

# Maintenance Rating Program

## Triangle Expressway

February 2024

2023 Fourth Quarter Report

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# 1.0 Executive Summary

The North Carolina Turnpike Authority (NCTA) Maintenance Rating Program (MRP) is a maintenance evaluation program for roadway features and toll facilities on the NCTA system. This report presents results from the 2023 Fourth Quarter Assessment of the Triangle Expressway.

The overall 2023 Fourth quarter maintenance rating of the Triangle Expressway was **95.0**, above the NCTA target rating of 90. As shown in **Table 1**, all five elements assessed achieved a rating greater than the target rating of 85.

**Table 1: MRP Element Results for the 2023 Fourth Quarter Assessment**

Element	MRP Rating	Target Rating
Road Surface	98.0	85.0
Unpaved Shoulders and Ditches	97.4	85.0
Drainage	94.9	85.0
Roadside	91.3	85.0
Traffic Control Devices	93.5	85.0
<b>Overall MRP Performance Rating</b>	<b>95.0</b>	<b>90.0</b>

This report also provides a rolling rating of the latest four quarterly inspections of the Triangle Expressway. As presented in **Table 2**, the rolling maintenance rating of the Triangle Expressway was **95.8**.

**Table 2: MRP Rolling Element Results**

Element	Q1 2023 Rating	Q2 2023 Rating	Q3 2023 Rating	Q4 2023 Rating	Rolling Rating
Road Surface	96.9	98.0	98.9	98.0	97.9
Unpaved Shoulders and Ditches	99.1	97.4	96.5	97.4	97.6
Drainage	93.3	95.7	96.9	94.9	95.2
Roadside	94.2	95.9	92.0	91.3	93.4
Traffic Control Devices	94.2 <sup>1</sup>	95.3 <sup>1</sup>	96.2	93.5	94.8 <sup>2</sup>
<b>Overall MRP Performance Rating</b>	<b>95.3<sup>1</sup></b>	<b>96.4<sup>1</sup></b>	<b>96.3</b>	<b>95.0</b>	<b>95.8<sup>2</sup></b>

<sup>1</sup>Excludes concrete surface pavement markers, striping, and symbols on mainline NC-540 and asphalt surface markers on mainline NC-885.

<sup>2</sup>Excludes quarter ratings for elements listed above.



In addition, the report provides findings of the Green Level Historic District signs inspection. This quarter, two signs were inspected. Both signs were found to be in good physical condition. The landscaped area around the two signs was maintained in accordance with NCTA MRP standards.

## 2.0 Introduction

The NCTA MRP is a comprehensive planning, measuring, and managing process that provides a means for communicating to managers, stakeholders, and customers the impacts of policy and budget decisions on program service delivery.

Using outcome-based performance measures and the service level scale (0 through 100), the inspection results are rated against established threshold criteria. The program analysis is accomplished using sampling procedures that capture the level of service being provided for individual assets. The evaluation procedure is based on the establishment of threshold conditions that quantify the maximum defect allowed on assets. Over time, the results can be charted to identify work needs and subsequent necessary actions.

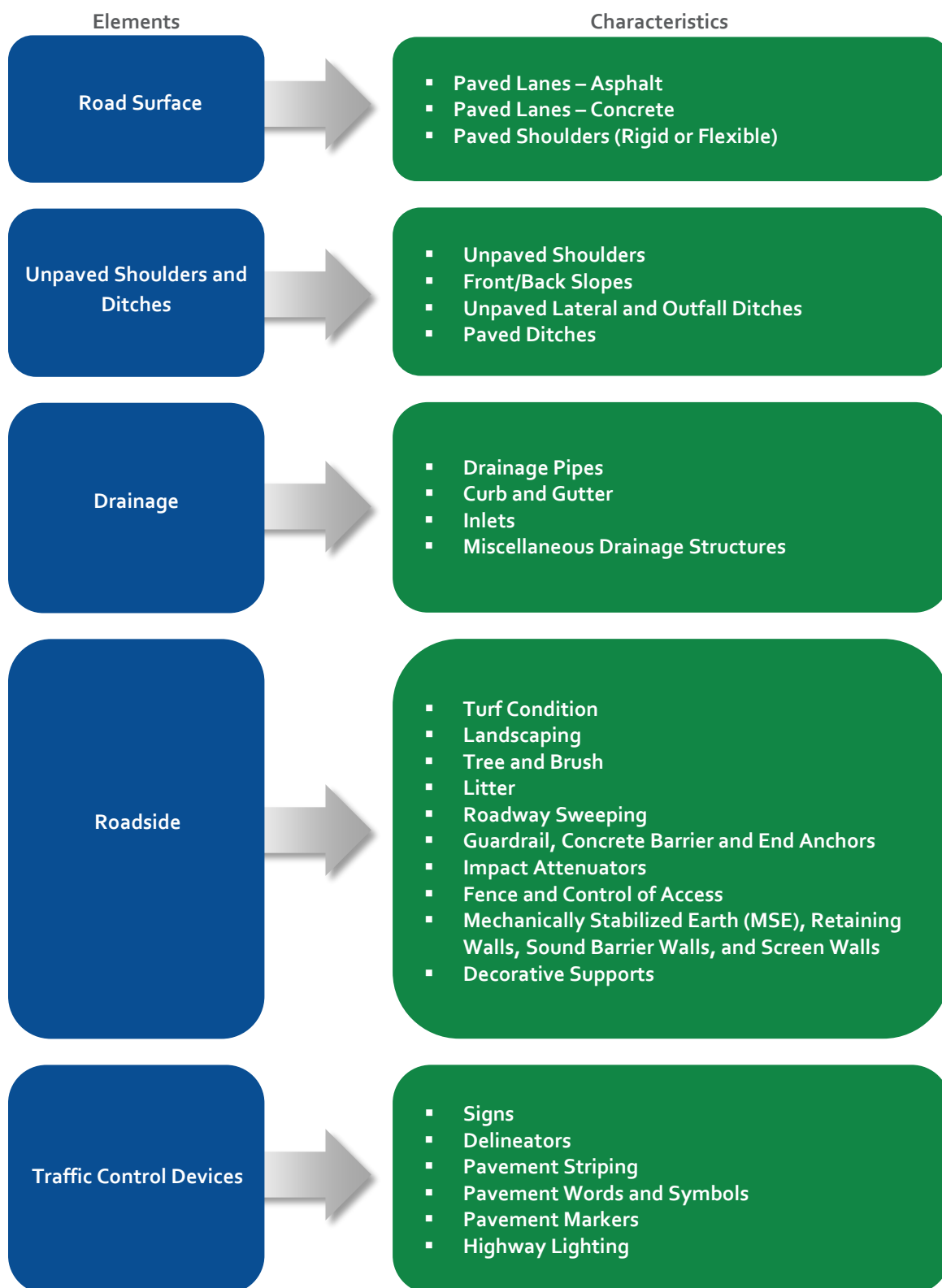
The NCTA performance standards, threshold criteria, and maintenance rating program were developed through a collaborative effort by NCTA managers, NCDOT maintenance staff, and consultants.

Using field survey information, a maintenance matrix can be developed to show the ties between maintenance activities and the characteristics of various roadway features. The purpose of this evaluation is to provide information that can be used to schedule and prioritize routine maintenance activities and provide uniform maintenance conditions that meet established objectives.

## 3.0 MRP Procedure

Per the *NCTA Roadway and Facility Maintenance Performance Standards V7*, roadway assets or characteristics on NCTA facilities have been grouped into elements. These elements and corresponding characteristics are shown in **Figure 1:**

Figure 1: Maintenance Elements and Characteristics



A weighting system has been established to identify the importance of each element and characteristic. This system consists of two weighting factors: one that accounts for the importance of individual characteristics within a given maintenance element (1-9), and one that accounts for the importance of the maintenance elements to the total rating (by % of score). This two-factor system reveals deficiencies among characteristics and elements.

The program analysis is accomplished using statistically valid, random sampling procedures that capture the level of service for individual characteristics, with a 95% confidence level in sampling. The sample characteristics selected are evaluated during quarterly inspections, which are performed during the months of February, May, August, and November to account for dynamic changes in assets during the various seasons. The evaluation process is completed using electronic data collection tablets and is based on established threshold conditions described in the NCTA Roadway and Facility Maintenance Standards V6. Those characteristics that meet or exceed the threshold are coded as PASSING; those that do not meet the threshold are coded as NOT PASSING.

When the evaluation process is completed, the number of PASSING samples and total sample are multiplied by the weighted values (1-9) to determine the actual and possible rating points for characteristics and elements. MRP ratings for elements and characteristics are then calculated as the ratio of the actual rating points to possible rating points. The MRP ratings represent the maintenance level of service currently being provided, as they define the percent of characteristics and elements that meet the maintenance condition standard. For instance, an MRP rating of 83 signifies that 83 percent of the inspected elements/characteristics met the standard.

The overall MRP rating is determined by calculating the sum of the elements' ratings multiplied by the following weighted factors:

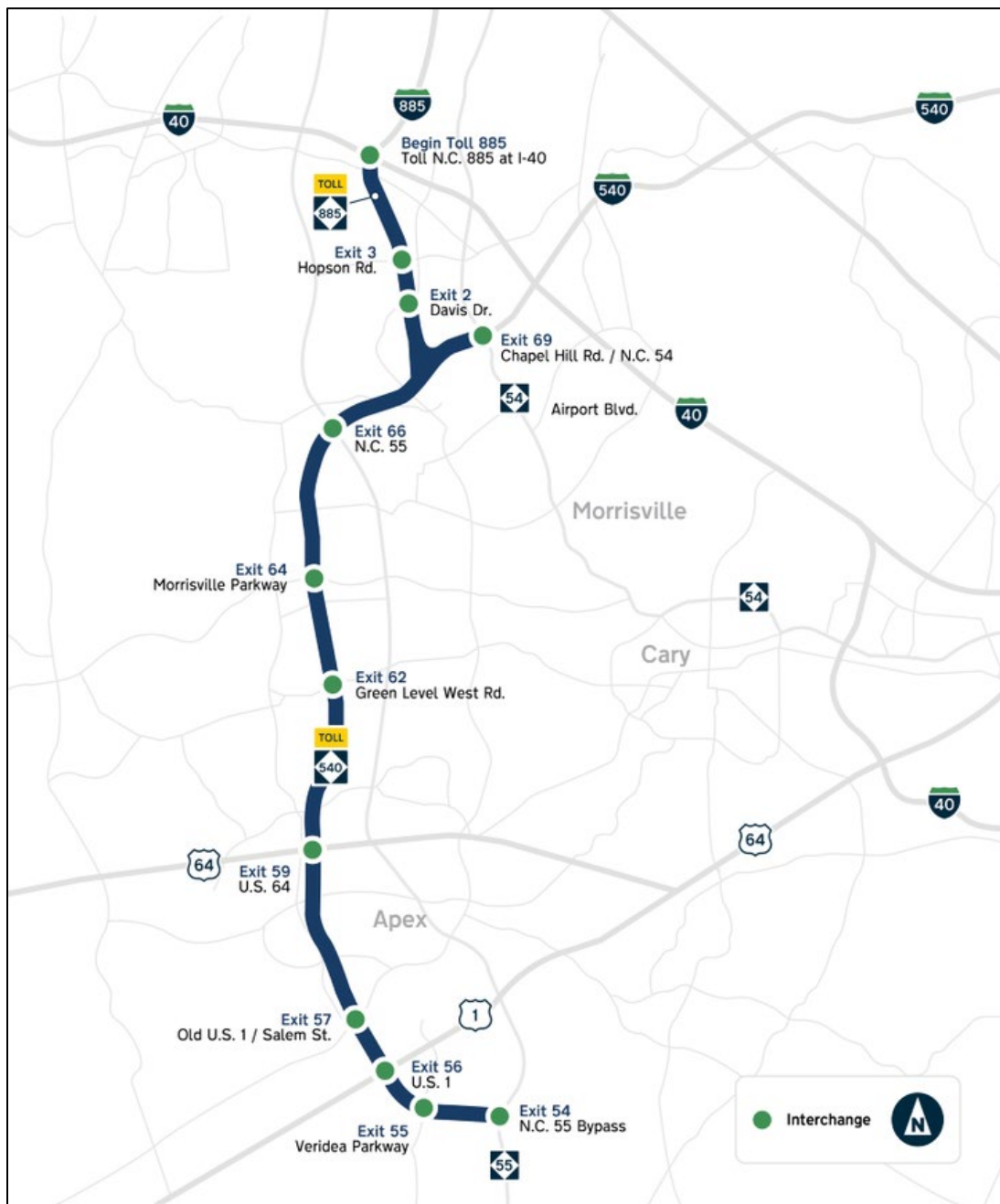
Road Surface =	25%
Unpaved Shoulders =	13%
Drainage =	15%
Roadside =	17%
Traffic Control Devices =	30%
<hr/>	
Total	100%

The NCTA's overall target rating is 90, with elements scoring 85 or higher, and characteristics 80 or higher. In addition to quarterly ratings, the cumulative rolling annual rating is calculated each quarter. This rating is obtained by adding the ratings of the latest four quarterly inspections to compensate for the likelihood of uneven sample sizes.

## 4.0 Triangle Expressway Description

The Triangle Expressway extends for approximately 18.8 miles from the interchange of I-40 and Toll NC-885 in Durham to the NC-55 Bypass near Holly Springs (*Figure 2*). It includes a one-mile segment on Toll NC-540 extending north from the Toll NC-540 / Toll NC-885 interchange to the NC-54 interchange. The Triangle Expressway consists of twelve interchanges and twenty-two all-electronic toll collection zones.

Figure 2: Triangle Expressway Map



## 5.0 Triangle Expressway Asset Inventory Update

Through normal day-to-day maintenance activities and the construction of special projects, roadside assets are continuously being added or modified on the roadway. NCTA coordinates closely with NCDOT Division 5 Maintenance and conducts routine field visits to maintain an accurate asset inventory and ensure the validity of the MRP survey.

During this quarter assets on Toll NC 540 exit ramps to and from NC-55 Bypass were removed from the inventory due to the Complete 540 construction project. **Table 3** presents the updated number of assets that are currently available for inspections.

**Table 3: Asset Inventory**

Assets	Total Inventory	2023 Eligible Inventory
Barriers	801	616
Curb and Gutter	428	391
Decorative Supports	305	298
Drainage	1179	1127
Misc. Drainage	218	202
Fences	508	483
Highway Lighting	435	430
Impact Attenuators	48	46
Inlets	1129	1075
Linear Segments	795	755
Plant Beds	266	257
Paved Ditches	2	2
Pavement Symbols	652	591
Signs	1224	1168
Tree and Brush	603	567
Turf	1074	1011
Walls	88	84

## 6.0 MRP Fourth Quarter Assessment

### 6.1 Quarterly Results

The overall 2023 Fourth quarter maintenance rating of the Triangle Expressway was 95.0, above NCTA's target overall rating of 90. All elements assessed achieved quarter ratings above the target rating of 85 established for element groups.

It is important to note that these results are only representative of the fourth quarter sample, one of the four surveys to provide an intermediate snapshot of seasonal conditions. Therefore, they are not a statistically valid representation of the assets; only the total of all four quarterly inspections, reported as the rolling rating, provide a 95% confidence level in statistical sampling. The Fourth quarter MRP performance ratings for elements and characteristics are presented in *Table 4* and *Table 5*, respectively.

**Table 4: MRP Element Results for Q4 2023**

Element	MRP Rating
Road Surface	98.0
Unpaved Shoulders and Ditches	97.4
Drainage	94.9
Roadside	91.3
Traffic Control Devices	93.5
<b>Overall MRP Performance Rating</b>	<b>95.0</b>

Table 5: MRP Characteristics Results for Q4 2023

Road Surface	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q4 Rating
Paved Lanes Asphalt	21	21	9	189	189	100
Paved Lanes Concrete	10	11	9	90	99	91
Paved Shoulder	32	32	5	160	160	100
<b>Element Total</b>				<b>439</b>	<b>448</b>	<b>98.0</b>
Unpaved Shoulders and Ditches	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q4 Rating
Unpaved Shoulder	30	32	9	270	288	94
Front/Back Slopes	32	32	6	192	192	100
Lateral and Outfall Ditches, Unpaved	32	32	6	192	192	100
Ditches, Paved	2	2	5	10	10	100
<b>Element Total</b>				<b>664</b>	<b>682</b>	<b>97.4</b>
Drainage	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q4 Rating
Drainage Pipes	33	34	7	231	238	97
Curb and Gutter	26	28	6	156	168	93
Inlets	33	34	7	231	238	97
Misc. Drainage Structure	22	25	4	88	100	88
<b>Element Total</b>				<b>706</b>	<b>744</b>	<b>94.9</b>
Roadside	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q4 Rating
Turf Condition	35	38	7	245	266	92
Landscaping	24	25	4	96	100	96
Trees and Brush	30	31	4	120	124	97
Litter	31	32	4	124	128	97
Roadway Sweeping	32	32	5	160	160	100
Guardrail, Concrete Barrier, and End Anchors	27	31	9	243	279	87
Impact Attenuators	8	9	9	72	81	89
Fence, Control Access	23	29	7	161	203	79
Retaining Walls and Sound Barrier Walls	13	18	5	65	90	72
Decorative Supports	24	25	5	120	125	96
Graffiti and Stain Removal	44	44	4	176	176	100
<b>Element Total</b>				<b>1582</b>	<b>1732</b>	<b>91.3</b>
Traffic Control Devices	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q4 Rating
Signs	31	32	7	217	224	97
Delineators	30	32	3	90	96	94
Pavement Striping/Marking	29	32	8	232	256	91
Words and Symbols	30	31	7	210	217	97
Pavement Markers	25	29	9	225	261	86
Highway Lighting	29	29	6	174	174	100
<b>Element Total</b>				<b>1148</b>	<b>1228</b>	<b>93.5</b>

Additionally, **Appendix A** includes maps that present the location of all assets assessed during the fourth quarter. **Appendix B** includes a list of the individual assets that did not achieve their target ratings.

## 6.2 Quarterly Analysis and Recommendations

### Elements

During the Fourth quarter, all elements exceeded NCTA's quarter score threshold criteria of 85. All elements received a quarter score above 90.

Road Surface (98.0) experienced a 0.2-point increase from the previous quarter's rolling rating. Paved Lanes Concrete (91) rolling rating increased by 1.0 point. All characteristics within this element continued scoring above 90 for last four quarters.

Unpaved Shoulders and Ditches (97.4) experienced an increase in rolling rating. The rating for this element was 0.1 points higher than the previous quarter rolling rating. All characteristics within this element continued scoring above 90.

Drainage (94.9) rolling rating also increased by 1.2 points from the previous quarter rolling rating. Curb and Gutter (93) and Inlets (97) rolling rating increased from last quarter by 0.9 and 2.9 points respectively.

Roadside (91.3) rolling rating decreased by 0.9 points from the previous quarter rolling rating. Guardrail (87) score decreased by 4.0 points from the previous quarter's rolling rating. Fences (79) experienced a decrease in rating of 5.4 points from the previous quarter rolling rating.

Traffic Control Devices (94.8) experienced an increase in rolling rating of 1.7 points from the previous quarter. Words and Symbols (97) experienced an increase in rolling rating of 8.4 points. Replacement of striping and markers for the remaining concrete sections was completed in Summer 2023.

Recommendations to improve specific critical characteristic ratings are provided in the following sections.

### Characteristics

This quarter, all but two characteristics, Retaining Walls and Sound Barrier Walls (72) and Fence, Control Access (79), met the NCTA target threshold criteria of 80. A description of the characteristic's conditions and future work planning recommendations are provided below. Pictures of all characteristic failures are included in **Appendix B**.



Fence and Control Access (71 rating – 23 of the 29 assets passed): Four of the six sections that did not pass had failed for openings great than 2 square feet. Two of the sections that did not pass inspection are presented in *Figure 3*.

**Figure 3: Fences and Control Access Inspection Results Sample**



Maintenance Program:

- 1) Fence shall be inspected every 4 months.
- 2) Areas where fence is adjacent to livestock or known pedestrian traffic must be secured until fence is fully restored.
- 3) Schedule and repair or replace damaged sections within the annual work program.

Maintenance and Evaluation Standards: Fencing does not meet the maintenance standards when any of the following criteria is observed:

- 1) A compression of the fence greater than  $\frac{1}{3}$  of its original height as measured from the natural ground to the top of the fence fabric.
- 2) An opening in the fence fabric greater than 2 square feet.
- 3) Any open gate in the limited access fence within the sample area.

Fence repair is scheduled through February and March of 2024.

Retaining Walls and Sound Barrier Walls (72 rating – 13 of the 18 assets passed): All five of the wall sections that did not pass inspection had unsealed cracks/joints. Two of the sections that did not pass inspection are presented in *Figure 3*.

**Figure 4: Retaining Walls and Sound Barrier Walls Inspection Results Sample**



**Maintenance Program:**

- 1) Walls shall be inspected during daily patrols.
- 2) Unwanted vegetation and graffiti (see graffiti standard) shall be scheduled for removal.
- 3) Minor wall or column damage shall be scheduled for repair within the annual work program.
- 4) Staining damage shall be scheduled for repair within the annual work program.
- 5) Any structural damage that poses a safety risk shall be scheduled immediately upon observation. Mitigate any safety hazard upon observation.

Maintenance and Evaluation Standards: MSE/retaining walls, sound barrier walls, and screen walls do not meet the maintenance standards when any of the following criteria is observed:

- 1) More than 10% of exposed surface is covered with unwanted vegetation.
- 2) Any single spall 1 inch deep or greater or cumulative spalls covering an area over 5 SF on any single facing.
- 3) More than 25% of weep holes within the sample section are not functioning properly.
- 4) Unsealed cracks or joints greater than 0.25 inches in width.
- 5) Stained areas exhibit cumulative scaling in excess of 1 SF.

## 7.0 Current Rolling MRP Rating

### 7.1 Annual Results

The 2023 annual rolling maintenance rating of the Triangle Expressway was **95.8**, exceeding NCTA's target overall rating of 90. All elements exceeded NCTA's rolling rating threshold criteria of 85. Twenty-six of the twenty-eight characteristic ratings met or exceeded the target rating of 80.

The 2023 results are presented in **Exhibit 1** and **Table 6**. These results are a collection of the four quarterly inspections conducted in the last year.

**Exhibit 1: MRP Element Results for 2023**

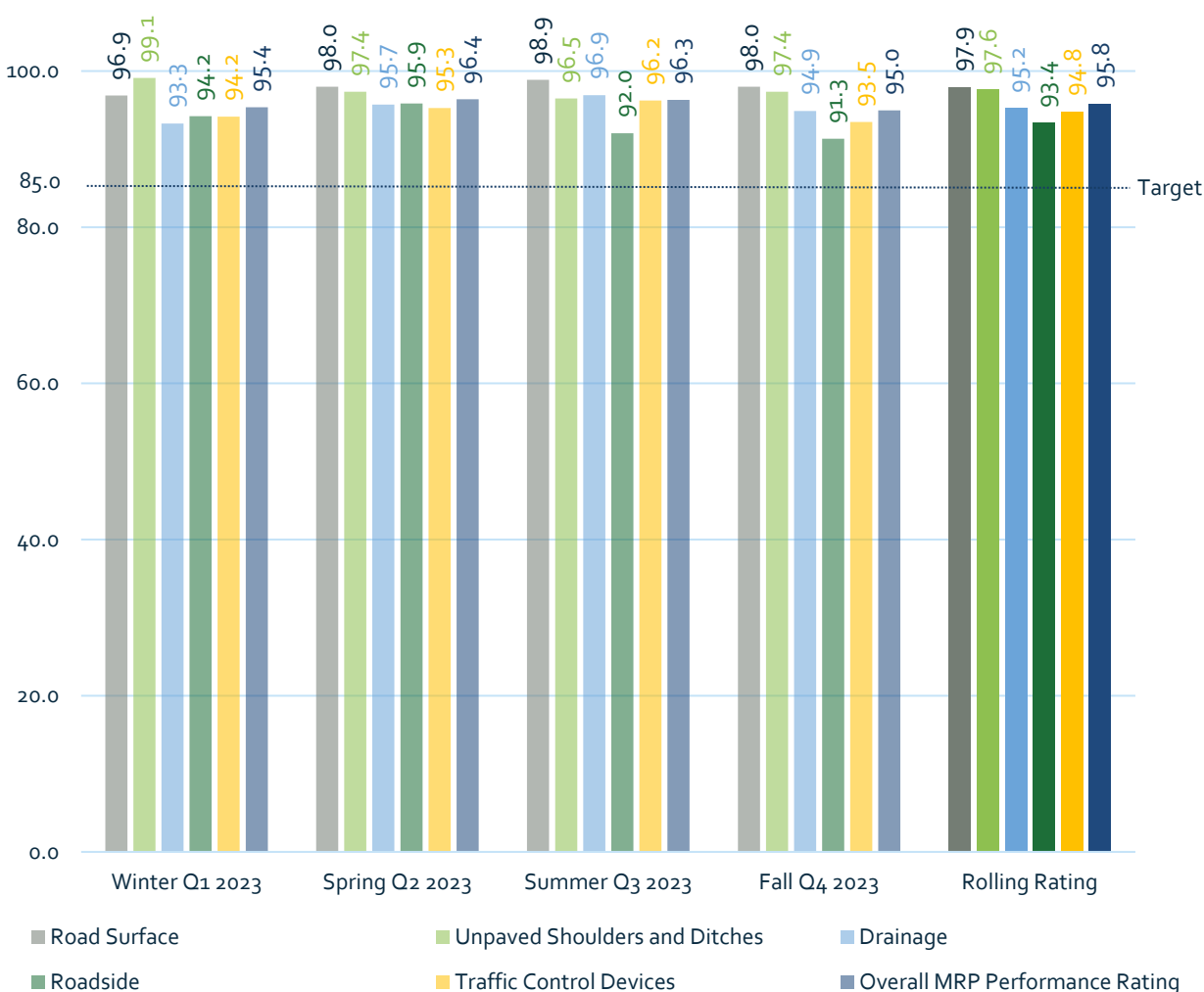


Table 6: MRP Rolling Element Results

Road Surface	Q2 2023 Rating	Q3 2023 Rating	Q3 2023 Rating	Q4 2023 Rating	Rolling Rating
Paved Lanes Asphalt	100	100	100	100	100
Paved Lanes Concrete	94	100	100	91	95
Paved Shoulder	100	97	97	100	98
<b>Element Total</b>	<b>98.0</b>	<b>98.9</b>	<b>98.9</b>	<b>98.0</b>	<b>97.9</b>
Unpaved Shoulders and Ditches	Q2 2023 Rating	Q3 2023 Rating	Q3 2023 Rating	Q4 2023 Rating	Rolling Rating
Unpaved Shoulder	94	94	94	94	95
Front/Back Slopes	100	97	97	100	99
Lateral and Outfall Ditches, Unpaved	100	100	100	100	99
Ditches, Paved	100	100	100	100	100
<b>Element Total</b>	<b>97.4</b>	<b>96.5</b>	<b>96.5</b>	<b>97.4</b>	<b>97.6</b>
Drainage	Q2 2023 Rating	Q3 2023 Rating	Q3 2023 Rating	Q4 2023 Rating	Rolling Rating
Drainage Pipes	97	97	97	97	95
Curb and Gutter	96	100	100	93	96
Inlets	97	100	100	97	99
Misc. Drainage Structure	88	84	84	88	86
<b>Element Total</b>	<b>95.7</b>	<b>96.9</b>	<b>96.9</b>	<b>94.9</b>	<b>95.2</b>
Roadside	Q2 2023 Rating	Q3 2023 Rating	Q3 2023 Rating	Q4 2023 Rating	Rolling Rating
Turf Condition	92	84	84	92	91
Landscaping	92	92	92	96	94
Trees and Brush	100	100	100	97	99
Litter	88	97	97	97	95
Roadway Sweeping	100	97	97	100	99
Guardrail, Concrete Barrier, and End Anchors	100	90	90	87	93
Impact Attenuators	100	100	100	89	97
Fence, Control Access	97	87	87	79	84
Retaining Walls and Sound Barrier Walls	78	72	72	72	76
Decorative Supports	100	100	100	96	99
Graffiti and Stain Removal	100	100	100	100	100
<b>Element Total</b>	<b>95.9</b>	<b>92.0</b>	<b>92.0</b>	<b>91.3</b>	<b>93.4</b>
Traffic Control Devices	Q2 2023 Rating	Q3 2023 Rating	Q3 2023 Rating	Q4 2023 Rating	Rolling Rating
Signs	97	93	93	97	94
Delineators	88	94	94	94	92
Pavement Striping/Marking	100 <sup>1</sup>	100 <sup>1</sup>	100	91	97 <sup>2</sup>
Words and Symbols	96 <sup>1</sup>	97 <sup>1</sup>	97	97	95 <sup>2</sup>
Pavement Markers	100 <sup>1</sup>	100	100	86	95
Highway Lighting	90	90	90	100	94
<b>Element Total</b>	<b>95.3<sup>1</sup></b>	<b>96.2<sup>1</sup></b>	<b>96.2</b>	<b>93.5</b>	<b>94.8<sup>2</sup></b>

<sup>1</sup> Excludes concrete surface pavement markers, striping, and symbols on mainline NC-540 and asphalt surface markers on mainline NC-885.

<sup>2</sup> Excludes the indicated quarter ratings for characteristics listed above.

## 7.2 Annual Analysis

Based on the combined results of all four quarterly inspections conducted in 2023, all elements exceeded NCTA's threshold criteria of 85. In addition, all characteristics, apart from Retaining Walls and Sound Barrier Wall (76), exceeded the target threshold criteria of 80. **Exhibit 2** shows the comparison in annual element ratings from 2020 to 2023, which shows all five elements increasing in rating from 2022 to 2023.

**Exhibit 2: Annual Rating Comparison Chart**





## 8.0 Green Level Historic District Signs

Green Level Historic District signs and surrounding landscaped areas were installed as part of the Triangle Expressway construction project. Currently, NCDOT is maintaining the Green Level Historic District Signs and the Town of Cary is providing maintenance to the landscaped areas surrounding these signs.

### 8.1 Analysis and Recommendations

As part of each quarterly inspection, an assessment team visits the two remaining Green Level Historic District signs to conduct a visual inspection of each sign and ensure they are in good standing. The two signs included in the inspection inventory were found to be in good condition. **Figure 4** shows the two signs assessed.

Figure 4: Green Level West Historic District Signs, Landscape Areas



## 9.0 Conclusion

This report presents the 2023 Fourth quarter assessment of the Triangle Expressway. The NCTA's target ratings are 90 for the rolling rating, 90 for the overall quarter rating, 85 for elements, and 80 for characteristics. The Fourth quarter 2023 overall rating was 95.0 and the rolling rating was 95.8, both ratings met the target rating of 90.

All element ratings were above the target ratings for the quarter and rolling assessment. During the Fourth quarter assessment, all but two characteristics met or exceeded the target rating of 80. The characteristics that received a quarter score less than 80 was Retaining Walls and Sound Barriers (72) and Fence, Control Access (79).

To maintain/improve the condition ratings, it is recommended that the fence repair cycles are completed as planned in the capital budget. Fence repair is scheduled for early 2024.

This quarter, the two Green Level Historic District signs inspected were found to be in good condition. Additionally, the landscaped areas surrounding the signs were found to be well maintained.

## **Appendix A**

**Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations**

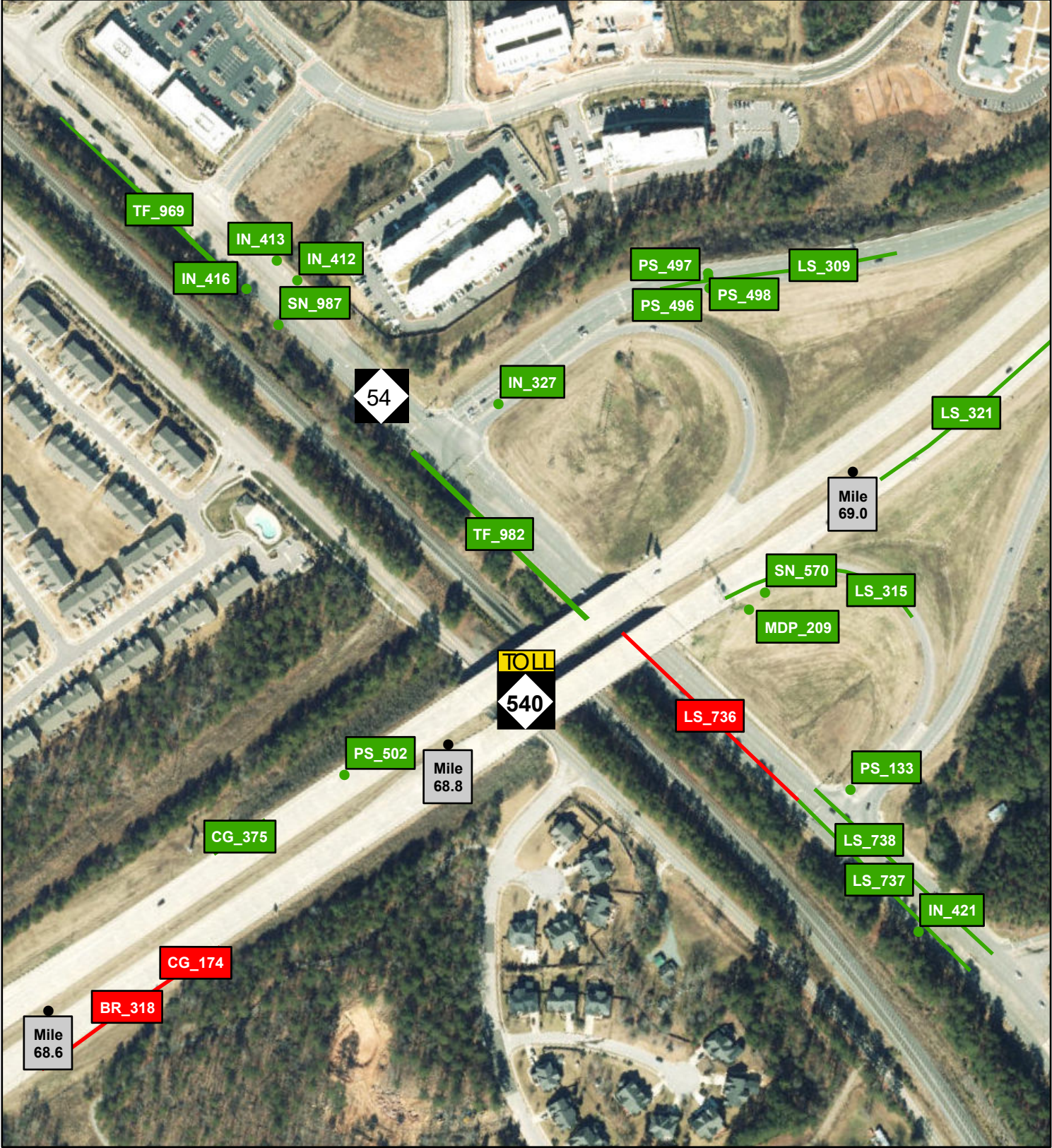


## Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations

Provided below are a series of maps outlining the assets that were a part of this quarter's sample and their corresponding result. Assets are defined by an Inventory ID, which is a unique identifier given to each individual asset. The components that make up the Inventory ID are an asset specific prefix along with a number, such as LS\_1. All assets and their respective prefixes are listed below:

- Guardrail, Concrete Barrier and End Anchors – BR
- Curb and Gutter – CG
- Decorative Supports – DS
- Drainage Pipes – DP
- Misc. Drainage Structures – MDP
- Fence and Control of Access – FN
- Graffiti – GR
- Highway Lighting – HL
- Impact Attenuators – IA
- Inlets – IN
- Landscaping – PB
- Linear Samples – LS
  - Paved Lanes – Asphalt
  - Paved Lanes – Concrete
  - Paved Shoulders
  - Unpaved Shoulders
  - Front/Back Slopes
  - Unpaved Lateral and Outfall Ditches
  - Litter
  - Roadway Sweeping
  - Pavement Striping/Markings
  - Pavement Markers
  - Delineators
- Paved Ditches – PD
- Pavement Words and Symbols – PS
- Signs – SN
- Tree and Brush – TB
- Turf Condition – TF
- MSE/Retaining Walls, Sound Barrier Walls, and Screen Walls – WL

Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



Legend



Failing Asset



Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

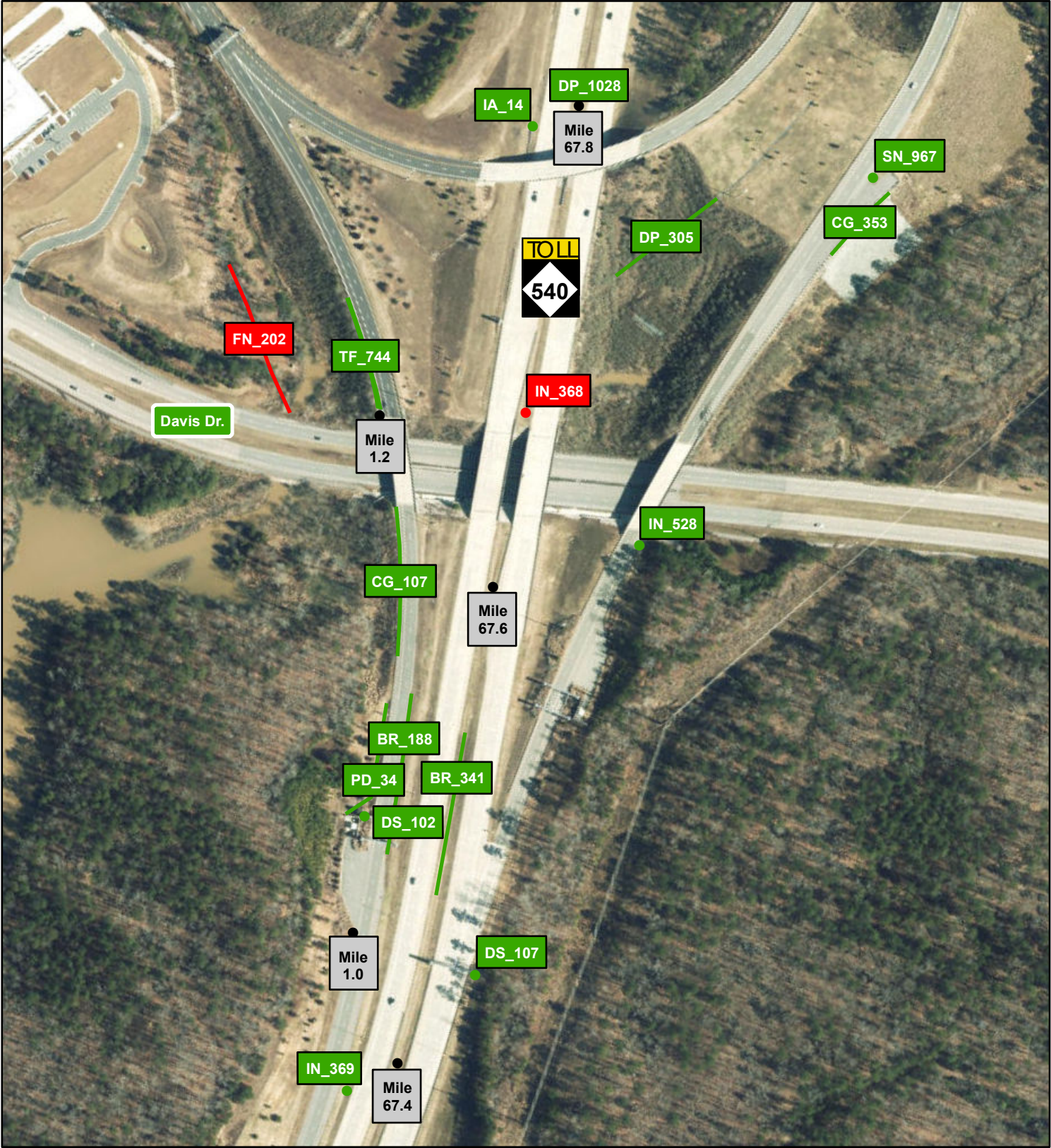
Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

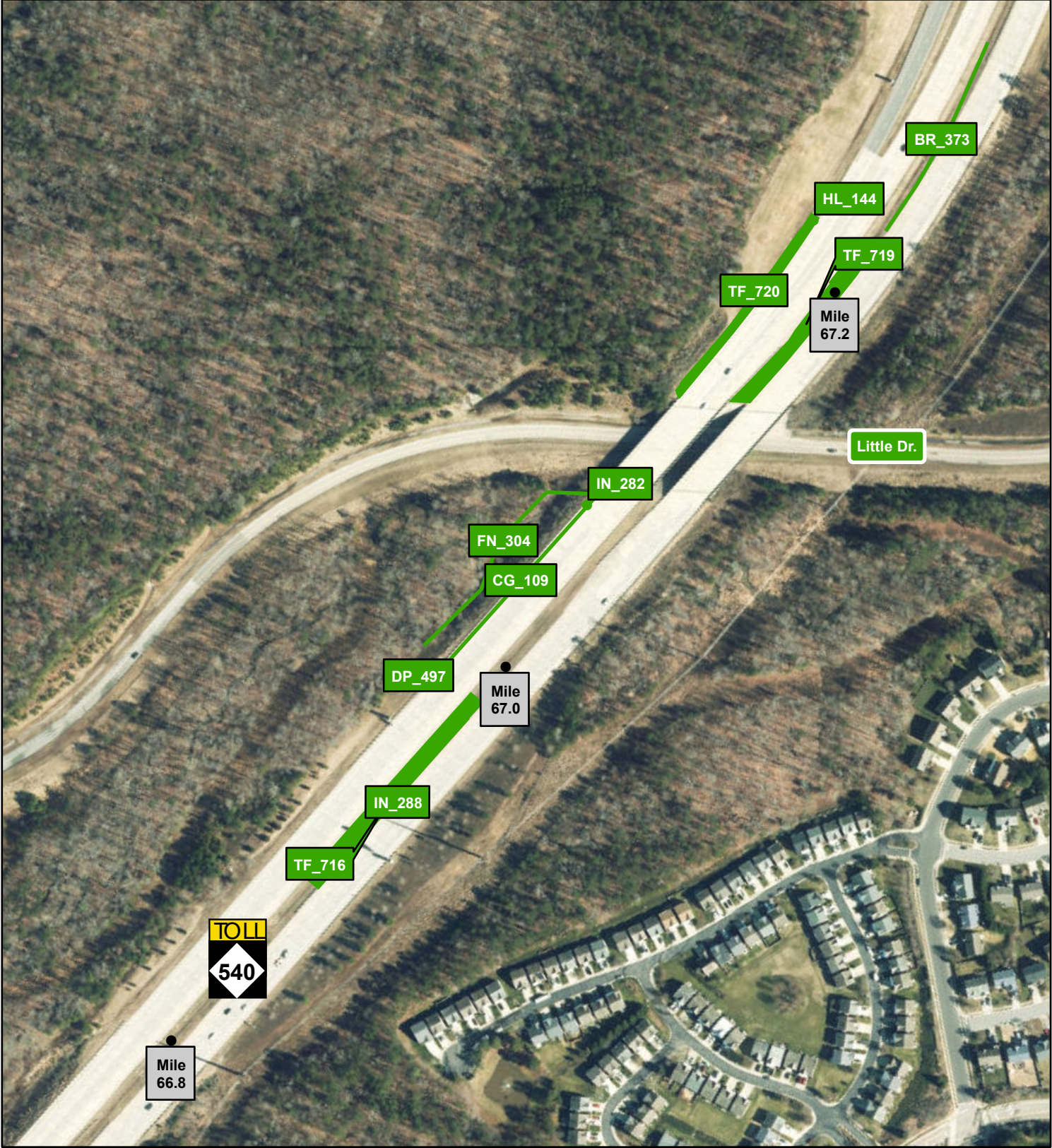
Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

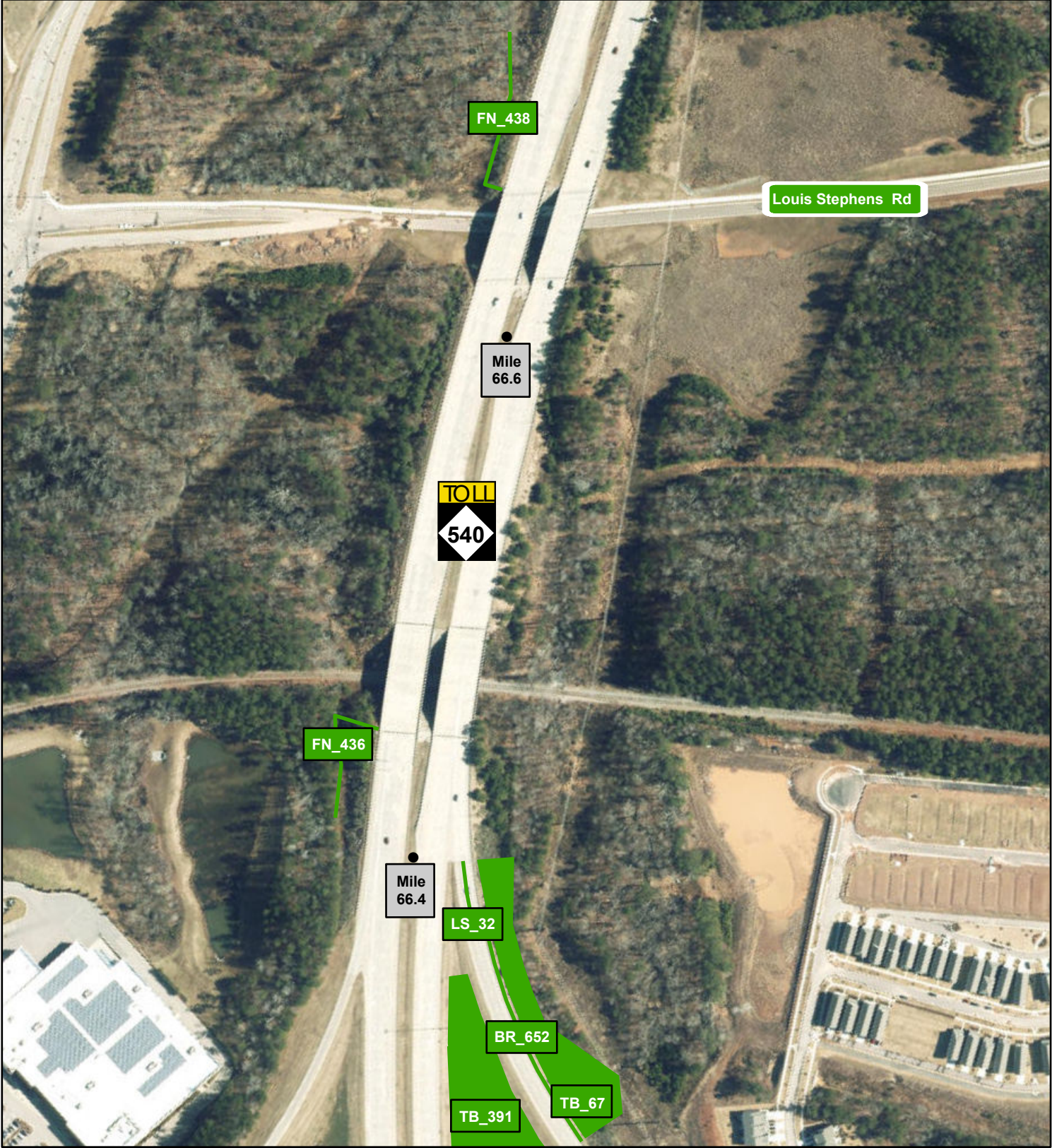
Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



**Legend**

Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



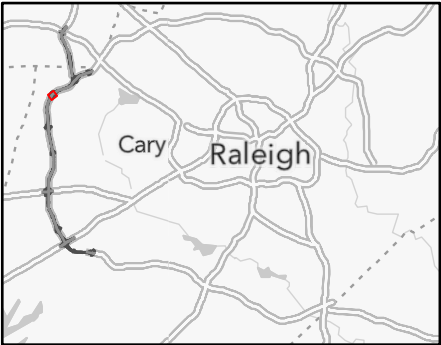
Legend



Failing Asset

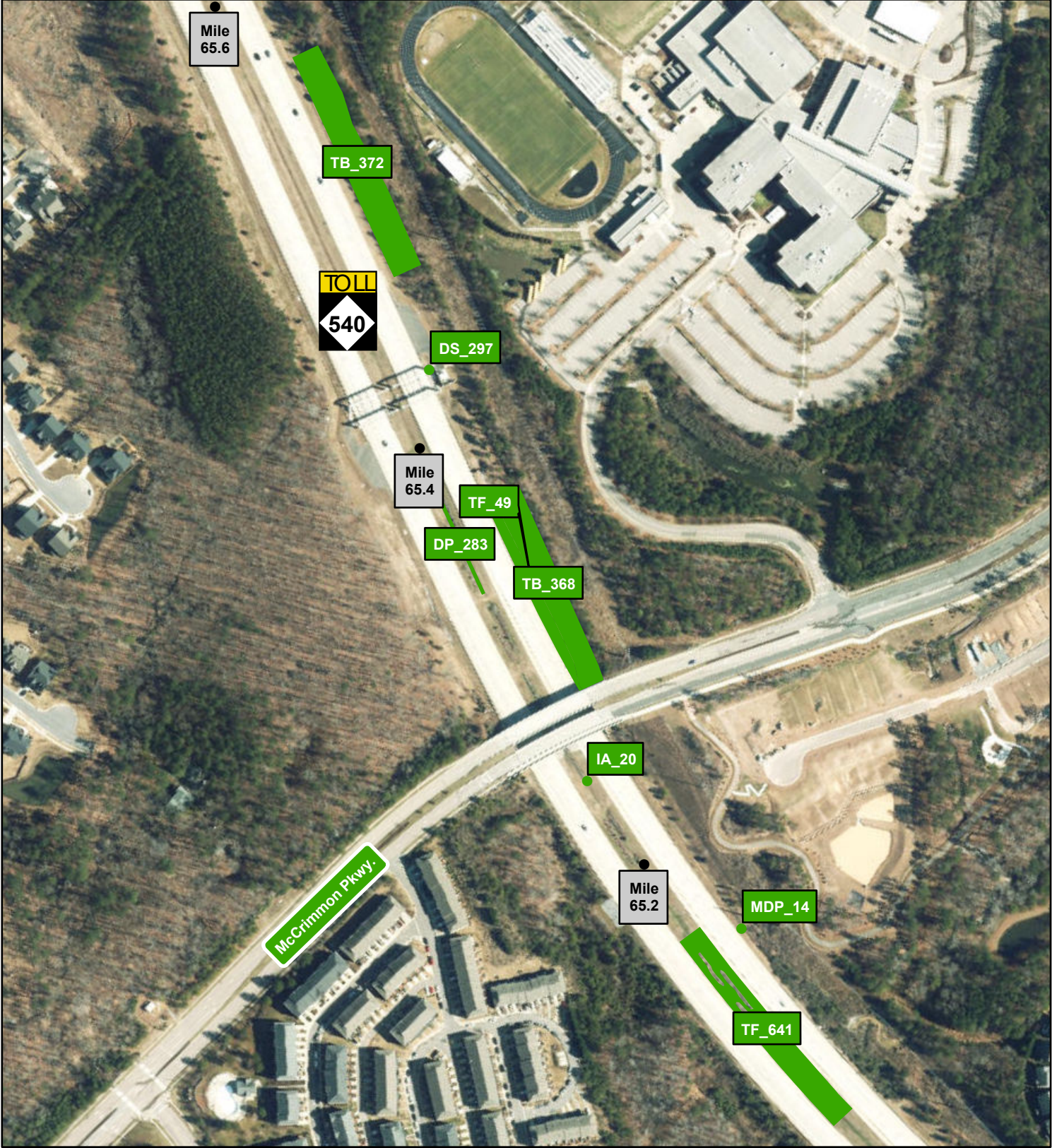


Passing Asset

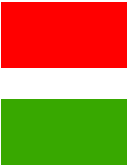




Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



Legend



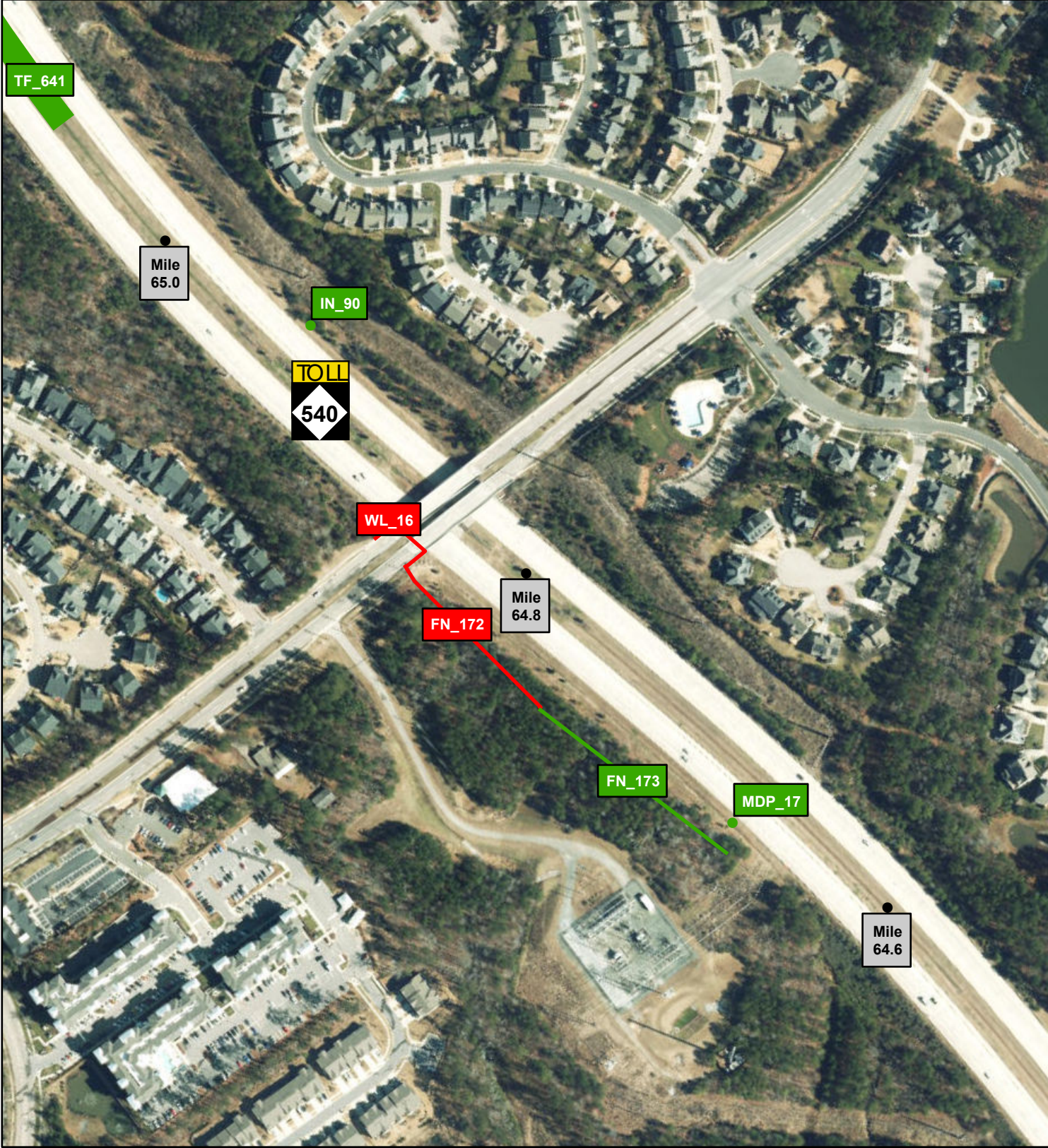
Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



Legend



Failing Asset



Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



Legend



Failing Asset



Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



**Legend**

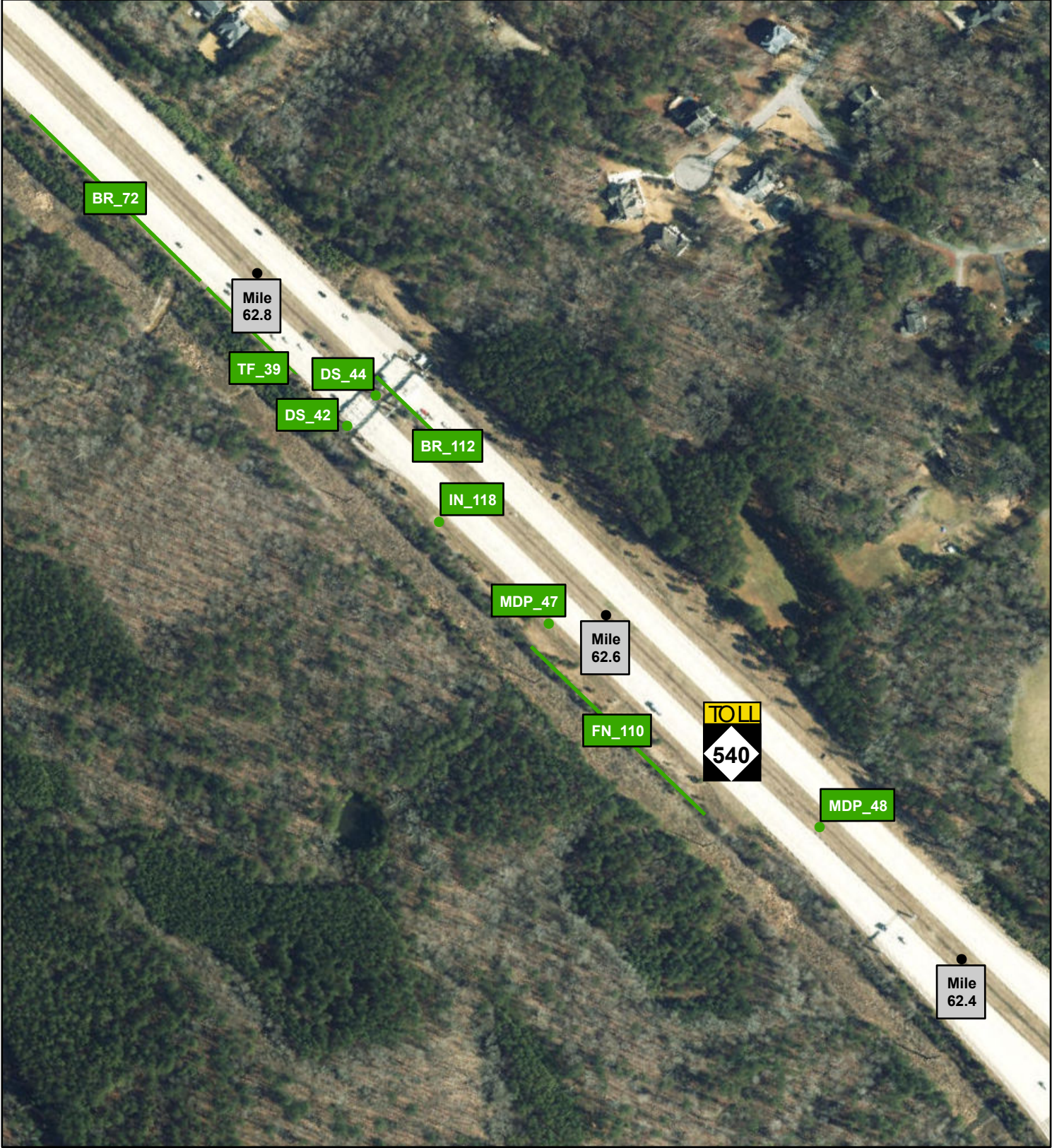
Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



**Legend**

Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



Legend



Failing Asset



Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

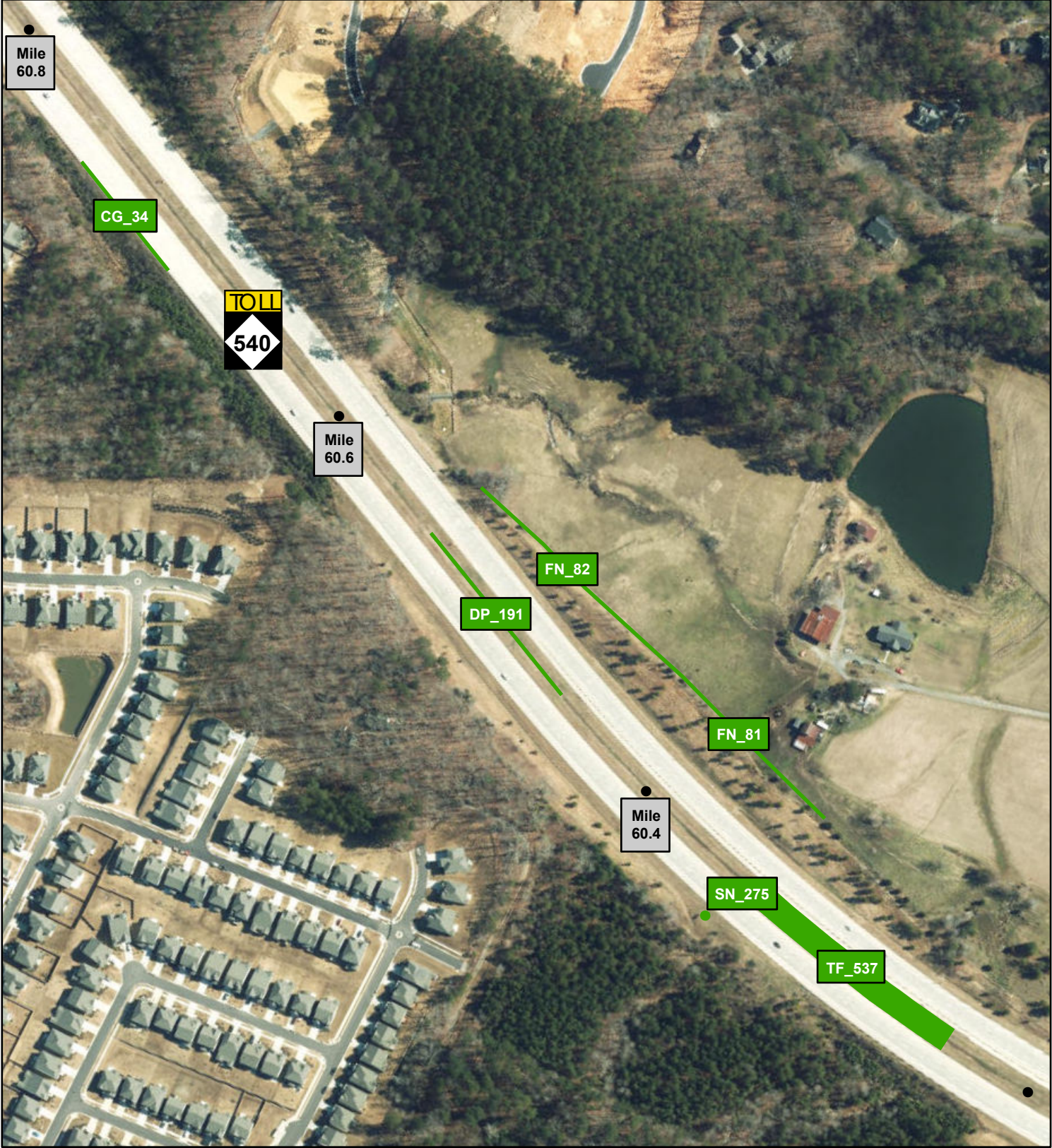
Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



**Legend**

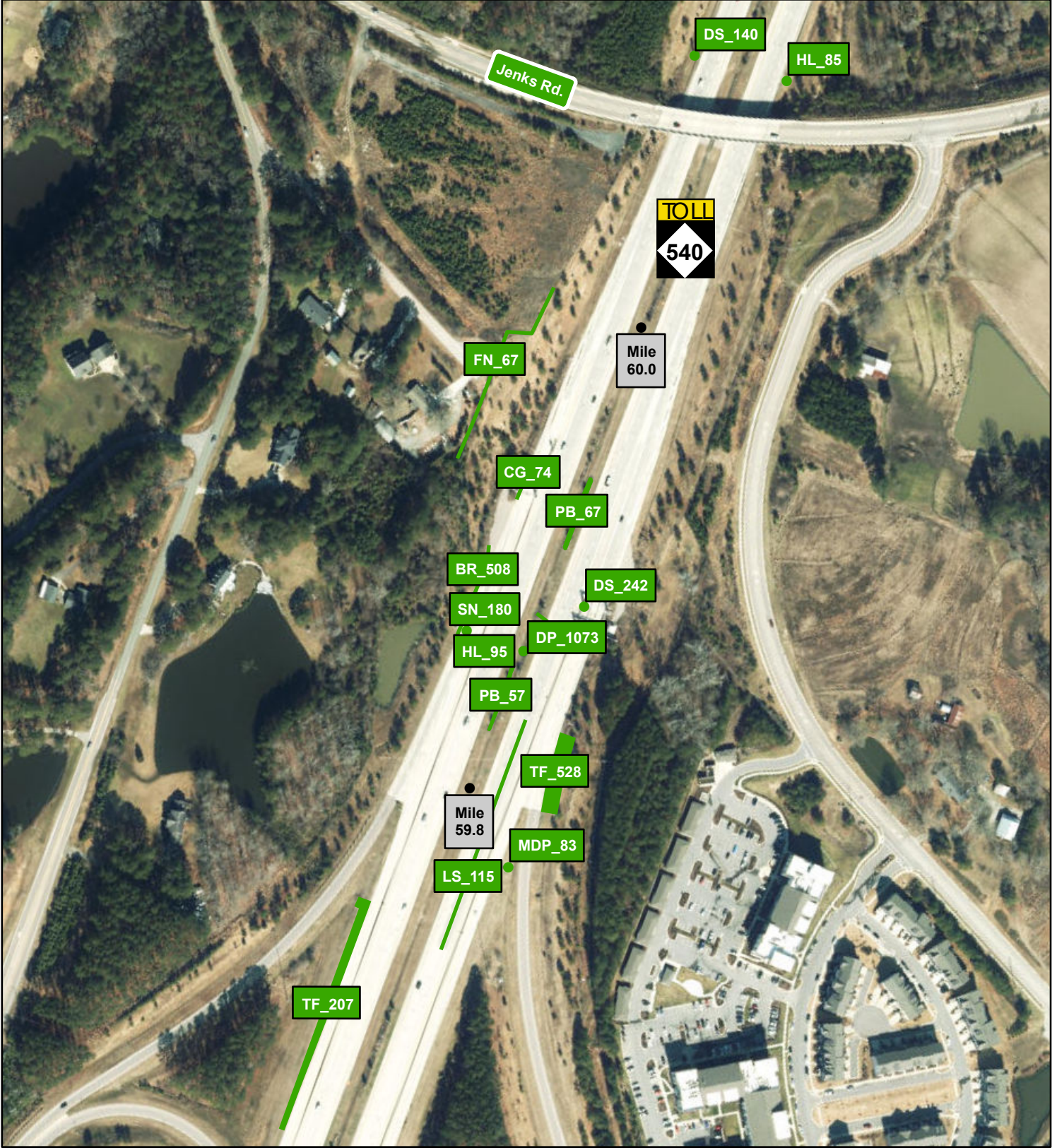
Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



Legend



Failing Asset

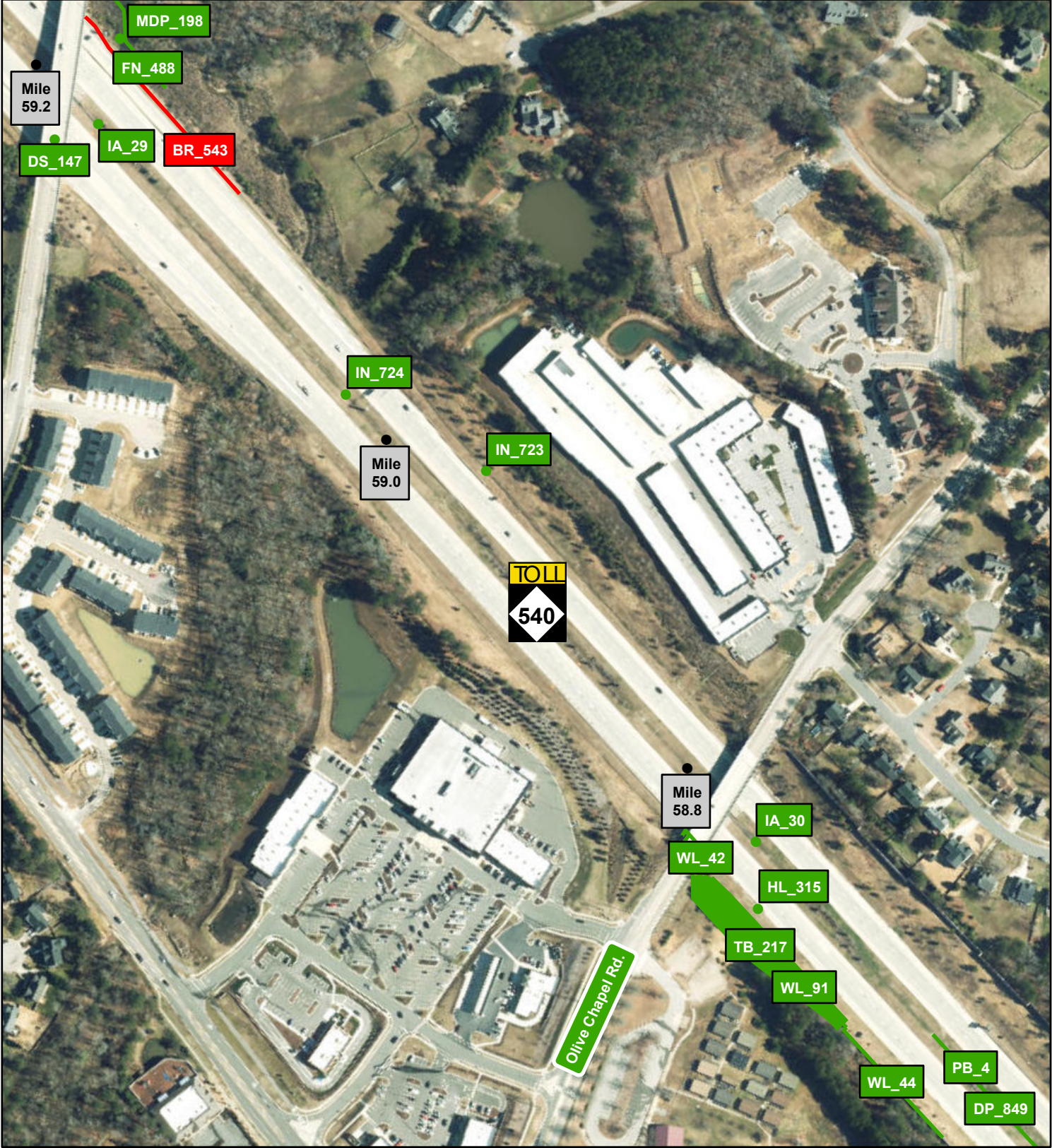


Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



Legend



Failing Asset

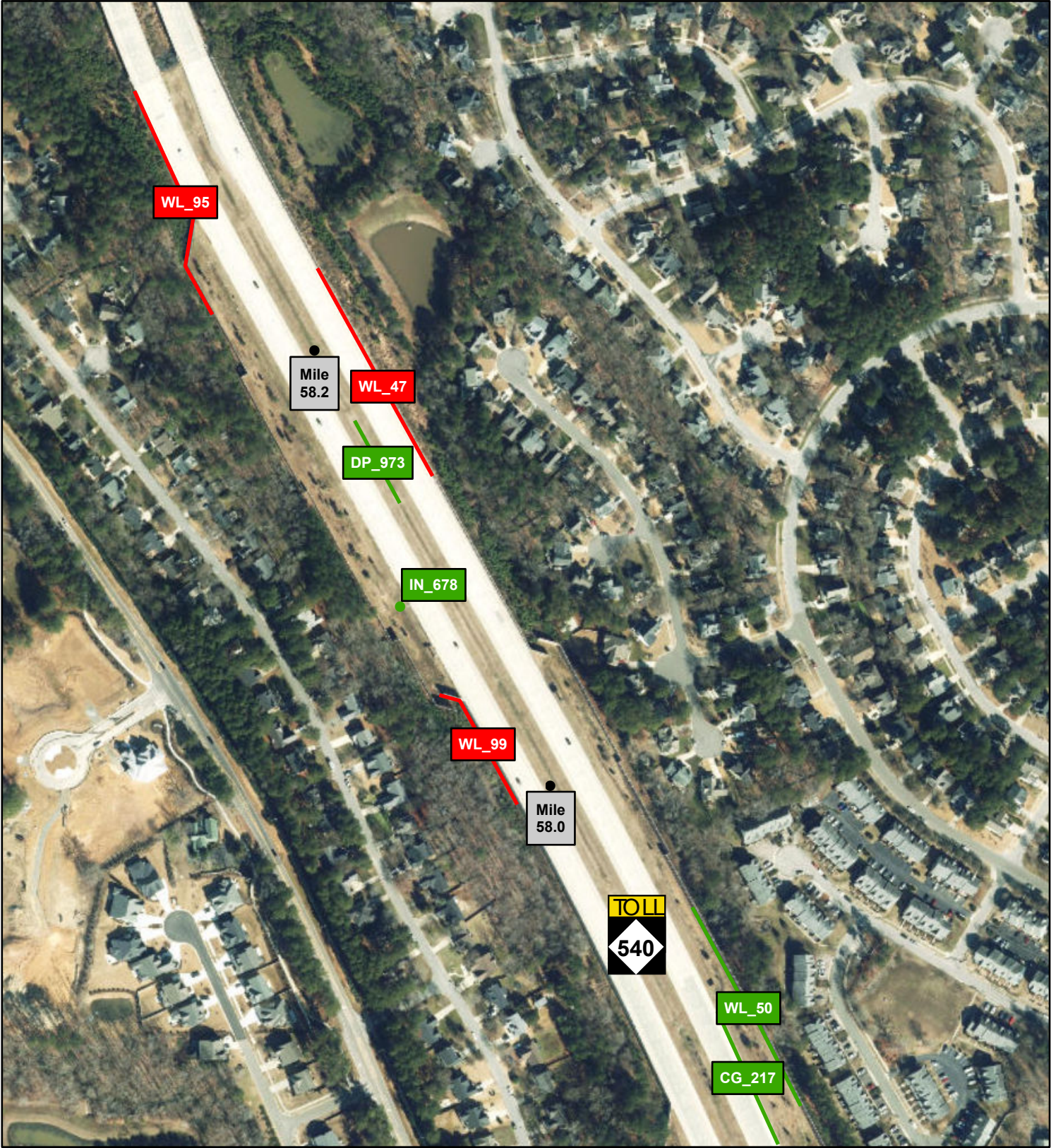


Passing Asset





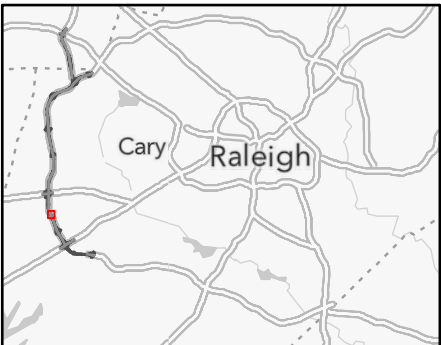
Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

Failing Asset

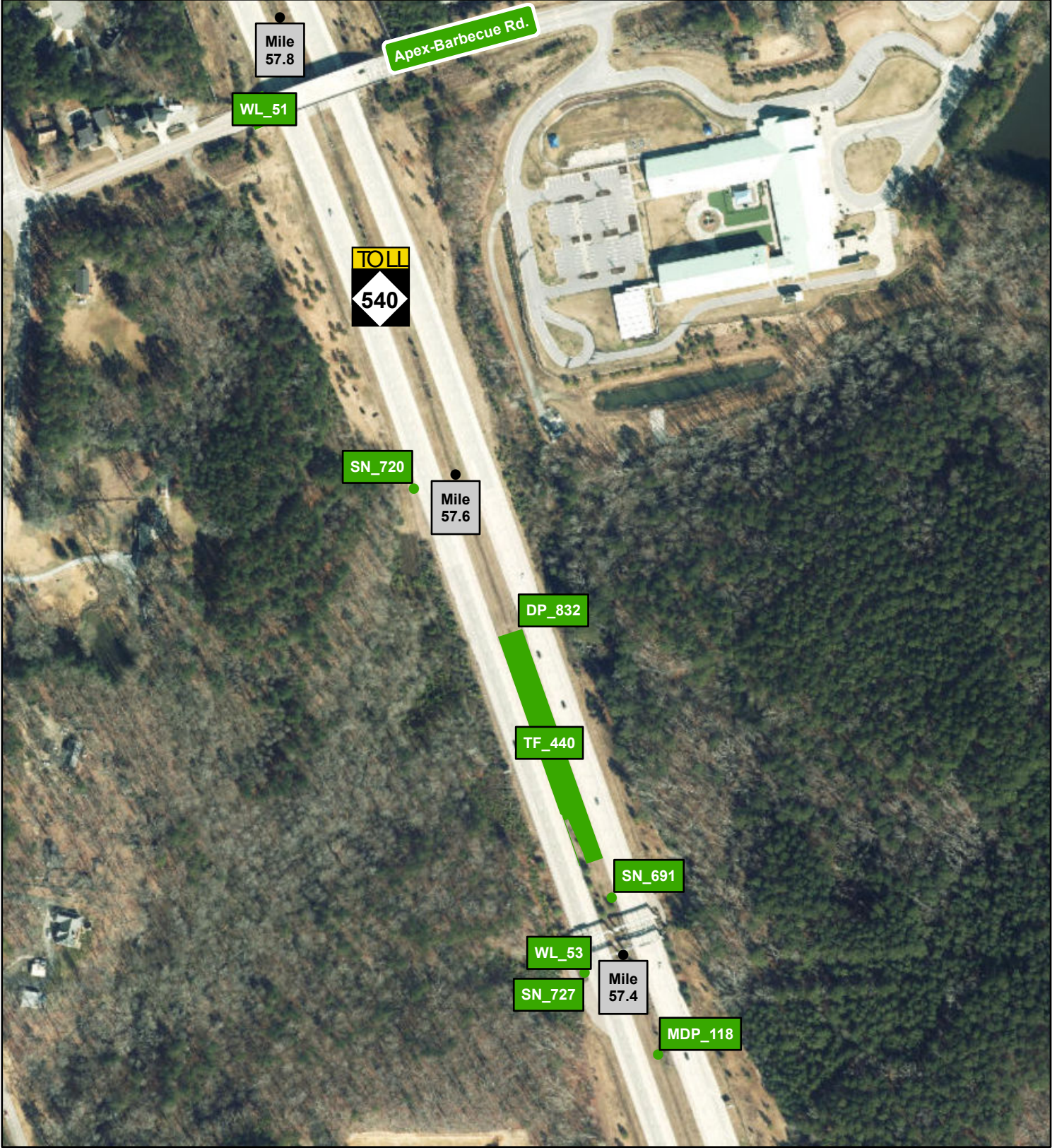
Passing Asset



NORTH CAROLINA  
**Turnpike Authority**



Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



Legend



Failing Asset

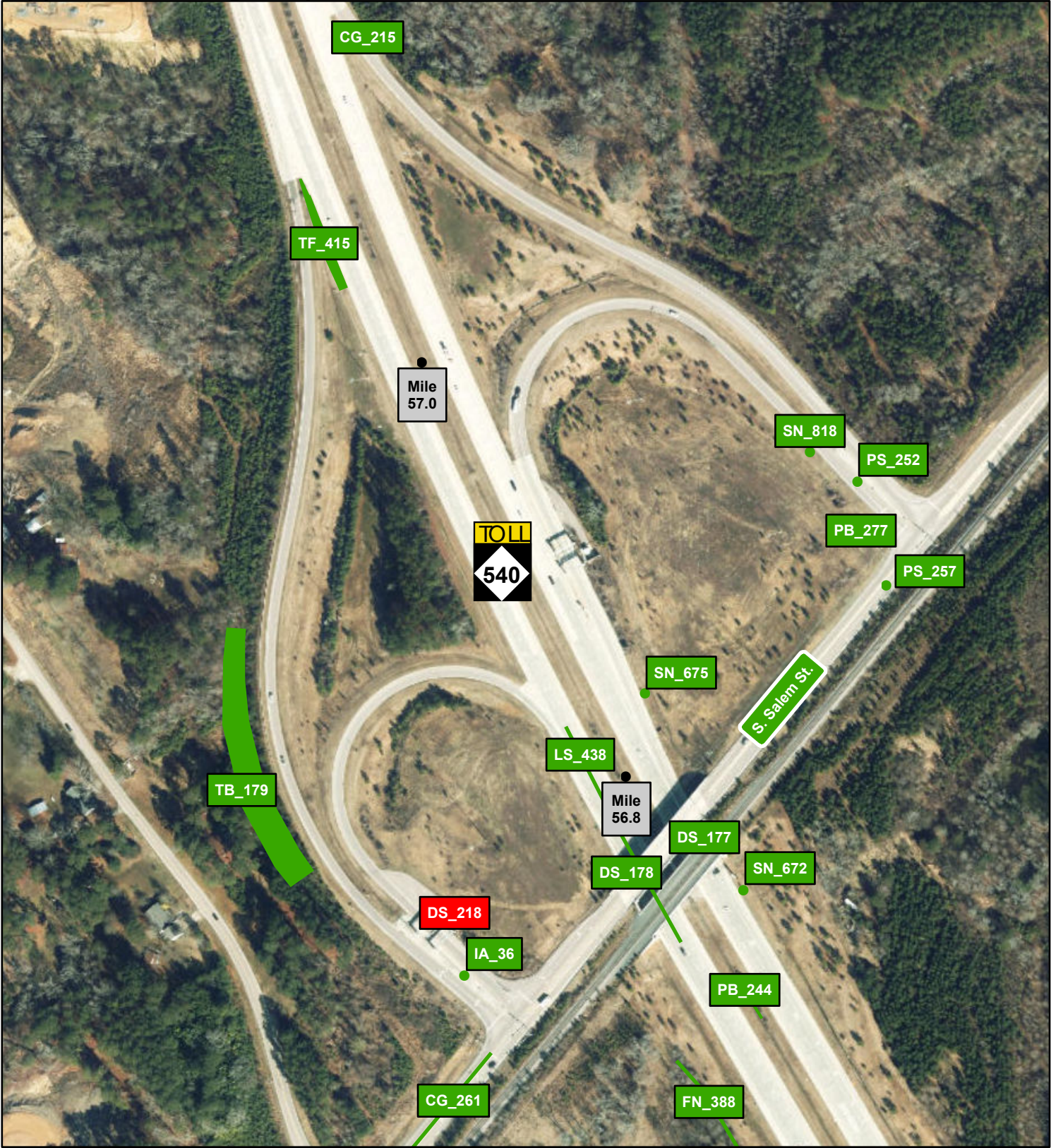


Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



Legend



Failing Asset

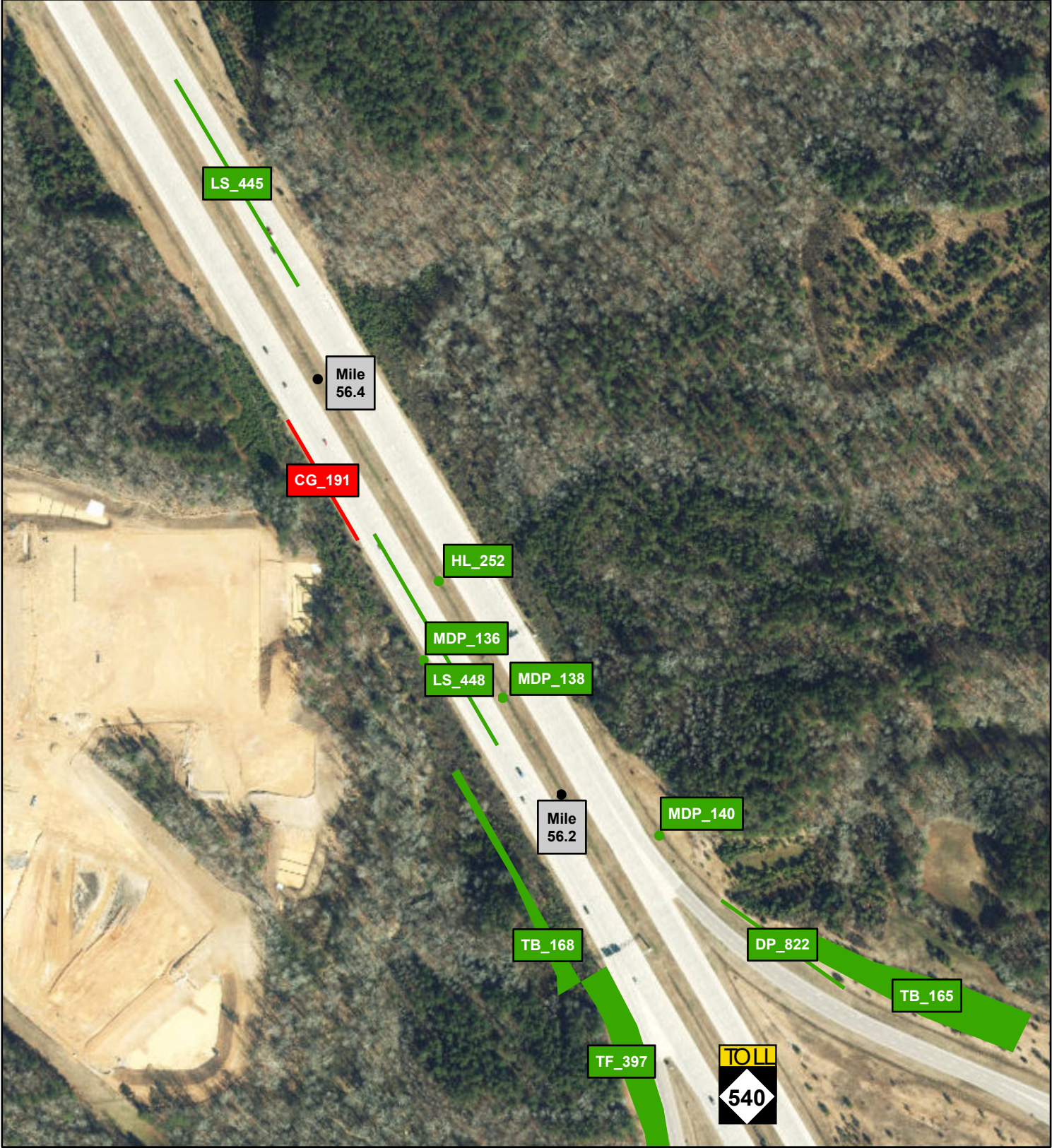


Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

Failing Asset

Passing Asset



NORTH CAROLINA  
Turnpike Authority



Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

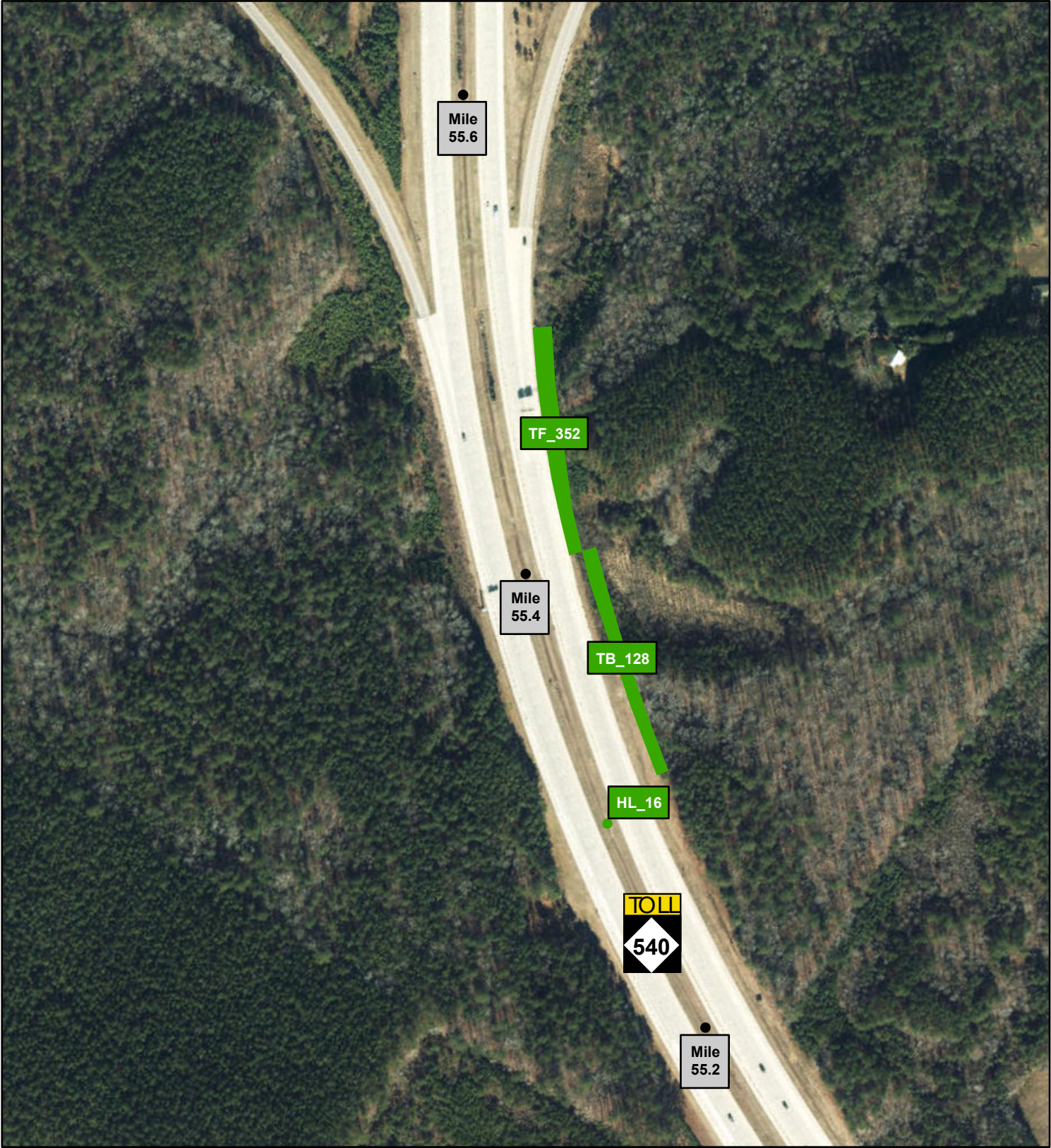
Failing Asset

Passing Asset







Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



**Legend**

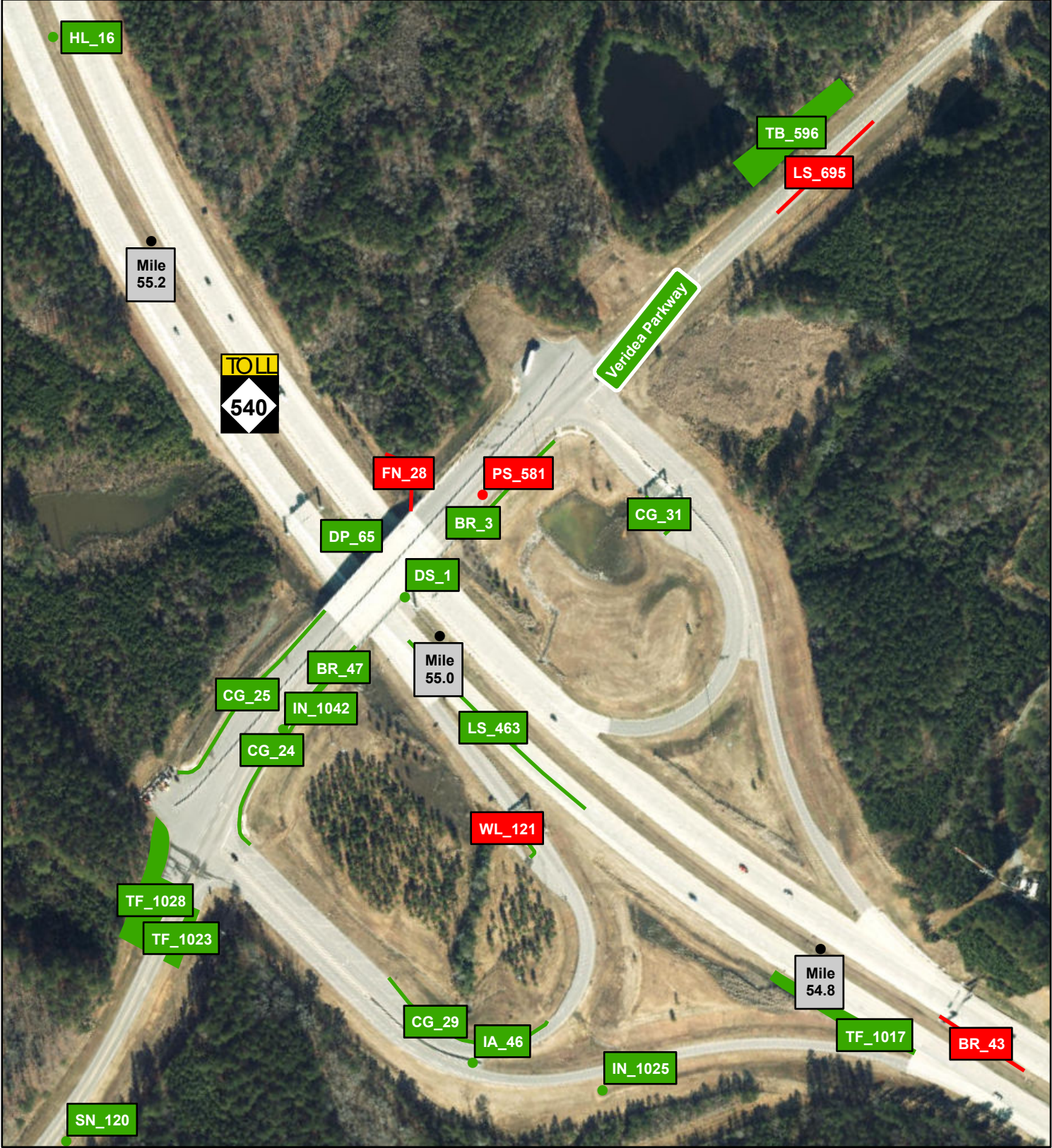
 Failing Asset

 Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



Legend



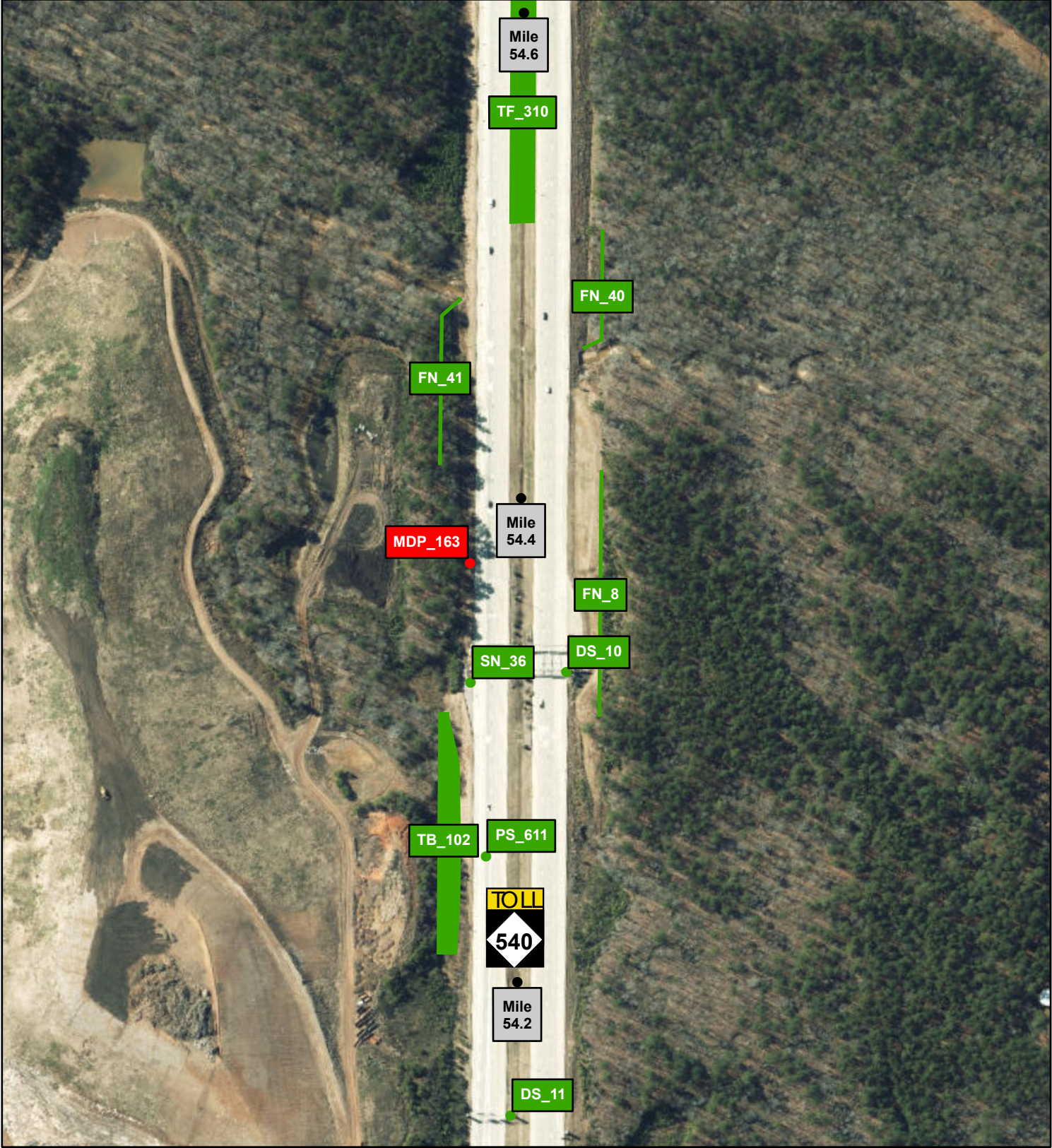
Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



Legend



Failing Asset



Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

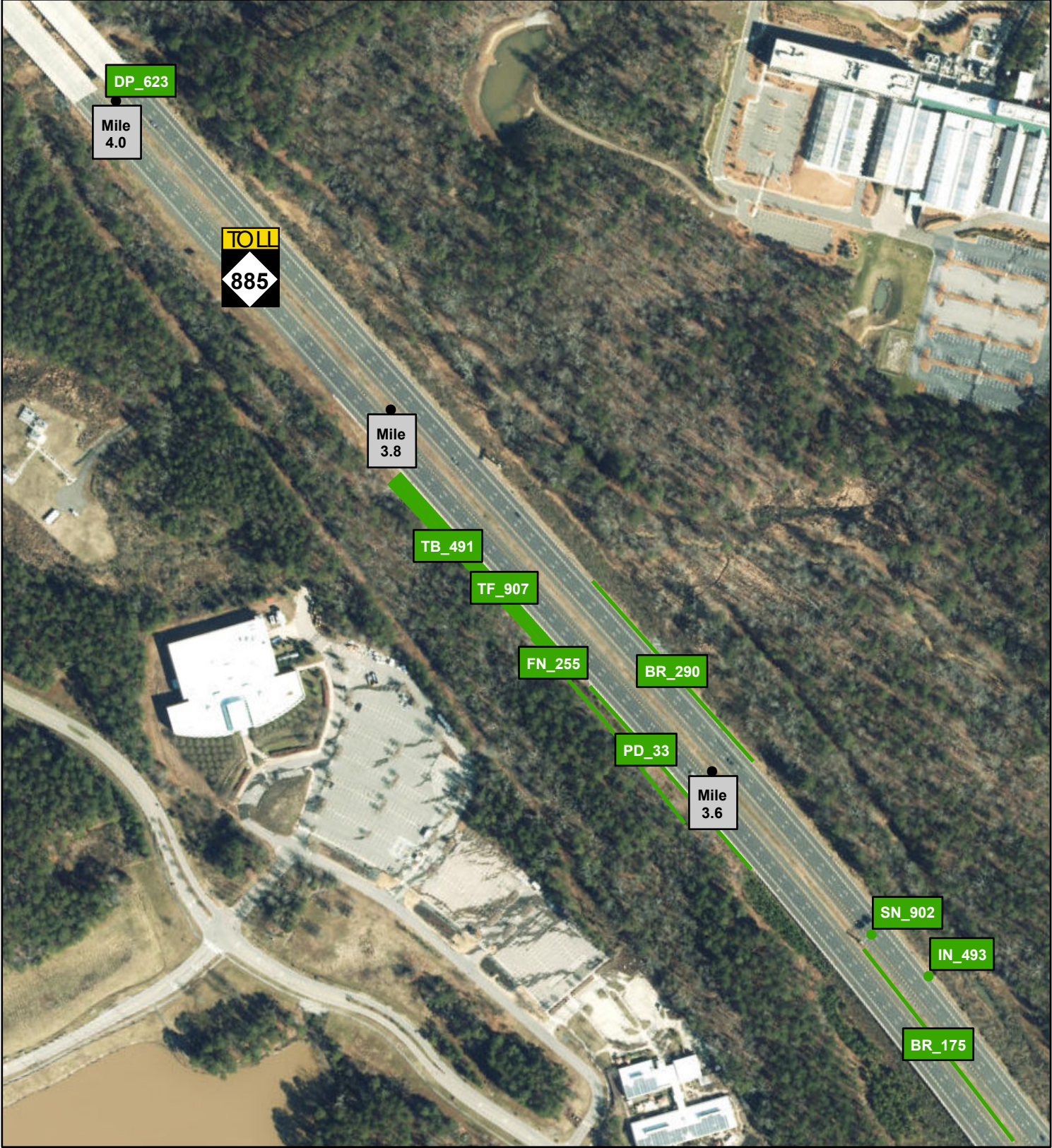
Failing Asset

Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

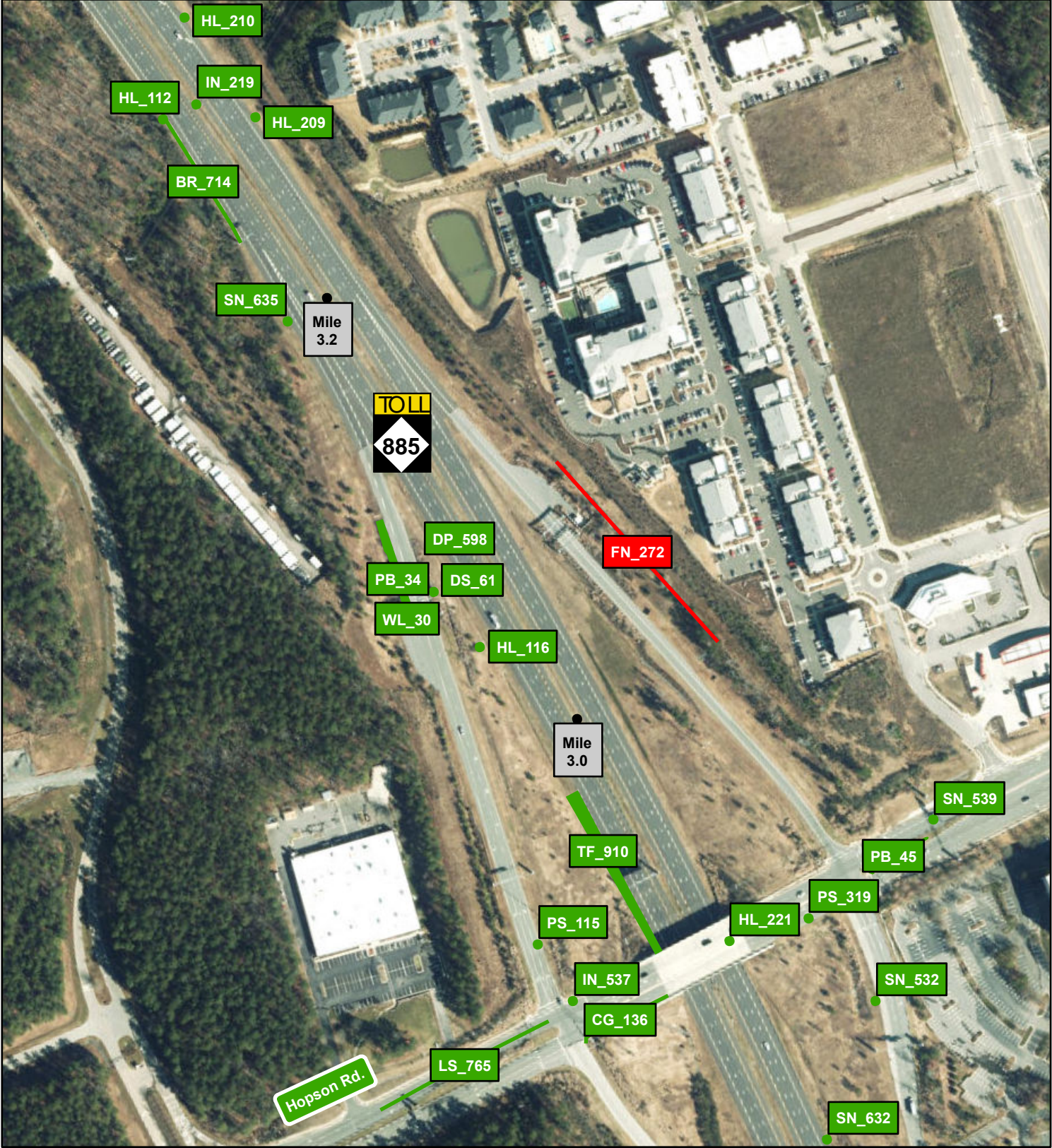
Failing Asset

Passing Asset







Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



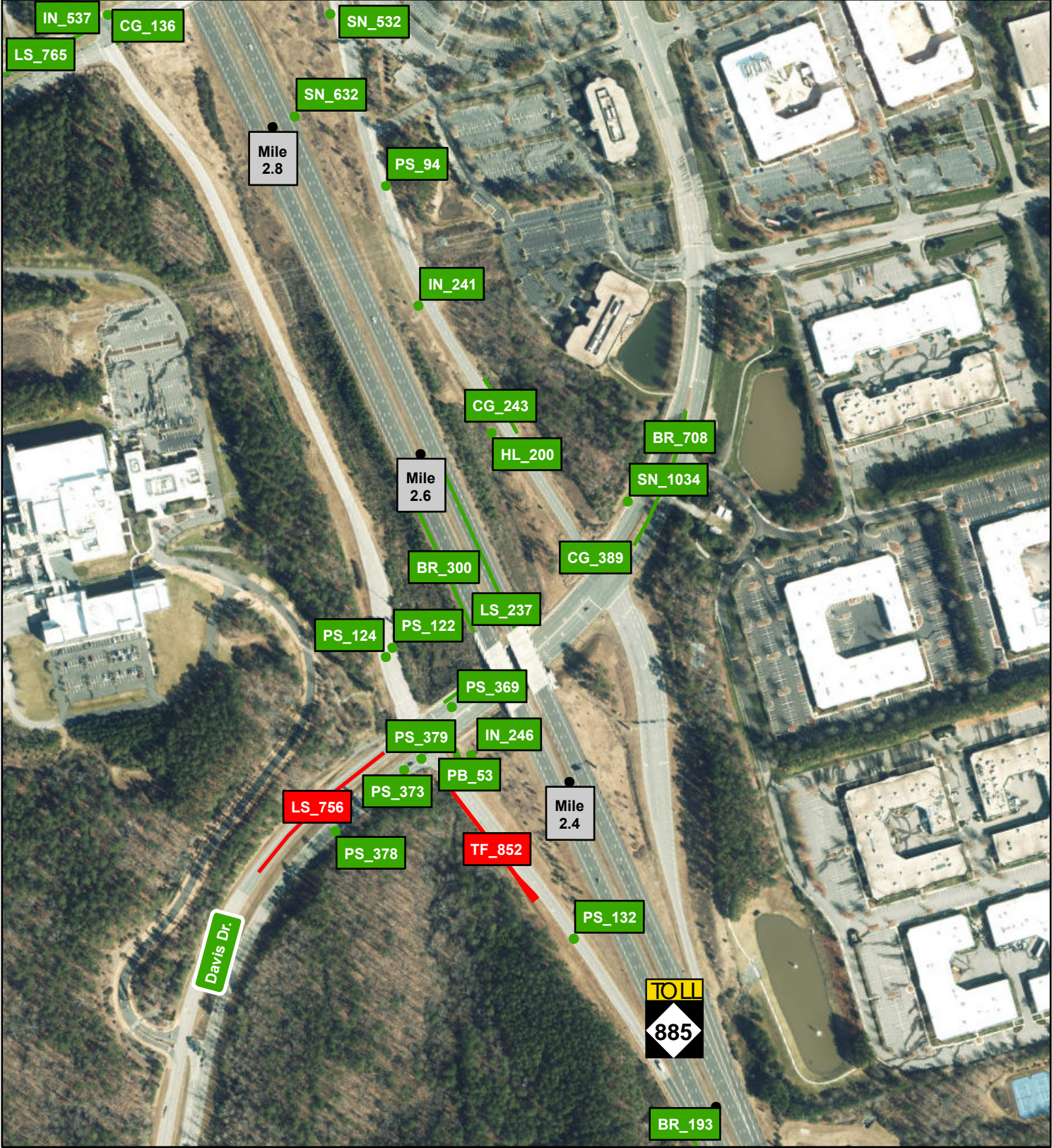
Legend

-  Failing Asset
-  Passing Asset





Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



Legend



Failing Asset

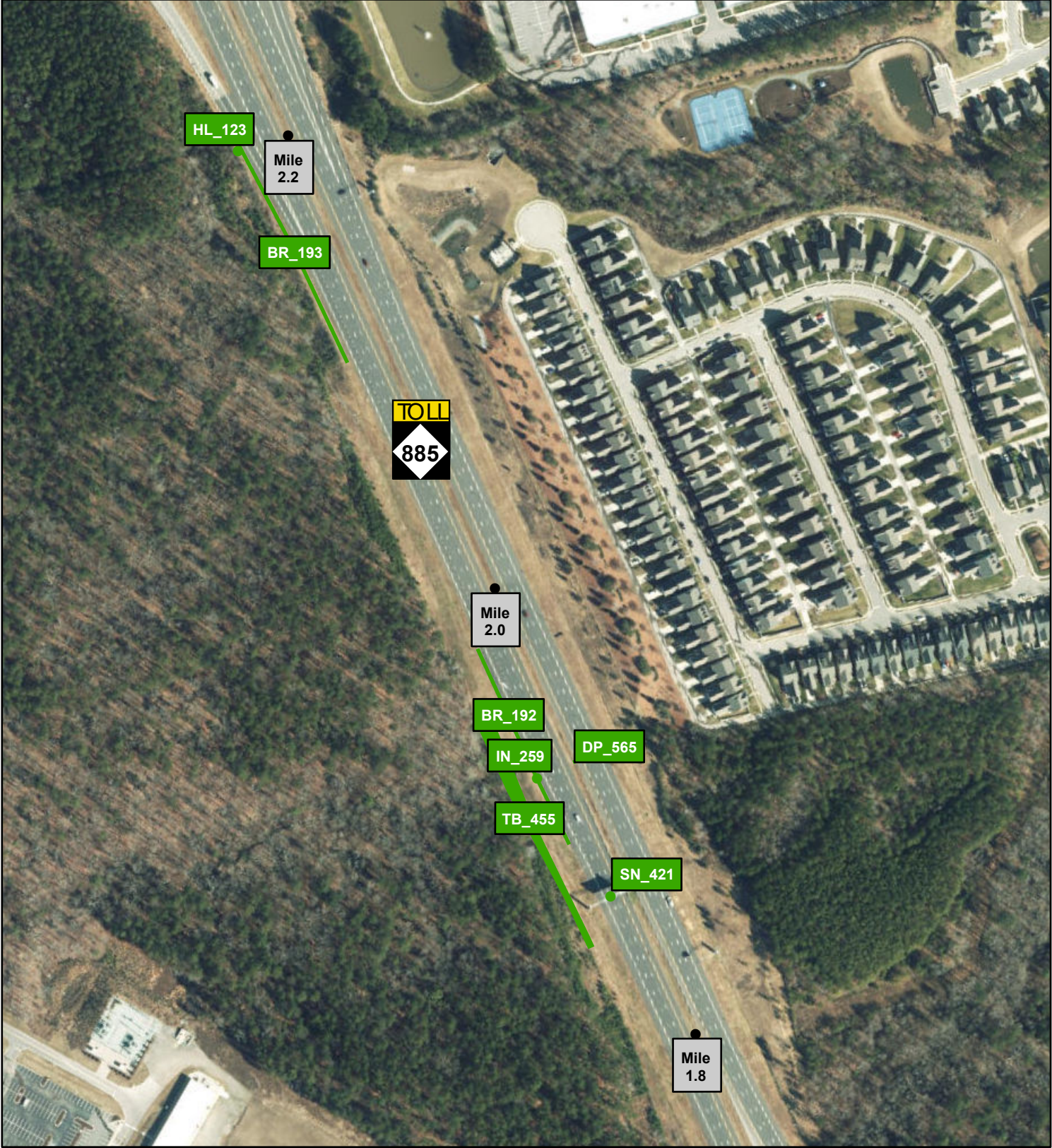


Passing Asset





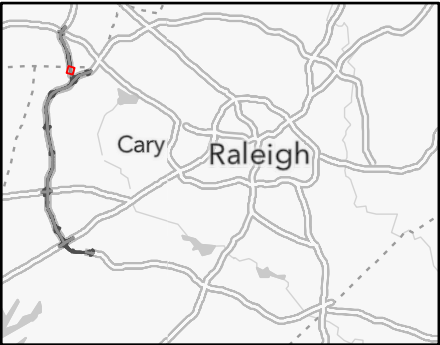
Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



# Legend

Failing Asset

Passing Asset

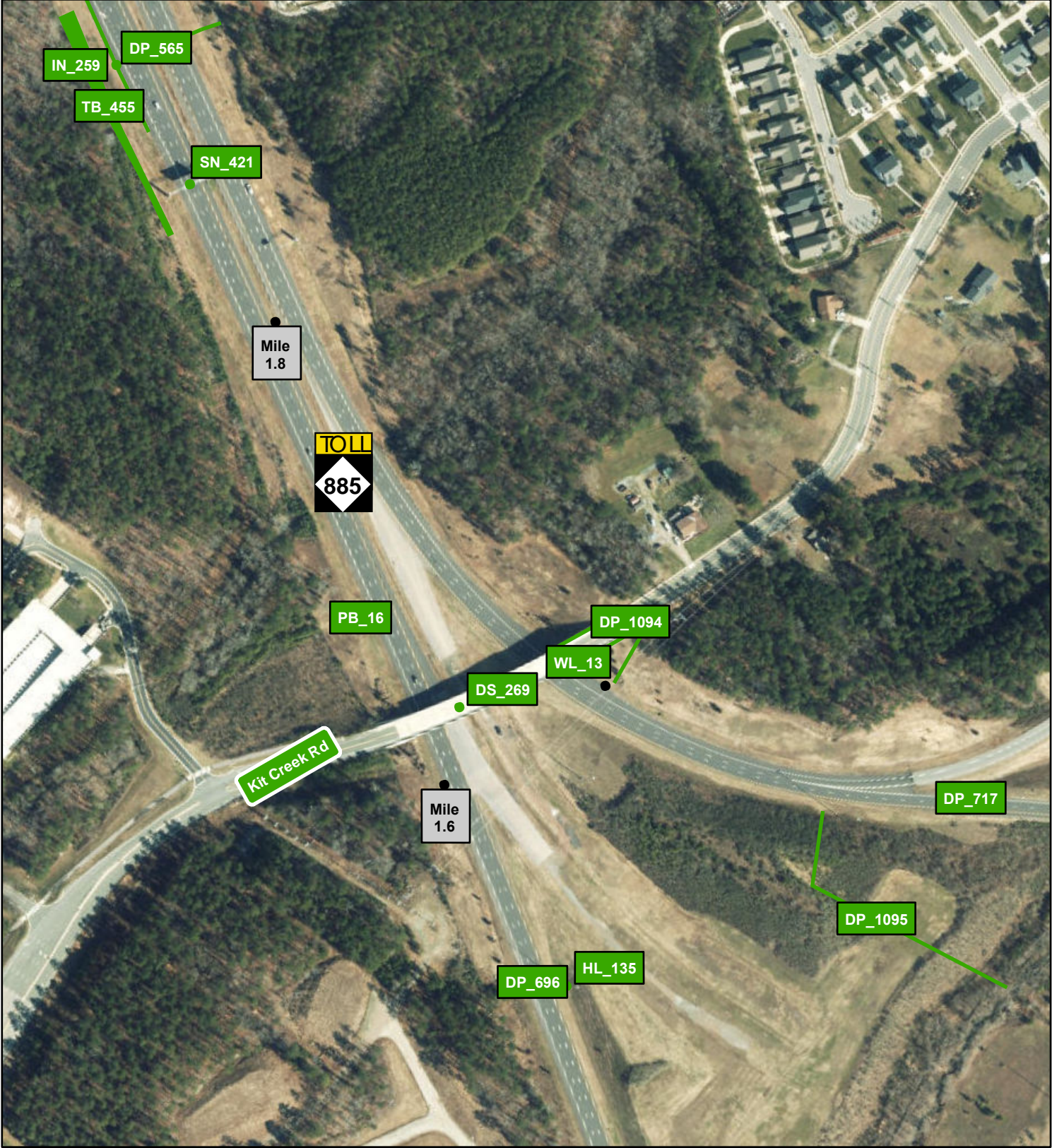


NORTH CAROLINA

Turnpike Authority



Appendix A: Triangle Expressway 2023 Fourth Quarter Asset Assessment Locations



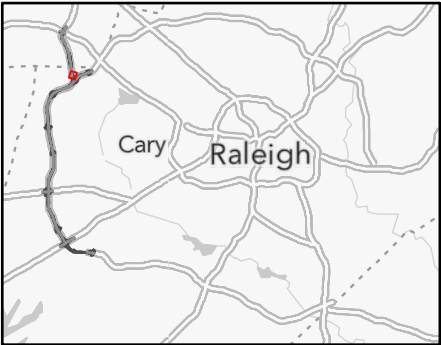
Legend



Failing Asset



Passing Asset





## **Appendix B**

**Triangle Expressway 2023 Fourth Quarter Table Results of Assets Failing MRP**

## Appendix B: Triangle Expressway 2023 Fourth Quarter Table Results of Assets Failing MRP





Provided below are a series of tables outlining the existing failures that occurred throughout the facility. Assets are defined by an Inventory ID, which is a unique identifier given to each individual asset. The components that make up the Inventory ID are an asset specific prefix along with a number, such as LS\_1. The Inventory ID and GIS Reference Page number correspond to the provided map packets and allow for quick location of particular asset failures. Photos of failures were provided when applicable.

All assets and their respective prefixes are listed below:

Guardrail, Concrete Barrier, and End Anchors (BR).....	1
Curb and Gutter (CG).....	2
Decorative Supports (DS).....	3
Drainage Pipes (DP).....	4
Misc. Drainage Structure (MDP) .....	5
Fence and Control of Access (FN) .....	6
Graffiti (GR).....	8
Highway Lighting (HL) .....	9
Impact Attenuators (IA).....	10
Inlets (IN).....	11
Landscaping (PB).....	12
Paved Lanes – Asphalt (LS) .....	13
Paved Lanes – Concrete (LS).....	13
Paved Shoulders (LS) .....	14
Unpaved Shoulders (LS) .....	14
Front/Back Slopes (LS) .....	15
Unpaved Lateral and Outfall Ditches (LS) .....	15
Litter (LS).....	16
Roadway Sweeping (LS).....	16
Pavement Striping (LS) .....	17
Pavement Markers (LS) .....	18
Delineators (LS) .....	19
Paved Ditches (PD).....	20
Pavement Words and Symbols (PS) .....	21
Signs (SN) .....	22
Tree and Brush (TB).....	23
Turf Condition (TF) .....	24
MSE/Retaining Walls, Sound Barrier Walls, and Screen Walls (WL) .....	25





## Guardrail, Concrete Barrier, and End Anchors (BR)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Guardrail	BR_43	Functional Damage		A26
2	Guardrail	BR_116	Missing Part		A10
3	Guardrail	BR_318	Twisted Post		A1
4	Guardrail	BR_543	Twisted Post		A18




## Curb and Gutter (CG)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Curb and Gutter	CG_174	Misalignment		A1
2	Curb and Gutter	CG_191	Misalignment		A22




## Decorative Supports (DS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Gantry Support	DS_218	Unsealed Crack/Joint		A21






## Drainage Pipes (DP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Drain	DP_1130	Eroded Area		A17







## Misc. Drainage Structure (MDP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Shoulder Drain	MDP_55	Obstruction		A13
2	Shoulder Drain	MDP_90	Obstruction		A17
3	Shoulder Drain	MDP_163	Rodent Screen		A27





## Fence and Control of Access (FN)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Woven	FN_28	Hole		A26
2	Woven	FN_172	Hole		A8
3	Woven	FN_202	Hole		A3
4	Woven	FN_215	Height		A2



## Fence and Control of Access (FN)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Woven	FN_272	Height		A30
6	Woven	FN_484	Hole		A13



## Graffiti (GR)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
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This asset did not produce any failures.


## Highway Lighting (HL)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
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This asset did not produce any failures.



## Impact Attenuators (IA)


#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Impact Attenuator	IA_12	Missing Parts		A2

## Inlets (IN)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Inlet	IN_368	Surface Damage		A3



## Landscaping (PB)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Plant Bed	PB_228	Overgrown	 A photograph showing a paved road with a yellow center line. To the left of the road, there is a grassy area with tall, dry, brownish vegetation (possibly reeds or tall grass) that appears to be overgrown. In the background, there are trees and a clear blue sky. A utility pole is visible on the right side of the road.	A2

## Paved Lanes – Asphalt (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
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This asset did not produce any failures.

## Paved Lanes – Concrete (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
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1

Concrete

LS\_165

Pothole



A14





## Paved Shoulders (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
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This asset did not produce any failures.

## Unpaved Shoulders (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_57	Drop off		A17
2	Asphalt	LS_259	Drop off		A28

### Front/Back Slopes (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
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This asset did not produce any failures.


### Unpaved Lateral and Outfall Ditches (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
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This asset did not produce any failures.



## Litter (LS)



#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_756	Litter		A31

## Roadway Sweeping (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
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This asset did not produce any failures.

## Pavement Striping (LS)



#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_695	Nighttime Reflectivity	Not Available for Nighttime Failures	A26
2	Asphalt	LS_723	Line Width, Line Missing		A6
3	Asphalt	LS_756	Line Missing		A31



## Pavement Markers (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_499	Nighttime Reflectivity	Not Available for Nighttime Failures	A23
2	Asphalt	LS_523	Nighttime Reflectivity	Not Available for Nighttime Failures	A24
3	Asphalt	LS_723	Nighttime Reflectivity	Not Available for Nighttime Failures	A6
4	Asphalt	LS_736	Markers Missing		A1

## Delineators (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_526	Missing, Nighttime Reflectivity		A24
2	Asphalt	LS_559	Missing, Nighttime Reflectivity		A17




## Paved Ditches (PD)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
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This asset did not produce any failures.

## Pavement Words and Symbols (PS)


#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Thru and Right	PS_581	Nighttime Reflectivity		A26



## Signs (SN)




#	Sign Type	Object ID	Failure Type	Photo	GIS Reference Page
1	One Way	SN_322	Height		A13

## Tree and Brush (TB)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Tree and Brush	TB_303	Lateral Clearance		A13



## Turf Condition (TF)


#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Turf	TF_375	Bare Ground		A23
2	Turf	TF_597	Bare Ground		A11
3	Turf	TF_852	Bare Ground		A31

## MSE/Retaining Walls, Sound Barrier Walls, and Screen Walls (WL)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Bridge Wall	WL_16	Unsealed Cracks/Joints		A8
2	Sound Wall	WL_47	Unsealed Cracks/Joints		A19
3	Sound Wall	WL_95	Unsealed Cracks/Joints		A19
4	Sound Wall	WL_99	Unsealed Cracks/Joints		A19



## MSE/Retaining Walls, Sound Barrier Walls, and Screen Walls (WL)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Sound Wall	WL_121	Unsealed Cracks/Joints		A26