governance Discussion

- The meeting aimed to explore how signals and structures data could be integrated with SARAH.
- The data governance project, funded by a federal grant, seeks to establish standardized workflows for managing crossing data.
- A workflow diagram was presented, outlining the process from data input to validation and publication.

Structures and Signals Data Integration

Structures Data:

- Cary Clemmons noted that structures data is currently stored in Oracle but is transitioning to SQL Server.
- The Wiggins system manages inspection data, and a new coding system is being implemented.
- The structures team tracks rail bridge locations, clearances, and signage but does not conduct structural inspections (handled by railroads).
- Many different views of the structure data have been developed for different users. In the future should consider developing one view to share out to the masses.

Signals Data:

- Zachary Little and Richard Zinser highlighted that signal-related crossing numbers are often stored as text, making queries difficult.
- Their team is developing a new signals maintenance database, which will integrate better with crossing data.
- Preemption type (simultaneous or advance) is a key data point needed from or as input into SARAH.
- Inspections occur annually, and a new pre-qualification code (211) and training was introduced to standardize preemption inspections.
- Future need to develop workflow to synchronize applicable databases

Action Items and Next Steps





| Arora Engineers, Inc. |

| aroraengineers.com |

- Structures & Signals Teams: Provide schema details on their respective data structures for integration analysis.
- Signals Team: To work on incorporating crossing ID fields for better linkage with SARAH.
- Data Governance Team: Continue workflow documentation and explore API-based validation for automated updates.
- Future Recommendation: Meeting to be scheduled for detailed discussion on schema integration if applicable and a dynamic method to report discrepancies.

Rethinking Infrastructure®



Executive Summary: Data Governance Framework for NC Railroad Crossings

The North Carolina Department of Transportation (NCDOT) Rail Division, in collaboration with Arora Engineering and supported by a State Transportation Innovation Council (STIC) grant from the Federal Highway Administration (FHWA), has developed a Data Governance Framework to enhance the management of railroad crossing data. The initiative aims to improve the quality, accessibility, and sustainability of data used for planning, safety, and operational decision-making.

Project Purpose & Goals:

The framework addresses critical needs around data collection, integration, validation, reporting, and dissemination of railroad crossing data. The primary goals are to:

- Establish transparent, sustainable data management practices.
- Improve data quality and update frequency.
- Enable efficient federal and stakeholder reporting.
- Support safety and investment decisions through data-driven insights.

Stakeholder Engagement:

Internal and external stakeholders—including GIS units, traffic and structures teams, school transportation groups, railroads (Class I and short lines), and federal agencies—were engaged to ensure a collaborative approach. Monthly meetings and stakeholder interviews helped define roles, capture workflows, and gather essential input data.

Core Components of the Framework:

- **SARRA System:** The State's Authoritative Railroad-Highway System, used for managing crossing data.
- **Linear Reference System (LRS):** Supports location-based referencing for crossings.
- **Workflow Mapping:** Comprehensive diagrams outline data flow from collection through federal reporting.
- **Data Federalization:** Promotes a future state where distributed data remains in its original systems but is accessed through centralized processes (e.g., APIs).
- **Data Validation & QA/QC:** Emphasis on automated checks and sustainable update mechanisms.

Data Sources & Frequency:

Data is sourced from field inventories, traffic counts, school bus routes, and railroad submissions. Crossings are inspected on a 3-year cycle, with additional updates as needed. Contributions from 115 school districts and various railroad operators are essential.

Future Directions:

Planned enhancements include:

- Migrating to mobile field data collection using Esri products.
- Automating data integration and validation via tools like FME.


- Improving public data access through dynamic GIS platforms.
- Increasing stakeholder collaboration and communication frequency.
- Expanding integration with public bus data where feasible.

Conclusion:


This pilot initiative sets the foundation for a broader NCDOT data governance strategy. By institutionalizing structured, collaborative, and technologically advanced data management practices, the Rail Division aims to improve the accuracy and utility of railroad crossing data for safety and operational efficiency statewide. A final technical memorandum will document findings and serve as a living reference for continued improvements.

Appendix B

Stakeholder PowerPoint Presentation



NORTH CAROLINA
Department of Transportation



Railroad Crossing – Data Governance


Todd Meyer (NCDOT) & Tom Tiner (Arora Engineers, LLC)

April 24, 2025 (10:00am – 10:30am)

Sponsored by a Federal Highway Administration (FHWA) State Transportation Innovation Council (STIC) Grant

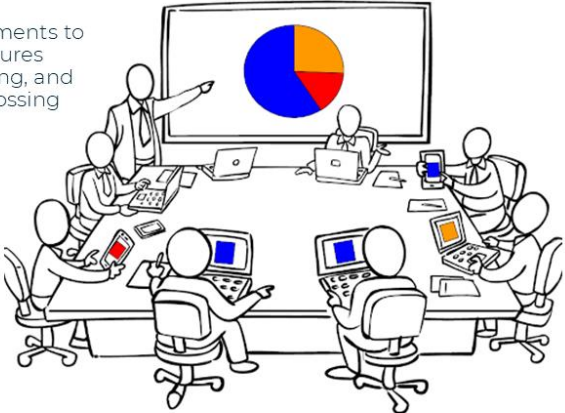
Connecting people, products and places safely and efficiently with customer focus, accountability and environmental sensitivity to enhance the economy and vitality of North Carolina

ncdot.govData Governance



Introductions

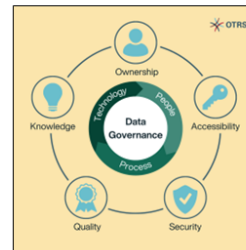
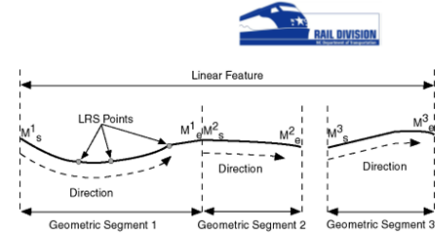
- Project Purpose
 - To review and provide recommended enhancements to the Rail Division's current processes and procedures regarding data collection, federalization, reporting, and publication/distribution surrounding railroad crossing data.
- Stakeholders
 - GIS Unit
 - Road Inventory
 - Traffic Signals
 - School Bus Routing
 - Federal Highway Administration (FHWA)
 - Railroad Agencies
 - Federal Railroad Authority (FRA)
- Goal – Continuous reporting of accurate railroad crossing data



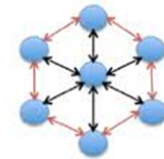
2

What's all this terminology about?

- State Authoritative Railroad And Highway System (SARAH) – NCDOT Rail Division's application and database that allows for the tracking and reporting of asset and project related data.
- Linear Reference System (LRS) - Method used to locate specific points or segments along a roadway by referencing their relative positions to known landmarks or measured distances, rather than using geographic coordinates.
- Data Governance - Is the set of rules and processes that ensure an organization's data is accurate, secure, and properly managed, so the right people can use it effectively.
- Data Federalization - Data remains in its original location but is accessed and combined virtually through a centralized system or framework.



Federated Data Model



How are we getting there?

- Facilitate stakeholder meetings to review crossing data guidance/procedures and identify roles and responsibilities to establish a sustainable and transparent railroad crossing inventory solution.
- Gather source documents for review
- Document findings and develop workflow diagrams representing enhanced methodology to capture, validate, and populate the SARAH database
- Coordinate monthly virtual calls to review progress and solicit feedback
- Recommend data validation procedures to ensure data quality and consistency
- Deliver a technical memorandum which documents and describes the entire data collection to processing lifecycle including workflow diagram and recommended validation procedures.



Crossing Inventory Form – 138 attributes

- ADT Counts - 2
- FRA Assigned - 2
- Inventory Team – 61
- NCDOT Division of Highways Data – 7
- Online Mapping Services – 3
- Rail Division – 18
- Rail Signals – 3
- School Data – 5
- Traffic Engineering – 2
- Railroad Data - 34

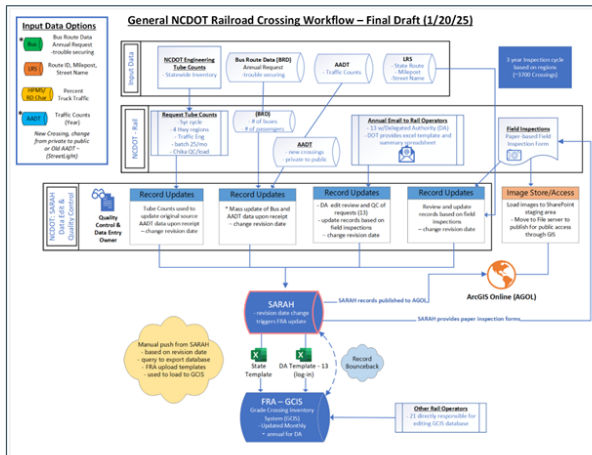
Line No.	Line Name	Line Type	Operator	Operational Status	Notes
1	Abbeville	Pass	Abbeville	Active	
2	Abbeville	Pass	Abbeville	Active	
3	Abbeville	Pass	Abbeville	Active	
4	Abbeville	Pass	Abbeville	Active	
5	Abbeville	Pass	Abbeville	Active	
6	Abbeville	Pass	Abbeville	Active	
7	Abbeville	Pass	Abbeville	Active	
8	Abbeville	Pass	Abbeville	Active	
9	Abbeville	Pass	Abbeville	Active	
10	Abbeville	Pass	Abbeville	Active	
11	Abbeville	Pass	Abbeville	Active	
12	Abbeville	Pass	Abbeville	Active	
13	Abbeville	Pass	Abbeville	Active	
14	Abbeville	Pass	Abbeville	Active	
15	Abbeville	Pass	Abbeville	Active	
16	Abbeville	Pass	Abbeville	Active	
17	Abbeville	Pass	Abbeville	Active	
18	Abbeville	Pass	Abbeville	Active	
19	Abbeville	Pass	Abbeville	Active	
20	Abbeville	Pass	Abbeville	Active	
21	Abbeville	Pass	Abbeville	Active	
22	Abbeville	Pass	Abbeville	Active	
23	Abbeville	Pass	Abbeville	Active	
24	Abbeville	Pass	Abbeville	Active	
25	Abbeville	Pass	Abbeville	Active	
26	Abbeville	Pass	Abbeville	Active	
27	Abbeville	Pass	Abbeville	Active	
28	Abbeville	Pass	Abbeville	Active	
29	Abbeville	Pass	Abbeville	Active	
30	Abbeville	Pass	Abbeville	Active	
31	Abbeville	Pass	Abbeville	Active	
32	Abbeville	Pass	Abbeville	Active	
33	Abbeville	Pass	Abbeville	Active	
34	Abbeville	Pass	Abbeville	Active	
35	Abbeville	Pass	Abbeville	Active	
36	Abbeville	Pass	Abbeville	Active	
37	Abbeville	Pass	Abbeville	Active	
38	Abbeville	Pass	Abbeville	Active	
39	Abbeville	Pass	Abbeville	Active	
40	Abbeville	Pass	Abbeville	Active	
41	Abbeville	Pass	Abbeville	Active	
42	Abbeville	Pass	Abbeville	Active	
43	Abbeville	Pass	Abbeville	Active	
44	Abbeville	Pass	Abbeville	Active	
45	Abbeville	Pass	Abbeville	Active	
46	Abbeville	Pass	Abbeville	Active	
47	Abbeville	Pass	Abbeville	Active	
48	Abbeville	Pass	Abbeville	Active	
49	Abbeville	Pass	Abbeville	Active	
50	Abbeville	Pass	Abbeville	Active	
51	Abbeville	Pass	Abbeville	Active	
52	Abbeville	Pass	Abbeville	Active	
53	Abbeville	Pass	Abbeville	Active	
54	Abbeville	Pass	Abbeville	Active	
55	Abbeville	Pass	Abbeville	Active	
56	Abbeville	Pass	Abbeville	Active	
57	Abbeville	Pass	Abbeville	Active	
58	Abbeville	Pass	Abbeville	Active	
59	Abbeville	Pass	Abbeville	Active	
60	Abbeville	Pass	Abbeville	Active	
61	Abbeville	Pass	Abbeville	Active	
62	Abbeville	Pass	Abbeville	Active	
63	Abbeville	Pass	Abbeville	Active	
64	Abbeville	Pass	Abbeville	Active	
65	Abbeville	Pass	Abbeville	Active	
66	Abbeville	Pass	Abbeville	Active	
67	Abbeville	Pass	Abbeville	Active	
68	Abbeville	Pass	Abbeville	Active	
69	Abbeville	Pass	Abbeville	Active	
70	Abbeville	Pass	Abbeville	Active	
71	Abbeville	Pass	Abbeville	Active	
72	Abbeville	Pass	Abbeville	Active	
73	Abbeville	Pass	Abbeville	Active	
74	Abbeville	Pass	Abbeville	Active	
75	Abbeville	Pass	Abbeville	Active	
76	Abbeville	Pass	Abbeville	Active	
77	Abbeville	Pass	Abbeville	Active	
78	Abbeville	Pass	Abbeville	Active	
79	Abbeville	Pass	Abbeville	Active	
80	Abbeville	Pass	Abbeville	Active	
81	Abbeville	Pass	Abbeville	Active	
82	Abbeville	Pass	Abbeville	Active	
83	Abbeville	Pass	Abbeville	Active	
84	Abbeville	Pass	Abbeville	Active	
85	Abbeville	Pass	Abbeville	Active	
86	Abbeville	Pass	Abbeville	Active	
87	Abbeville	Pass	Abbeville	Active	
88	Abbeville	Pass	Abbeville	Active	
89	Abbeville	Pass	Abbeville	Active	
90	Abbeville	Pass	Abbeville	Active	
91	Abbeville	Pass	Abbeville	Active	
92	Abbeville	Pass	Abbeville	Active	
93	Abbeville	Pass	Abbeville	Active	
94	Abbeville	Pass	Abbeville	Active	
95	Abbeville	Pass	Abbeville	Active	
96	Abbeville	Pass	Abbeville	Active	
97	Abbeville	Pass	Abbeville	Active	
98	Abbeville	Pass	Abbeville	Active	
99	Abbeville	Pass	Abbeville	Active	
100	Abbeville	Pass	Abbeville	Active	

Rail Operator	Operator Code	GCIS
Aberdeen, Carolina & Western Railroad	ACWR	Yes
Aberdeen & Rockfish Railroad Company	AR	Yes
Alexander Railroad Company	ARC	Yes
Cape Fear Railways, Incorporated	CF	Yes
Carolina Coastal Railway, Incorporated	CLNA	Yes
Cragg Mountain Railroad	CMR	Yes
Camp Lejeune Railroad	CPLU	Yes
Caldwell County Railroad Co.	CWCY	Yes
The Great Smoky Mountains Railway	GSM	Yes
Laurinburg & Southern Railroad Company	LRS	Yes
Red Springs & Northern Railroad	RSNR	Yes
Thermal Belt Railway	TBR	Yes
Yadkin Valley Railroad Company	YVR	Yes
Amtrak	ATX	No
Atlantic Railway Co. LLC	ATLR	No
Atlantic & Western Railway, L.P.	ATW	No
Blue Ridge Southern Railroad	BRU	No
Chesapeake & Albemarle Railroad Company	CA	No
Charlotte Area Transit System	CATS	No
Charlotte Western Railroad, LLC	CWR	No
CSX Transportation	CSX	No
Department of Defense	DOD	No
Kenon Railroad, LLC	KEN	No
Military Ocean Terminal Railroad At Sunny Point	MRSK	No
N.C. Transportation Museum Foundation	NCHK	No
North Carolina & Virginia Railroad Company	NCKV	No
New Hope Valley Railway	NHVR	No
Norfolk Southern Railway Company	NS	No
Raleigh & Fayetteville Railroad, LLC	RFFC	No
R J Corman Railroad Co/Carolina Lines, LLC	RJCS	No
None	UNK	No
Winston-Salem Southbound Railway	WSS	No
Wilmington Terminal Railroad Incorporated	WTRY	No
Archer Daniels Midland Co	ZAMC	No



How can you help?

Multiple authoritative data sources feed the authoritative crossing record. Therefore, facilitating dynamic data validation, reporting, and reconciliation through data federalization with these sources dynamically helps to maintain high confidence in the dataset.



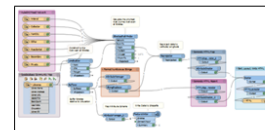
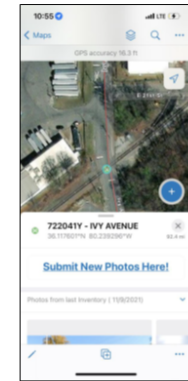
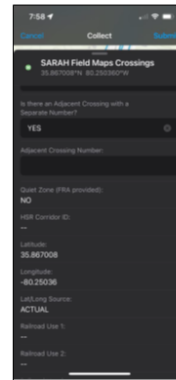
Is there an interest in supporting the integration of rail data with your data model (CrossingID)?

Can you share views of your data through publicly available downloads or through API's?

What questions do you have of us?

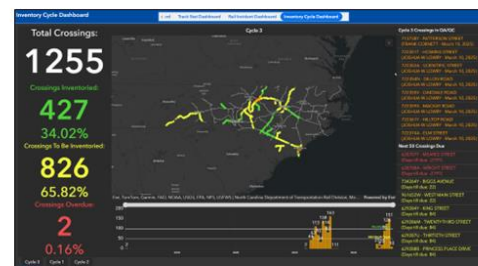
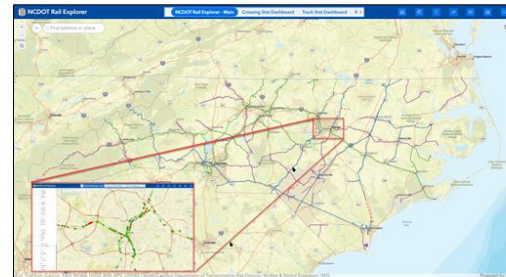
Future Enhancements

- Creation of API to facilitate data migration
- Fully implement a mobile Field Maps inventory process
 - Eliminate paper-based forms
 - Linking to navigation applications
 - Ability to work off-line
 - Data loaded to ArcGIS Online
 - Office data synchronization
- Additional automated quality control procedures (FME)
- Visual data validation procedures within GIS
- Enhance Integration with the Highway Linear Referencing System (LRS)
 - Ability to automate highway data updates at crossing
 - Crossing events are located on the LRS



Action items moving forward

- Increase frequency of communication with stakeholders
- Increased engagement with stakeholders necessary in data sharing activities & system enhancements
- Further design, test, and deployment of mobile inventory collection procedures
- Develop automation scripts support QC
- Continue dissemination of information to public via ArcGIS Online
- Continued Process Improvement





Comments & Feedback

North Carolina Department of Transportation
Rail Division

TODD MEYER, PE, MCE
Data Analysis & Inventory Manager

Mail: 1556 Mail Service Center
Raleigh, NC 27699-1556
Physical: 862 Capital Blvd.
Raleigh, NC 27603

(919) 707-4121 T
tmeyer@ncdot.gov



Thomas Tiner, GISP
Geospatial Discipline Lead
Arora Engineers, LLC

704.390.8836 mobile
ttiner@aroraengineers.com



Thank you for participating! 9

Appendix C

NCDOT Inventory Form Fields with Responsibility

A total of 137 fields of rail crossing information make up the FRA record for each crossing. The field below “Source/Collection Method”

Section	Box	Name	Origin	Responsibility	Source/Collection Method	Comments
Header	A	Revision Date	FRA	Both	Rail Division	
Header	B	Reporting Agency	FRA	Both	Rail Division	
Header	C	Reason for Update	FRA	Both	Rail Division	
Header	D	DOT Crossing Inventory Number	FRA	Both	Rail Division	
Header	E	Crossing Status	NCDOT	State	Rail Division	Open, Closed, Inactive
I	1	Primary Operating Railroad	FRA	Railroad	Railroad data	
I	2	State	FRA	State	Inventory Team	
I	3	County	FRA	State	Inventory Team	
I	4	City / Municipality	FRA	State	Inventory Team	
I	5	Street/Road Name & Block Number	FRA	State	Inventory Team	The Block Number portion of the field is optional
I	6	Highway Type & No.	FRA	State	NCDOT Division of Highways data	
I	7	Do Other Railroads Operate a Separate Track at Crossing?	FRA	Railroad	Railroad data	
I	8	Do Other Railroads Operate Over Your Track at Crossing?	FRA	Railroad	Railroad data	
I	9	Railroad Division or Region	FRA	Railroad	Railroad data	
I	10	Railroad Subdivision or District	FRA	Railroad	Railroad data	
I	11	Branch or Line Name	FRA	Railroad	Railroad data	
I	12	RR Milepost	FRA	Railroad	Railroad data	
I	13	Line Segment	FRA	Railroad	Railroad data	
I	14	Nearest RR Timetable Station	FRA	Railroad	Railroad data	
I	15	Parent RR	FRA	Railroad	Railroad data	
I	16	Crossing Owner	FRA	Railroad	Railroad data	
I	17	Crossing Type	FRA	State	Rail Division	Private, Public
I	18	Crossing Purpose	FRA	State	Rail Division	Highway, Pathway Ped, Station Ped
I	19	Crossing Position	FRA	State	Inventory Team	
I	20	Public Access	FRA	Railroad	Railroad data	Only applies to private crossings
I	21	Type of Train	FRA	Railroad	Railroad data	
I	22	Average Passenger Train County Per Day	FRA	Railroad	Railroad data	
I	23	Type of Land Use	FRA	State	Inventory Team	
I	24	Is there an Adjacent Crossing with a Separate Number?	FRA	State	Inventory Team	
I	25	Quiet Zone	FRA	Neither	FRA Assigned	Only FRA is allowed to update in GCIS
I	26	HSR Corridor ID	FRA	State	FRA Assigned	High Speed Rail
I	27	Latitude in decimal degrees	FRA	State	Online mapping services	
I	28	Longitude in decimal degrees	FRA	State	Online mapping services	
I	29	Lat/Long Source	FRA	State	Online mapping services	

Section	Box	Name	Origin	Responsibility	Source/Collection Method	Comments
I	30.A	Railroad Use	FRA	Railroad	Railroad data	Free-entry field for railroad to enter any additional data they desire
I	30.B	Railroad Use	FRA	Railroad	Railroad data	Free-entry field for railroad to enter any additional data they desire
I	30.C	Railroad Use	FRA	Railroad	Railroad data	Free-entry field for railroad to enter any additional data they desire
I	30.D	Railroad Use	FRA	Railroad	Railroad data	Free-entry field for railroad to enter any additional data they desire
I	31.A	State Use	FRA	State	Rail Division	Free-entry field for state to enter any additional data they desire
I	31.B	State Use	FRA	State	Rail Division	Free-entry field for state to enter any additional data they desire
I	31.C	State Use	FRA	State	Rail Division	Free-entry field for state to enter any additional data they desire
I	31.D	State Use	FRA	State	Rail Division	Free-entry field for state to enter any additional data they desire
I	32.A	Narrative (Railroad Use)	FRA	Railroad	Railroad data	
I	32.B	Narrative (State Use)	FRA	State	Inventory Team	optional
I	33	Emergency Notification Telephone No.	FRA	Railroad	Railroad data	field observation
I	34	Railroad Contact (Telephone No.)	FRA	Railroad	Railroad data	
I	35	State Contact (Telephone No.)	FRA	State	Rail Division	
II	1.A	Total Day Thru Trains	FRA	Railroad	Railroad data	
II	1.B	Total Night Thru Trains	FRA	Railroad	Railroad data	
II	1.C	Total Switching Trains	FRA	Railroad	Railroad data	
II	1.D	Total Transit Trains	FRA	Railroad	Railroad data	
II	1.E	Check If Less Than One Movement Per Day	FRA	Railroad	Railroad data	
II	2	Year of Train Count Data	FRA	Railroad	Railroad data	
II	3.A	Maximum Timetable Speed	FRA	Railroad	Railroad data	
II	3.B	Typical Speed Range Over Crossing	FRA	Railroad	Railroad data	
II	4	Type and Count of Tracks	FRA	Railroad	Railroad data	
II	5	Train Detection	FRA	Railroad	Railroad data	
II	6	Is Track Signaled?	FRA	Railroad	Railroad data	
II	7.A	Event Recorder	FRA	Railroad	Railroad data	
II	7.B	Remote Health Monitoring	FRA	Railroad	Railroad data	
II	8	RR Data Update Source	NCDOT	State	Rail Division	
II	9	RR Data Update Date	NCDOT	State	Rail Division	
III	1	Are There Signs or Signals?	FRA	State	Inventory Team	
III	2.A	Crossbuck Assemblies (R1-1)	FRA	State	Inventory Team	
III	2.B	STOP Signs	FRA	State	Inventory Team	
III	2.C	YIELD Signs	FRA	State	Inventory Team	
III	2.D	Advance Warning Signs	FRA	State	Inventory Team	
III	2.E	Low Ground Clearance Sign (W10-5)	FRA	State	Inventory Team	

Section	Box	Name	Origin	Responsibility	Source/Collection Method	Comments
III	2.F	Pavement Markings	FRA	State	Inventory Team	
III	2.G	Channelization Devices/Medians	FRA	State	Inventory Team	
III	2.H	EXEMPT Sign	FRA	State	Inventory Team	
III	2.I	ENS Sign Displayed	FRA	State	Inventory Team	
III	2.J	Other MUTCD Signs	FRA	State	Inventory Team	FRA field; an additional free-text box was added by NCDOT for signage not covered elsewhere in this field or on the form
III	2.K	Private Crossing Signs	FRA	Railroad	Inventory Team	Only applies to private crossings
III	2.L	LED Enhanced Signs	FRA	State	Inventory Team	Not known to exist at any crossings in North Carolina
III	3.A	Gate Arms	FRA	State	Inventory Team	
III	3.B	Gate Configuration	FRA	State	Inventory Team	
III	3.C	Cantilevered (or Bridged) Flashing Light Structures	FRA	State	Inventory Team	
III	3.D	Mast-Mounted Flashing Lights	FRA	State	Inventory Team	
III	3.E	Total Count of Flashing Light Pairs	FRA	State	Inventory Team	
III	3.F	Installation Date of Current Active Warning Devices	FRA	State	Rail Signals	
III	3.G	Wayside Horn	FRA	State	Inventory Team	
III	3.H	Highway Traffic Signals Controlling Crossing	FRA	State	Inventory Team	
III	3.I	Bells	FRA	State	Inventory Team	
III	3.J	Non-Train Active Warning	FRA	State	Rail Division	
III	3.K	Other Flashing Lights or Warning Devices	FRA	State	Inventory Team	
III	4.A	Does nearby Hwy Intersection have Traffic Signals?	FRA	State	Inventory Team	
III	4.B	Hwy Traffic Signal Interconnection	FRA	State	Rail Signals	
III	4.C	Hwy Traffic Signal Preemption	FRA	State	Rail Signals	
III	5	Highway Traffic Pre-Signals	FRA	State	Inventory Team	
III	6	Highway Monitoring Devices	FRA	State	Inventory Team	
III	7	8-Inch Flasher Lens	NCDOT	State	Inventory Team	
III	8	Traffic Signal Inventory No.	NCDOT	State	Traffic Engineering	
III	9	Other Private Signa/Signals	NCDOT	State	Inventory Team	
III	10	Preemption Inspection Date	NCDOT	State	Traffic Engineering	
IV	1	Traffic Lanes Crossing Railroad	FRA	State	Inventory Team	
IV	2	Is Roadway/Pathway Paved?	FRA	State	Inventory Team	
IV	3	Does Track Run Down a Street?	FRA	State	Inventory Team	
IV	4	Is Crossing Illuminated?	FRA	State	Inventory Team	
IV	5	Crossing Surface	FRA	State	Inventory Team	
IV	6	Intersecting Roadway Within 500 Feet?	FRA	State	Inventory Team	
IV	7	Smallest Crossing Angle	FRA	State	Inventory Team	
IV	8	Is Commercial Power Available?	FRA	State	Inventory Team	
IV	9	Vehicle Drag Marks Visible At Crossing?	NCDOT	State	Inventory Team	
IV	10	Evidence of Regular Pedestrian Traffic Over Crossing?	NCDOT	State	Inventory Team	

Section	Box	Name	Origin	Responsibility	Source/Collection Method	Comments
V	1	Highway System	FRA	State	NCDOT Division of Highways data	
V	2	Functional Classification of Road at Crossing	FRA	State	NCDOT Division of Highways data	
V	3	Is Crossing on State Highway System?	FRA	State	NCDOT Division of Highways data	
V	4	Highway Speed Limit	FRA	State	NCDOT Division of Highways data	
V	5	Linear Referencing System	FRA	State	NCDOT Division of Highways data	
V	6	LRS Milepost	FRA	State	NCDOT Division of Highways data	
V	7	Annual Average Daily Traffic	FRA	State	AADT Counts	
V	8	Estimated Percent Trucks	FRA	State	AADT Counts	
V	9	Regularly Used by School Buses?	FRA	State	School Data	
V	10	Emergency Services Route	FRA	State	Inventory Team	
VI	1	Crossing Warning Type Code	NCDOT	State	Inventory Team	
VI	2	Crossbuck Condition	NCDOT	State	Inventory Team	
VI	3	NCDOT Comments	NCDOT	State	Inventory Team	
VI	4	No. of School Bus Occupants	NCDOT	State	School Data	
VI	5	Year of School Bus Data	NCDOT	State	School Data	
VI	6	Full Turning Count Required?	NCDOT	State	Inventory Team	
VI	7	Crossing To Be Traffic Counted?	NCDOT	State	Inventory Team	
VI	8	Sight Distance Factor for Quadrant 1	NCDOT	State	Inventory Team	Options "1 - Average Above Sight Distance" and "3 - Below Average Sight Distance" are unused and will be removed in the near future
VI	9	Sight Distance Factor for Quadrant 2	NCDOT	State	Inventory Team	Options "1 - Average Above Sight Distance" and "3 - Below Average Sight Distance" are unused and will be removed in the near future
VI	10	Sight Distance Factor for Quadrant 3	NCDOT	State	Inventory Team	
VI	11	Sight Distance Factor for Quadrant 4	NCDOT	State	Inventory Team	
VI	12	Sight Distance Observed Date	NCDOT	State	Inventory Team	
VI	13	Inventory Cycle	NCDOT	State	Inventory Team	
VI	14	Inventory Date	NCDOT	State	Inventory Team	
VI	15	Inventoried By	NCDOT	State	Inventory Team	
VI	16	TIP Investigated By	NCDOT	State	Rail Division	
VI	17	TIP Investigated Date	NCDOT	State	Rail Division	
VI	18	Crossing Candidate for Improvement?	NCDOT	State	Rail Division	Will be removed from data in near future
VI	19	Photos Taken Date	NCDOT	State	Inventory Team	
VI	20	GPS Taken Date	NCDOT	State	Inventory Team	
VI	21	School Bus Node	NCDOT	State	School Data	
VI	22	School Bus LEA	NCDOT	State	School Data	

Appendix D

List of Rail Operators

The following is a list of all Rail Operators with the State of North Carolina. The Rail Division is the delegated authority for editing the records for those coded as “Yes” under the GCIS Submittals column.

Rail Operator	Operator Code	GCIS Submittals	Comments
Aberdeen, Carolina & Western Railroad	ACWR	Yes	
Aberdeen & Rockfish Railroad Company	AR	Yes	
Alexander Railroad Company	ARC	Yes	
Amtrak	ATK	No	Mostly recorded as an “other railroad” in boxes I.7 and/or I.8. Amtrak does independently own and operate tracks in other states (ex., the Northeast Corridor between Washington, DC and New York City), but not in North Carolina.
Atlantic Railways Co. LLC	ATLR	No	
Atlantic & Western Railway, L.P.	ATW	No	
Blue Ridge Southern Railroad	BLU	No	
Chesapeake & Albemarle Railroad Company	CA	No	
Charlotte Area Transit System	CATS	No	The CATS light rail system does not fall within the jurisdiction of FRA crossing inventory. Portions of the CATS alignment were formerly NS right-of-way, and so some crossings were retained in the SARAH database after the line was redeveloped for the light rail. These crossings are not currently being inventoried as part of the regular cycles, and mostly serve as historical records.
Charlotte Western Railroad, LLC	CER	No	
Cape Fear Railways, Incorporated	CF	Yes	
Carolina Coastal Railway, Incorporated	CLNA	Yes	
Craggy Mountain Railroad	CMLX	Yes	
Camp Lejeune Railroad	CPLJ	Yes	
CSX Transportation	CSX	No	
Caldwell County Railroad Co.	CWCY	Yes	
Department of Defense	DOD	No	
The Great Smoky Mountains Railway	GSM	Yes	
Kinston Railroad, LLC	KNR	No	
Laurinburg & Southern Railroad Company	LRS	Yes	
Military Ocean Terminal Railroad At Sunny Point	MRSX	No	
N C Transportation Museum Foundation	NCMX	No	Primary operator for a single crossing at the N.C. Transportation Museum in Spencer, NC
North Carolina & Virginia Railroad Company	NCVA	No	
New Hope Valley Railway	NHVX	No	
Norfolk Southern Railway Company	NS	No	
Raleigh & Fayetteville Railroad, LLC	RFCC	No	
R J Corman Railroad Co/Carolina Lines, LLC	RJCS	No	
Red Springs & Northern Railroad	RSNR	Yes	
Thermal Belt Railway	TBRY	Yes	
None	UNK	No	Used in situations where there is no current rail operator over a segment of tracks, and/or where rail operations are connected to the general railroad system network but do not fall under FRA’s jurisdiction. This includes, but is not limited to: - Crossings on out-of-service and/or “rail-banked” corridors where NCDOT owns the rail right-of-way, but which do not currently have any rail operations; - A crossing associated with a former rail switching operation at paper mill; the mill has since gone out of business, but the crossing still exists and (to our knowledge) has not been taken over by another railroad;
Winston-Salem Southbound Railway	WSS	No	
Wilmington Terminal Railroad Incorporated	WTRY	No	
Yadkin Valley Railroad Company	YVRR	Yes	
Archer Daniels Midland Co	ZAMC	No	The corresponding FRA records for these crossings show the Primary Operator as None (UNK). To the best of our knowledge, ZAMC is the code for a separate Archer Daniels Midland operation and does not apply to their operation near Southport, NC, but we use it internally for ease of identification.