

# Maintenance Rating Program

Triangle Expressway

May 2023

2023 First Quarter Report



## CONSULTANT CERTIFICATION OF COMPLETION

May 4, 2023

Alan W. Shapiro, P.E.  
Director of Highway Operations, NCTA  
1 South Wilmington Street  
Raleigh, NC 27601

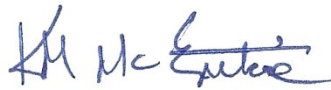
### NCTA Triangle Expressway Roadway Maintenance Performance Rating Program; Q1, FY 2023 Rating

This is to certify that I, Ken M. McEntire, PE am an authorized official representative of the company Mott MacDonald I&E, LLC, a subconsultant to HNTB North Carolina, P.C. Collaboratively; we are working as the Triangle Expressway Roadway and Facility Maintenance Performance Rating Program Consultants.

I know of my own personal knowledge, and do hereby certify, that the work of the contract described above has been independently performed in accordance with, and in conformity to, the *NCTA Roadway and Facility Maintenance Performance Standards*.

Sincerely,

Mott MacDonald I&E, LLC



Ken M. McEntire, PE  
Principal Project Manager – Operations and Maintenance

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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 First Quarter Assessment of the Triangle Expressway.

The overall 2023 first quarter maintenance rating of the Triangle Expressway was **95.3**, 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 First Quarter Assessment**

Element	MRP Rating	Target Rating
Road Surface	96.9	85.0
Unpaved Shoulders and Ditches	99.1	85.0
Drainage	93.3	85.0
Roadside	94.2	85.0
Traffic Control Devices	94.2	85.0
<b>Overall MRP Performance Rating</b>	<b>95.3</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 **94.8**.

**Table 2: MRP Rolling Element Results**

Element	Q2 2022 Rating	Q3 2022 Rating	Q4 2022 Rating	Q1 2023 Rating	Rolling Rating
Road Surface	98.9	100.0	96.0	96.9	97.9
Unpaved Shoulders and Ditches	96.0	94.7	98.7	99.1	97.1
Drainage	94.2	92.1	94.8	93.3	93.6
Roadside	92.4	93.3	93.8	94.2	93.4
Traffic Control Devices	93.4 <sup>1</sup>	92.5 <sup>1</sup>	90.9 <sup>1</sup>	94.2 <sup>1</sup>	92.7 <sup>2</sup>
<b>Overall MRP Performance Rating</b>	<b>95.1<sup>1</sup></b>	<b>94.7<sup>1</sup></b>	<b>94.3<sup>1</sup></b>	<b>95.3<sup>1</sup></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 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.

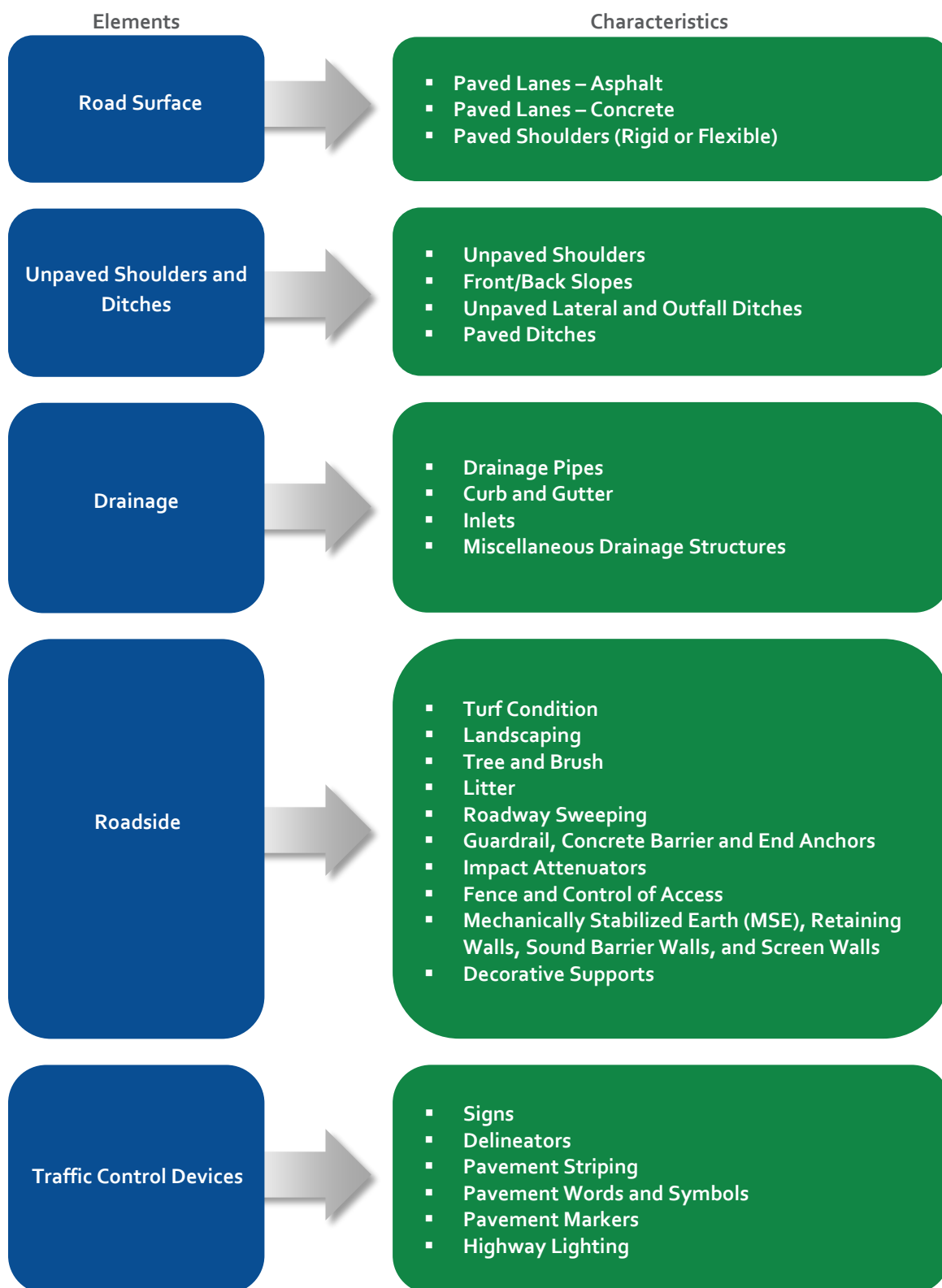
The NCTA performance standards, threshold criteria, and maintenance rating program were developed through a collaborative effort by NCTA managers, NCDOT maintenance staff, and consultants.

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:

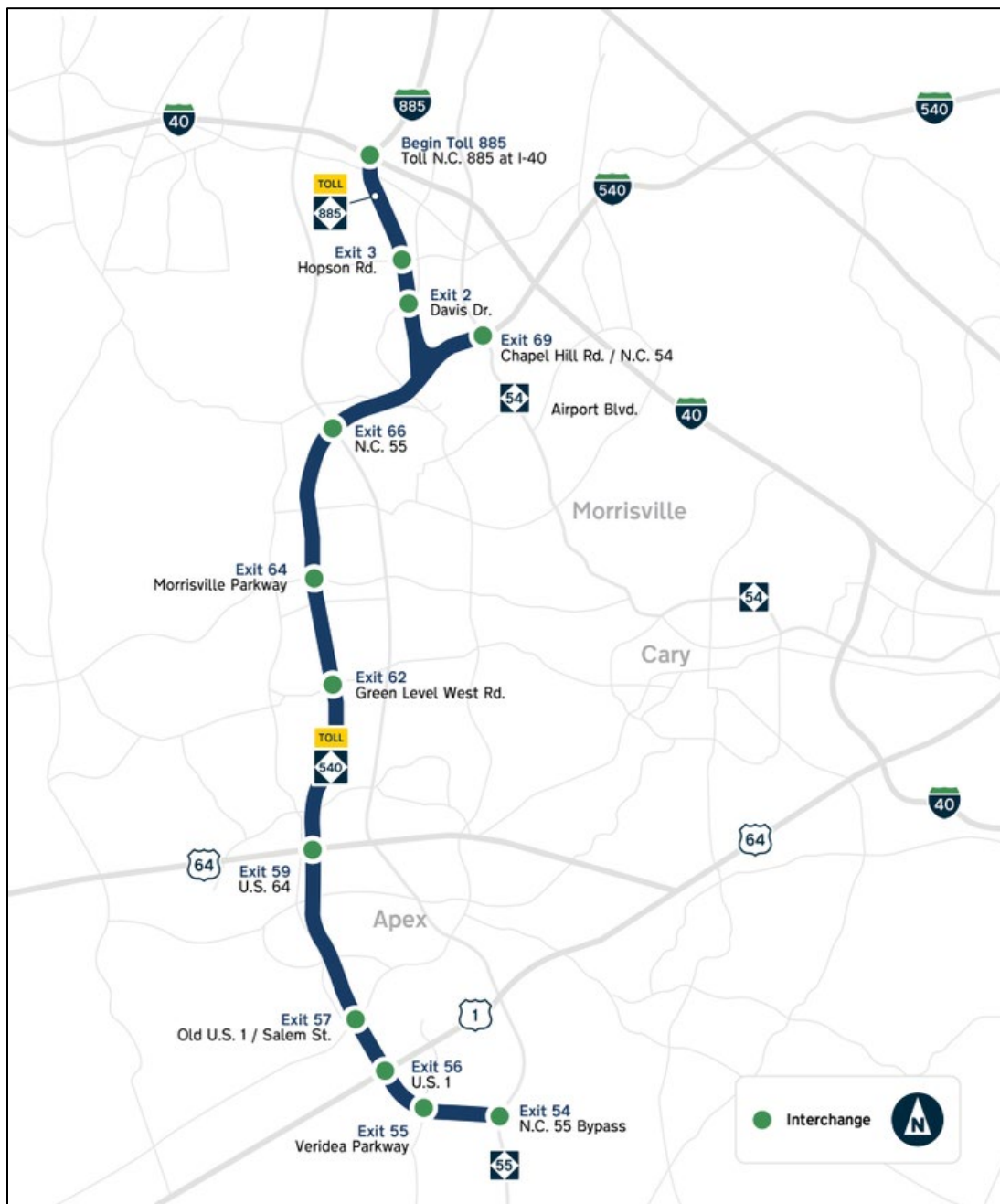
Road Surface =	25%
Unpaved Shoulders =	13%
Drainage =	15%
Roadside =	17%
Traffic Control Devices =	30%
<hr/>	
Total	100%

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 First Quarter Assessment

### 6.1 Quarterly Results

The overall 2023 first quarter maintenance rating of the Triangle Expressway was 95.3, 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 first 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 first quarter MRP performance ratings for elements and characteristics are presented in **Table 4** and **Table 5**, respectively.

**Table 4: MRP Element Results for Q1 2023**

Element	MRP Rating
Road Surface	96.9
Unpaved Shoulders and Ditches	99.1
Drainage	93.3
Roadside	94.2
Traffic Control Devices	94.2
<b>Overall MRP Performance Rating</b>	<b>95.3</b>



Table 5: MRP Characteristics Results for Q1 2023

Road Surface	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q1 Rating
Paved Lanes Asphalt	15	15	9	135	135	100
Paved Lanes Concrete	16	17	9	144	153	94
Paved Shoulder	31	32	5	155	160	97
<b>Element Total</b>				<b>434</b>	<b>448</b>	<b>96.9</b>
Unpaved Shoulders and Ditches	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q1 Rating
Unpaved Shoulder	32	32	9	288	288	100
Front/Back Slopes	32	32	6	192	192	100
Lateral and Outfall Ditches, Unpaved	31	32	6	186	192	97
Ditches, Paved	2	2	5	10	10	100
<b>Element Total</b>				<b>676</b>	<b>682</b>	<b>99.1</b>
Drainage	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q1 Rating
Drainage Pipes	30	34	7	210	238	88
Curb and Gutter	27	28	6	162	168	96
Inlets	34	34	7	238	238	100
Misc. Drainage Structure	21	25	4	84	100	84
<b>Element Total</b>				<b>694</b>	<b>744</b>	<b>93.3</b>
Roadside	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q1 Rating
Turf Condition	37	38	7	259	266	97
Landscaping	24	25	4	96	100	96
Trees and Brush	31	31	4	124	124	100
Litter	32	32	4	128	128	100
Roadway Sweeping	32	32	5	160	160	100
Guardrail, Concrete Barrier, and End Anchors	29	31	9	261	279	94
Impact Attenuators	9	9	9	81	81	100
Fence, Control Access	20	28	7	140	196	71
Retaining Walls and Sound Barrier Walls	15	18	5	75	90	83
Decorative Supports	26	26	5	130	130	100
Graffiti and Stain Removal	44	44	4	176	176	100
<b>Element Total</b>				<b>1630</b>	<b>1730</b>	<b>94.2</b>
Traffic Control Devices	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q1 Rating
Signs	30	33	7	210	231	91
Delineators	30	32	3	90	96	94
Pavement Striping/Marking	8	8	8	64	64	100
Words and Symbols	22	24	7	154	168	92
Pavement Markers	8	8	9	72	72	100
Highway Lighting	28	29	6	168	174	97
<b>Element Total</b>				<b>758</b>	<b>805</b>	<b>94.2</b>

Additionally, **Appendix A** includes maps that present the location of all assets assessed during the first 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 first quarter, all elements exceeded NCTA's quarter score threshold criteria of 85. All elements received a quarter score above 90.

Road Surface (96.9) experienced a 0.2 point increase from the previous quarter's rolling rating. Asphalt resurfacing was completed in September of 2021. Paved Lanes Asphalt (100) rolling rating increased by 1.8 points.

Unpaved Shoulders and Ditches (99.1) experienced a slight 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 (93.4) rolling rating increased by 0.3 points from the previous quarter rolling rating. Curb and Gutter (96) and Inlets (97) rolling rating increased from last quarter by 1.0 and 0.7 points respectively.

Roadside (94.2) rolling rating did not change from the previous quarter rolling rating. Retaining Walls and Sound Barrier Walls (83) scored above the threshold value, increasing by 2.3 points from the previous quarter's rolling rating. Fences and Control Access (71) experienced a decrease in rating of 4.3 points from the previous quarter rolling rating.

Traffic Control Devices (94.2) experienced an increase in rolling rating of 0.5 points from the previous quarter. Pavement Striping/Marking (100) experienced an increase in rolling rating of 1.3 points. A portion of concrete striping replacement was performed in Summer 2022. Replacement of striping and markers for the remaining concrete sections is scheduled for Spring 2023.

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

### Characteristics

This quarter, all but one characteristic, Fences and Control Access (71), 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 – 20 of the 28 assets passed): Five of the eight wall sections that did not pass had failed for height. 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 was ongoing through February and March when the inspection was occurring.

## 7.0 Current Rolling MRP Rating

The rolling maintenance rating of the Triangle Expressway was **94.8**, exceeding NCTA's target overall rating of **90**. All elements exceeded NCTA's rolling rating threshold criteria of 85. Twenty-seven of the twenty-eight characteristic ratings met or exceeded the target rating of 80.

The 2022/2023 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 2022/2023**

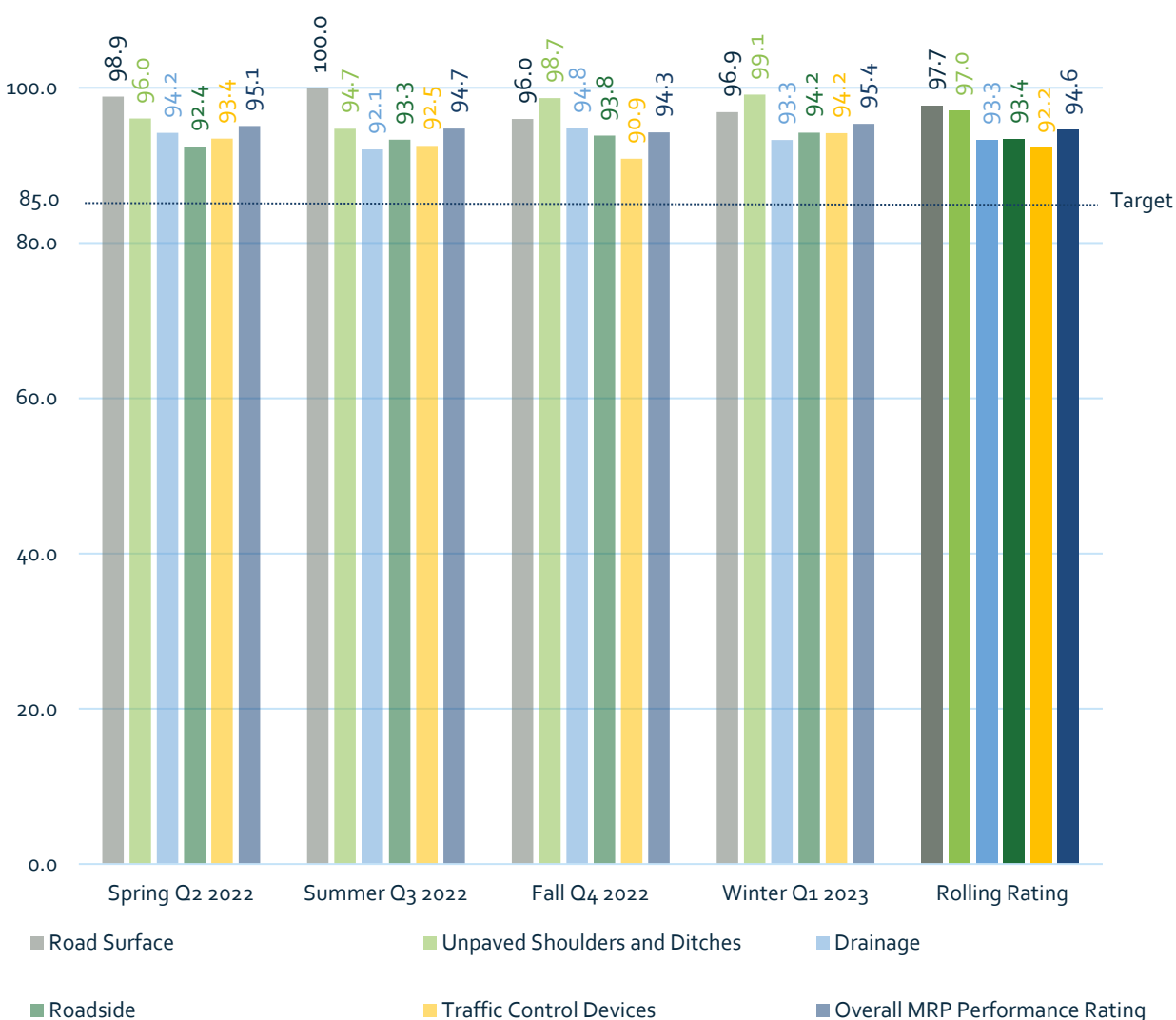


Table 6: MRP Rolling Element Results

Road Surface	Q2 2022 Rating	Q3 2022 Rating	Q4 2022 Rating	Q1 2023 Rating	Rolling Rating
Paved Lanes Asphalt	100	100	100	100	100
Paved Lanes Concrete	100	100	88	94	96
Paved Shoulder	97	100	100	97	98
Element Total	98.9	100.0	96.0	96.9	97.9
Unpaved Shoulders and Ditches	Q2 2022 Rating	Q3 2022 Rating	Q4 2022 Rating	Q1 2023 Rating	Rolling Rating
Unpaved Shoulder	91	88	97	100	94
Front/Back Slopes	100	100	100	100	100
Lateral and Outfall Ditches, Unpaved	100	100	100	97	99
Ditches, Paved	100	100	100	100	100
Element Total	96.0	94.7	98.7	99.1	97.1
Drainage	Q2 2022 Rating	Q3 2022 Rating	Q4 2022 Rating	Q1 2023 Rating	Rolling Rating
Drainage Pipes	97	100	94	88	95
Curb and Gutter	93	93	96	96	95
Inlets	94	88	97	100	95
Misc. Drainage Structure	90	82	89	84	87
Element Total	94.2	92.1	94.8	93.3	93.6
Roadside	Q2 2022 Rating	Q3 2022 Rating	Q4 2022 Rating	Q1 2023 Rating	Rolling Rating
Turf Condition	84	88	88	97	89
Landscaping	100	92	100	96	97
Trees and Brush	100	94	100	100	98
Litter	100	97	88	100	96
Roadway Sweeping	100	100	100	100	100
Guardrail, Concrete Barrier, and End Anchors	88	93	100	94	94
Impact Attenuators	100	89	100	100	97
Fence, Control Access	88	94	80	71	87
Retaining Walls and Sound Barrier Walls	75	75	75	83	77
Decorative Supports	100	100	92	100	98
Graffiti and Stain Removal	100	100	98	100	99
Element Total	92.4	93.3	92.3	94.2	93.4
Traffic Control Devices	Q2 2022 Rating	Q3 2022 Rating	Q4 2022 Rating	Q1 2023 Rating	Rolling Rating
Signs	97	91	91	91	93
Delineators	94	100	91	94	95
Pavement Striping/Marking	100 <sup>1</sup>	91 <sup>1</sup>	100 <sup>1</sup>	100 <sup>1</sup>	98 <sup>2</sup>
Words and Symbols	87 <sup>1</sup>	83 <sup>1</sup>	82 <sup>1</sup>	92 <sup>1</sup>	85 <sup>2</sup>
Pavement Markers	85 <sup>1</sup>	100 <sup>1</sup>	100 <sup>1</sup>	100 <sup>1</sup>	95 <sup>2</sup>
Highway Lighting	97	97	94	97	96
Element Total	93.4 <sup>1</sup>	92.5 <sup>1</sup>	90.9 <sup>1</sup>	94.2 <sup>1</sup>	92.7 <sup>2</sup>

<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.

## 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 first 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 first quarter 2023 overall rating was 95.3 and the rolling rating was 94.8, both ratings met the target rating of 90.

All element ratings were above the target ratings for the quarter and rolling assessment. During the first quarter assessment, all but one characteristic met or exceeded the target rating of 80. The characteristic that received a quarter score less than 80 was Fences and Control Access (71).

To maintain/improve the condition ratings, it is recommended that the pavement striping/markings replacement cycles are completed as planned in the capital budget. Replacement of pavement striping, and marking is scheduled for Spring.

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 2032 First Quarter Asset Assessment Locations**



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



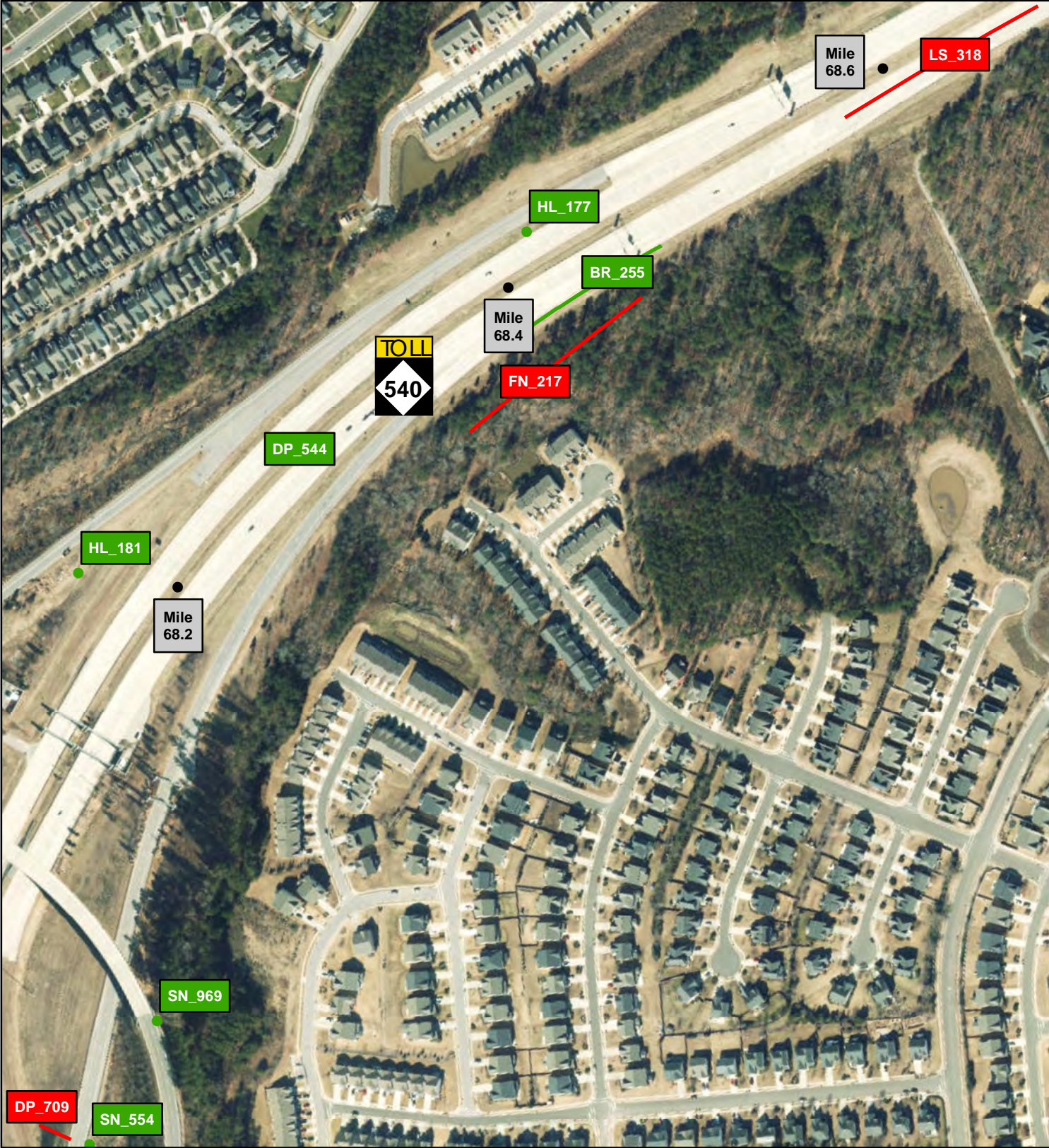
Legend

-  Failing Asset
-  Passing Asset







Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend

-  Failing Asset
-  Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend



Failing Asset

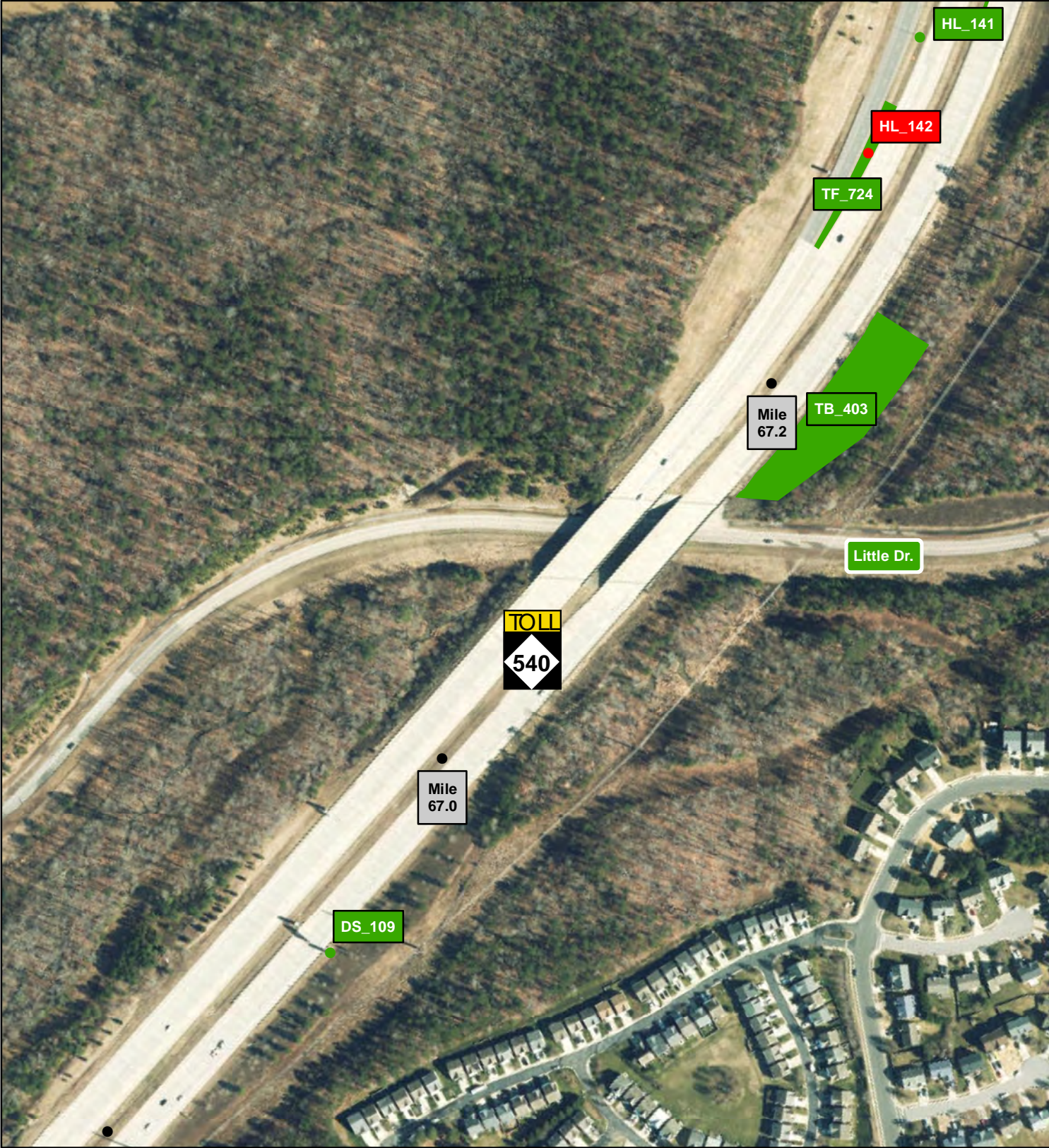


Passing Asset







Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



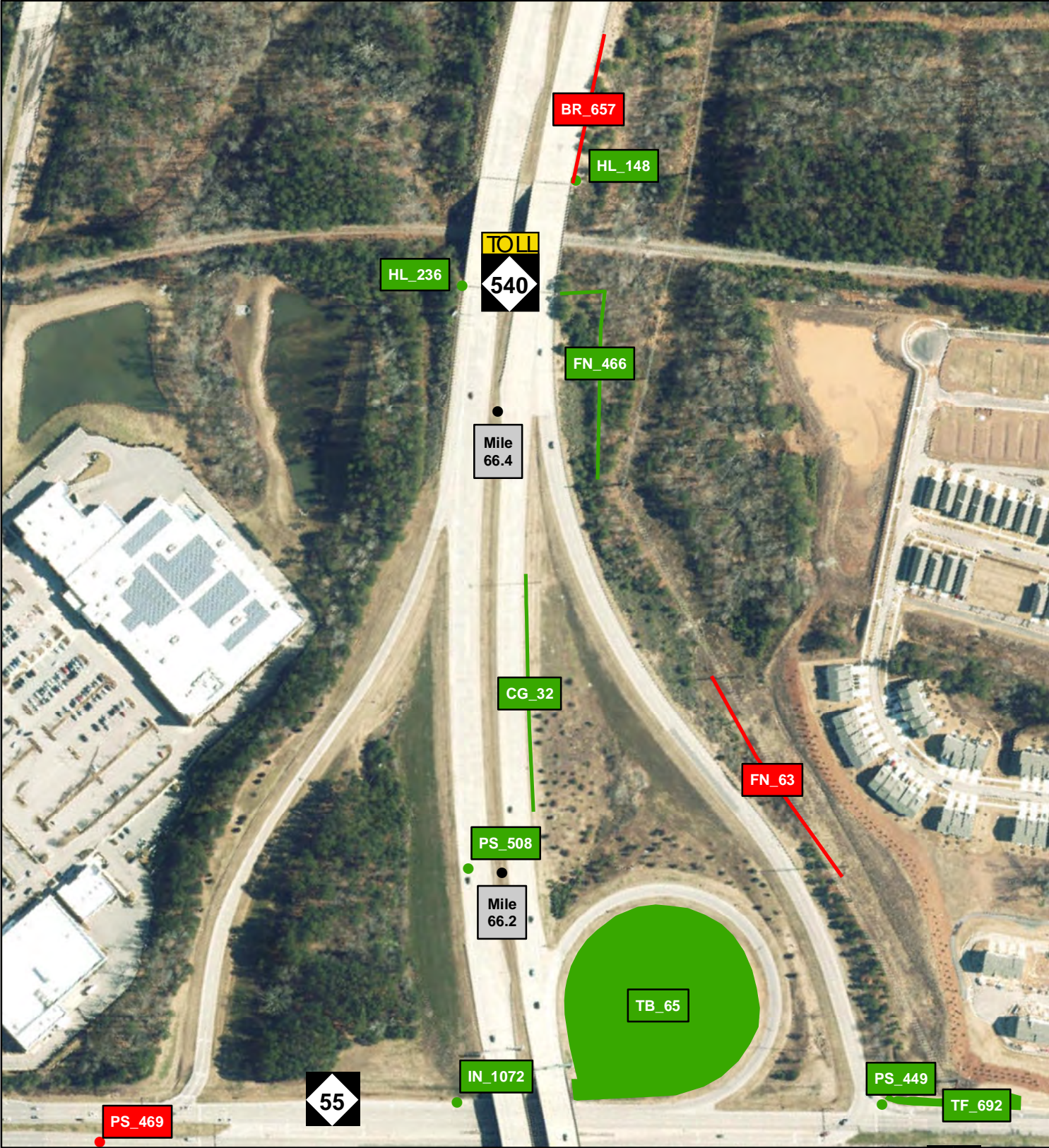
Legend

-  Failing Asset
-  Passing Asset







Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



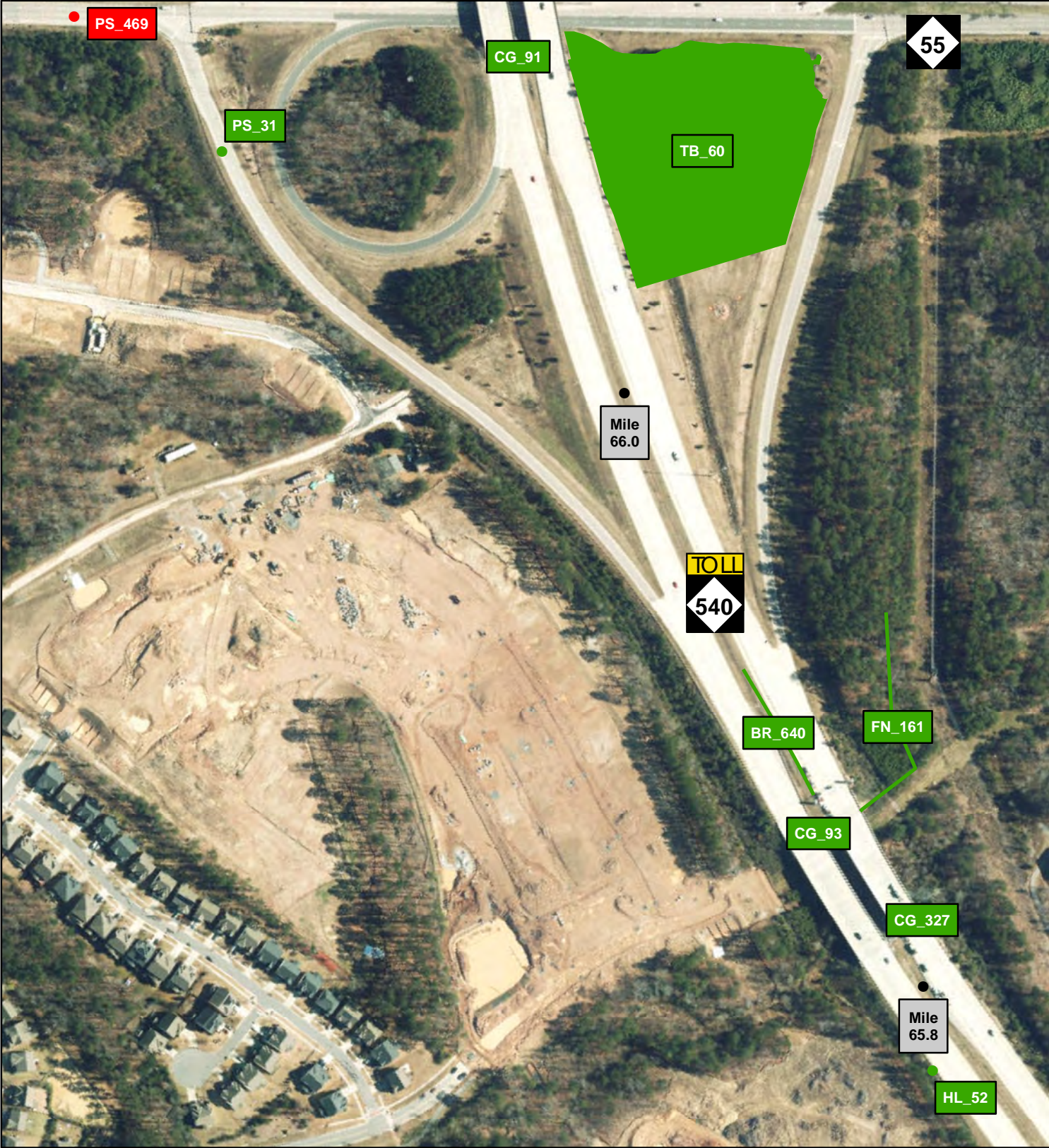
Legend

-  Failing Asset
-  Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend



Failing Asset

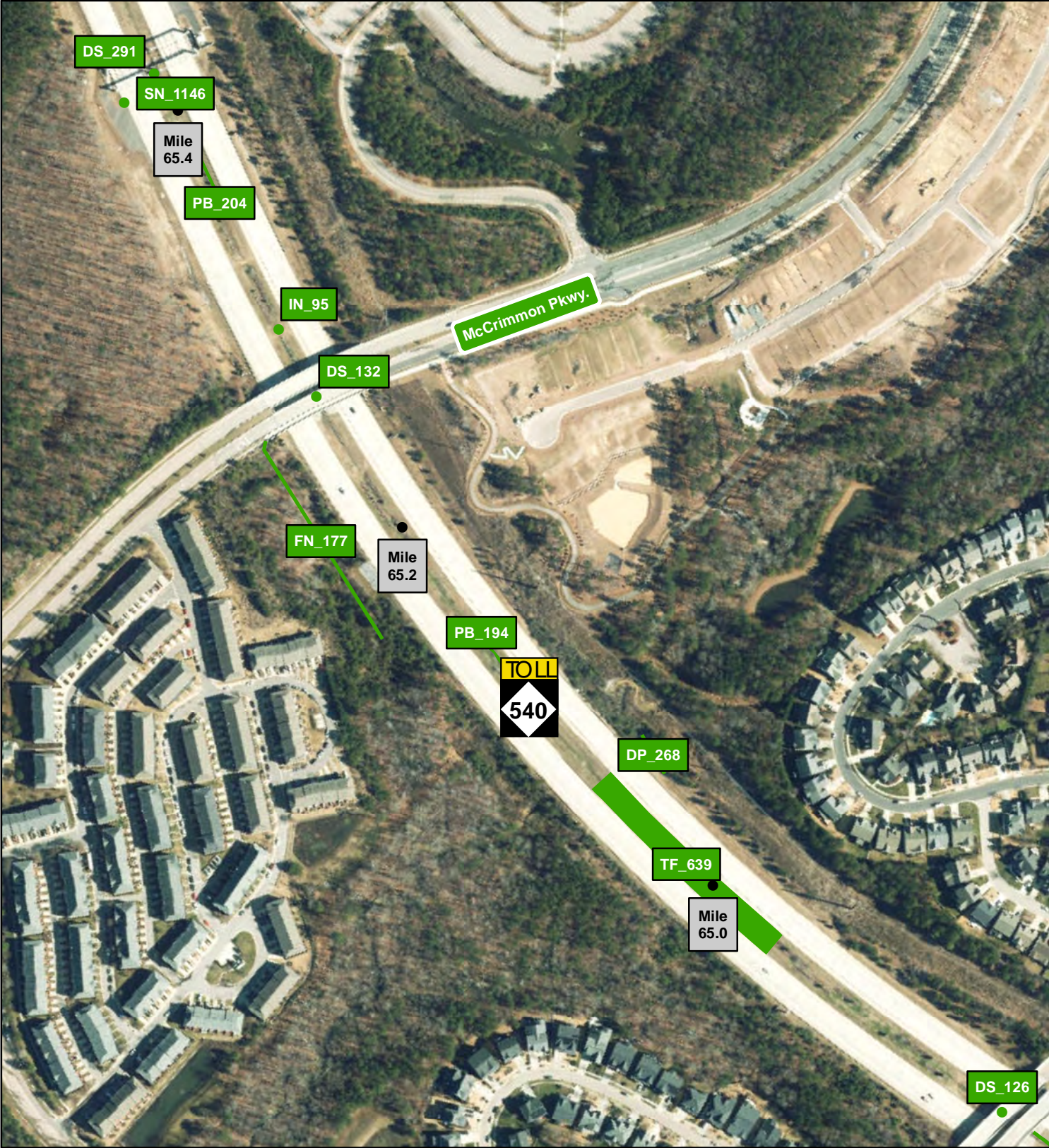


Passing Asset







Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



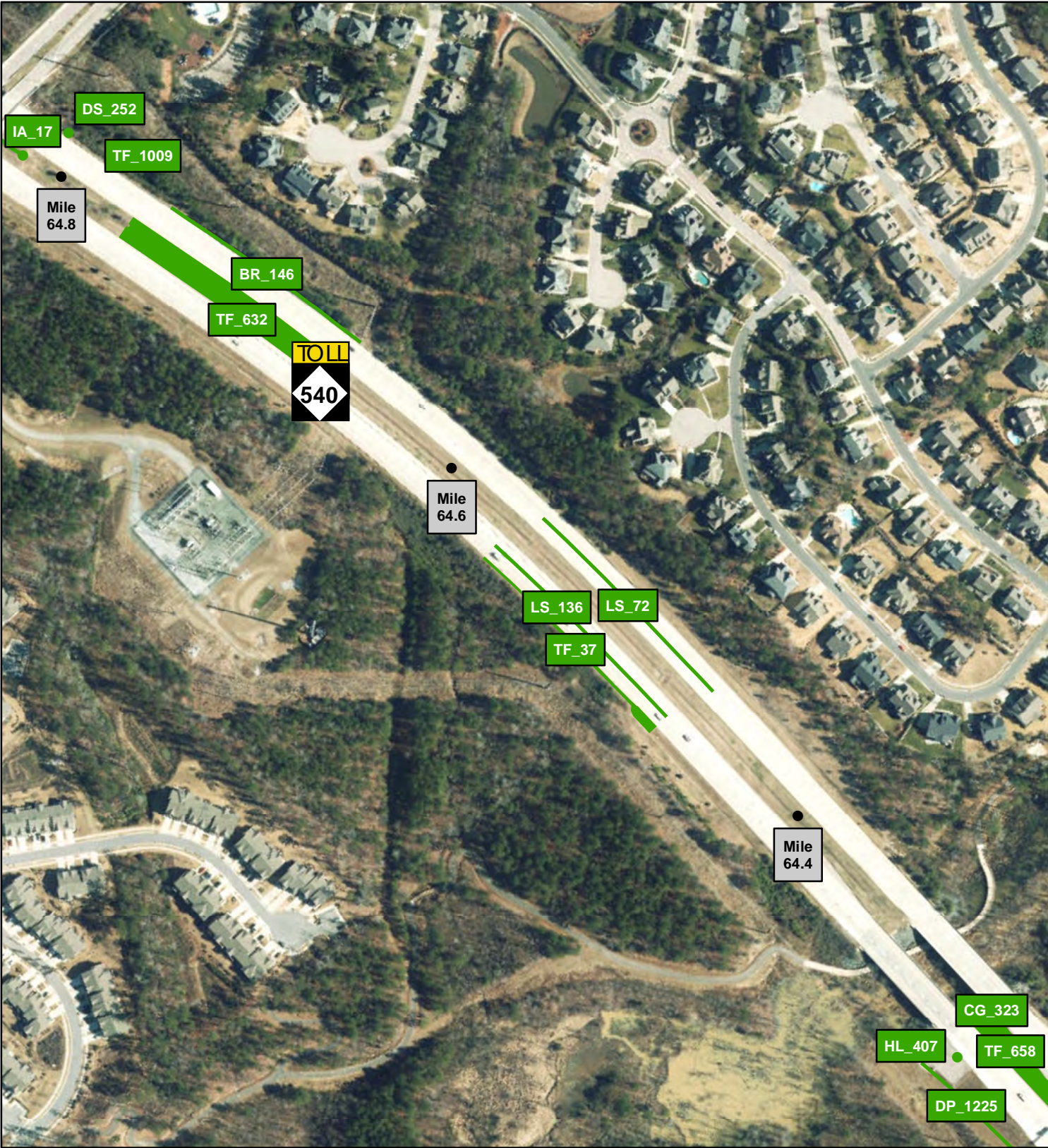
Legend

-  Failing Asset
-  Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend



Failing Asset



Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend



Failing Asset



Passing Asset





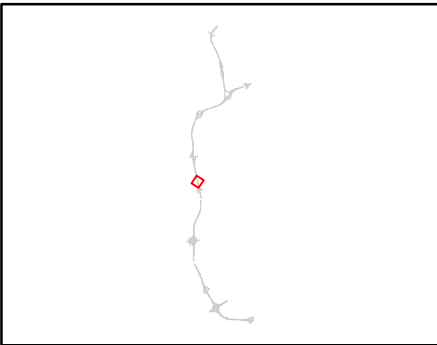


Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend

-  Failing Asset
-  Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



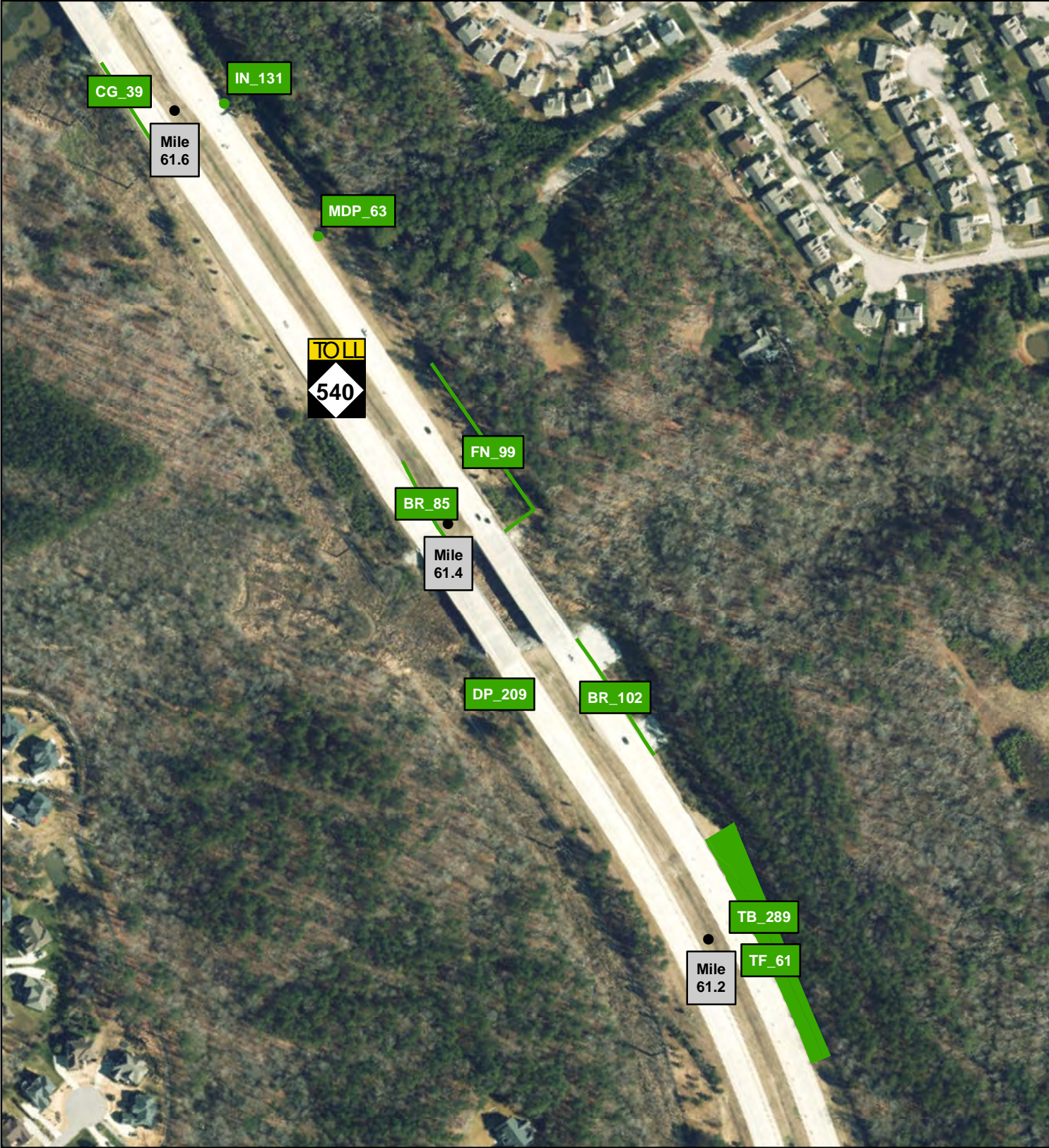
Legend

- Failing Asset
- Passing Asset







Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



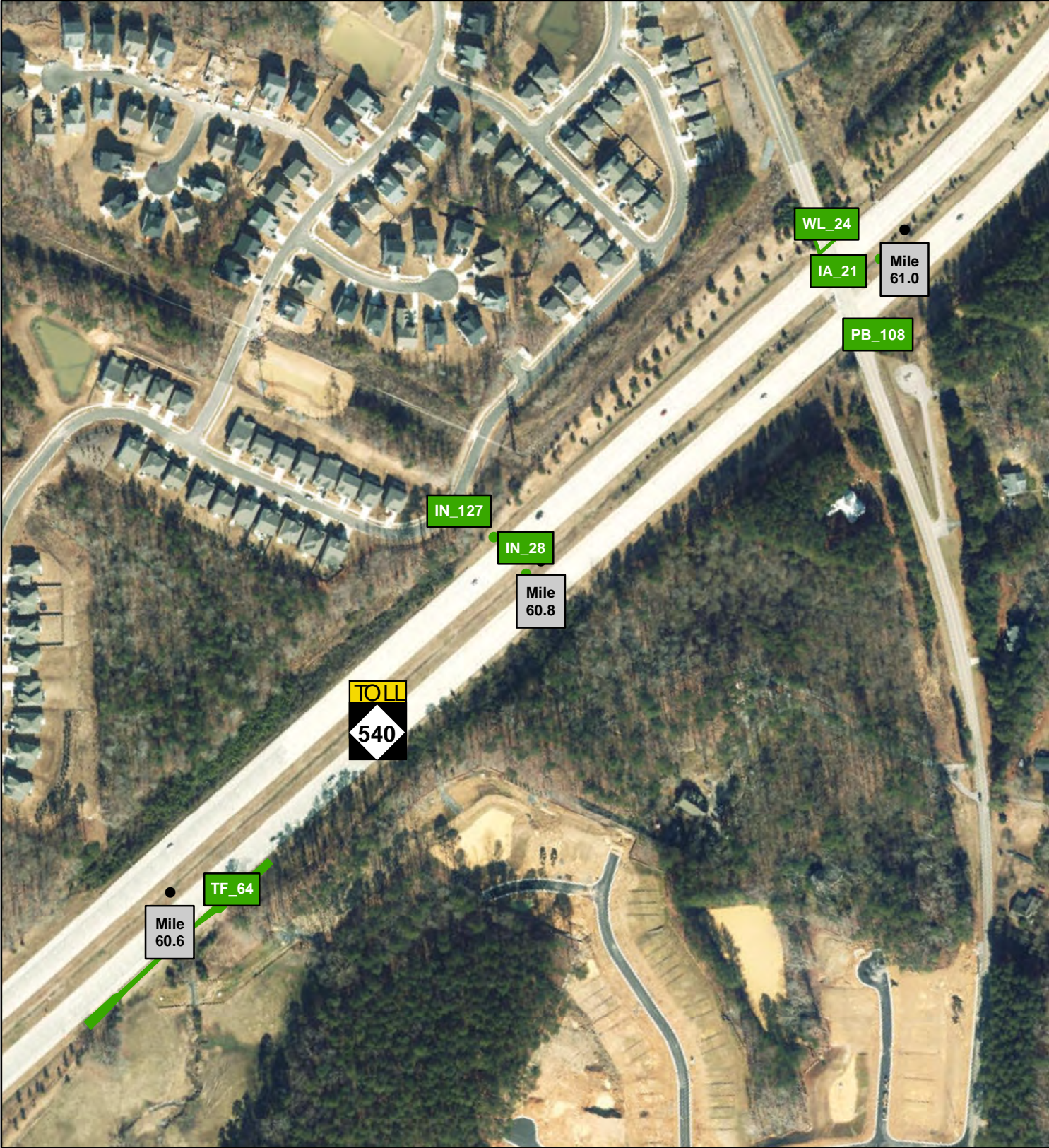
Legend

-  Failing Asset
-  Passing Asset







Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



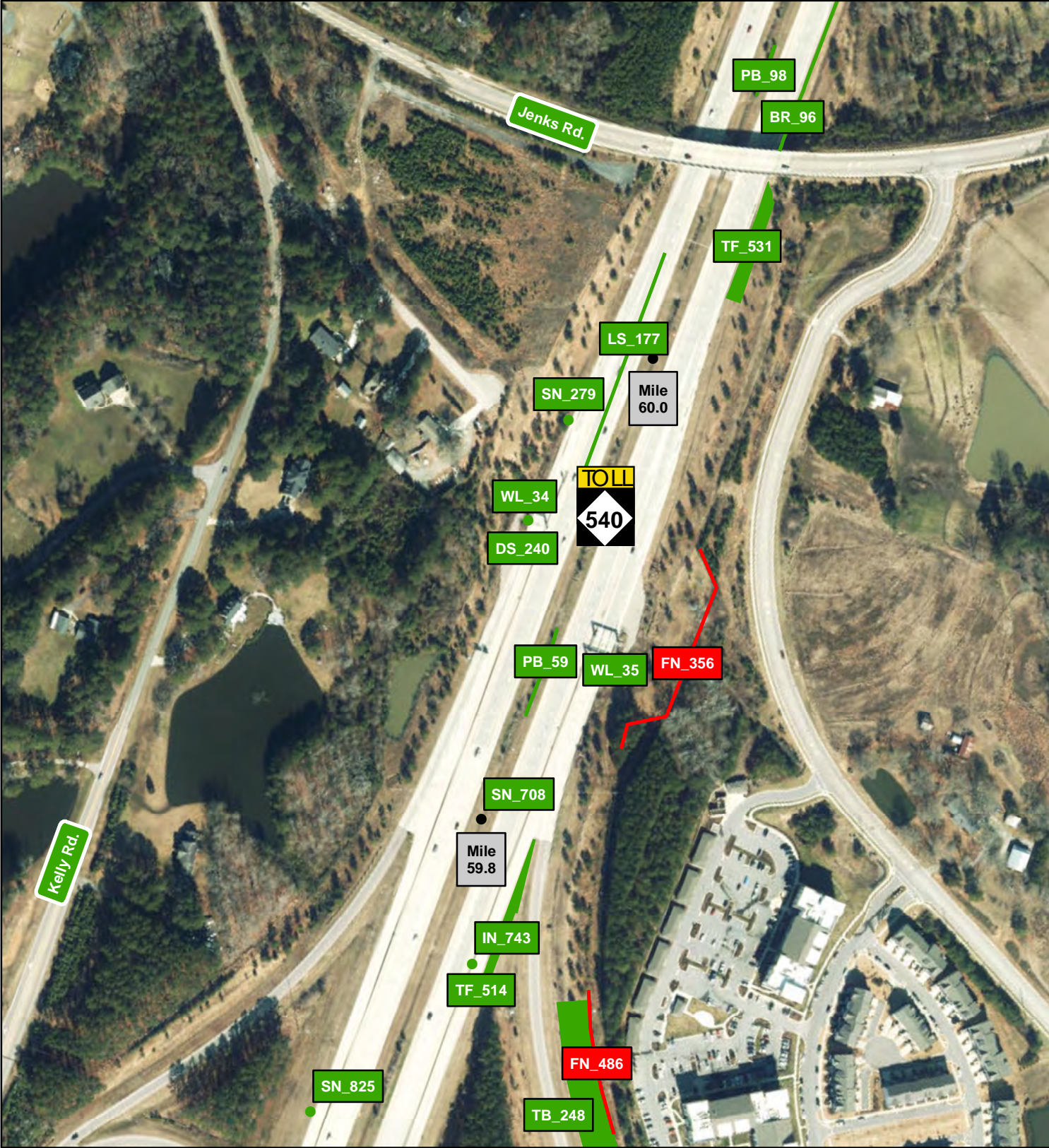
Legend

-  Failing Asset
-  Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend



Failing Asset

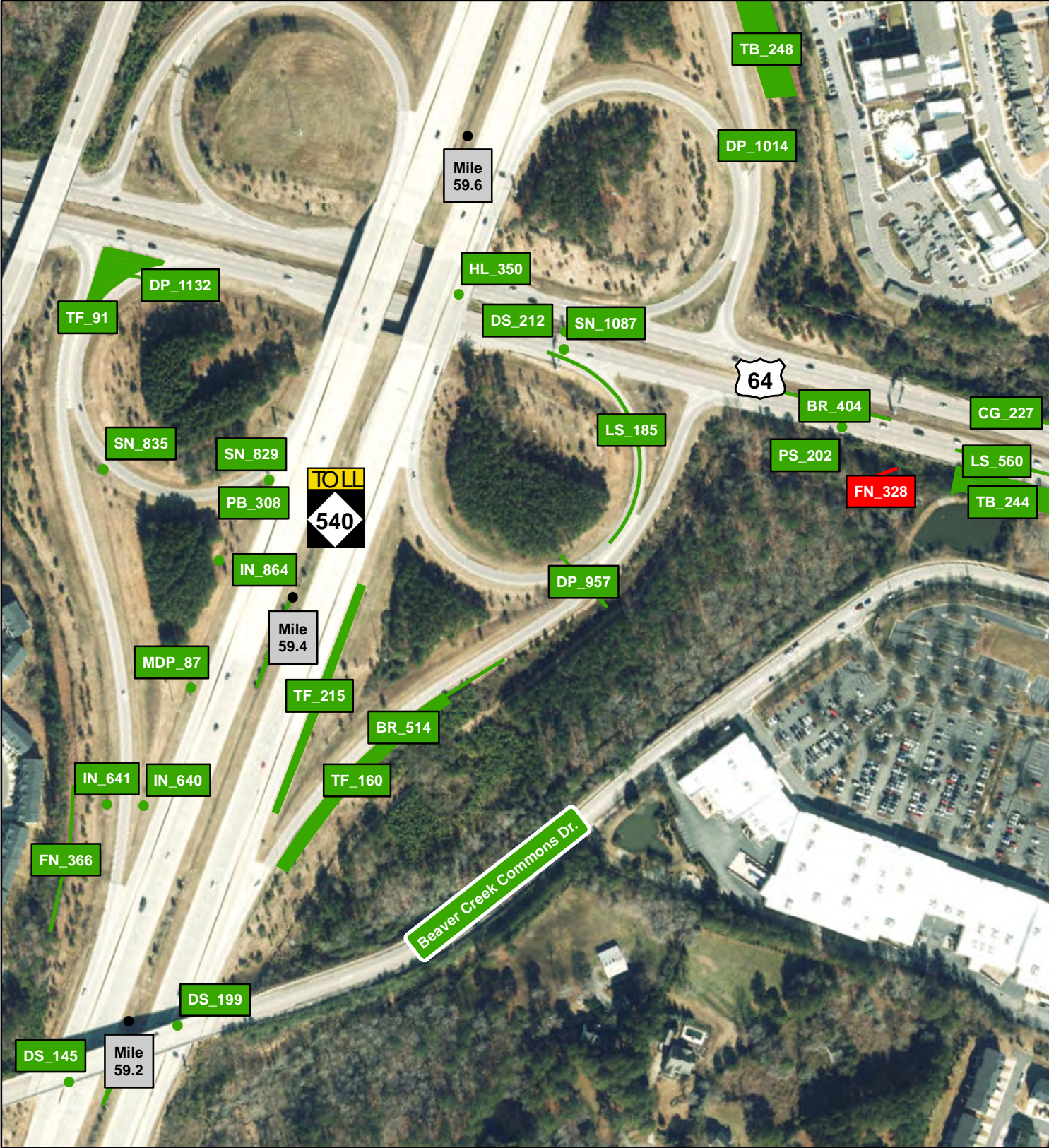


Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend



Failing Asset

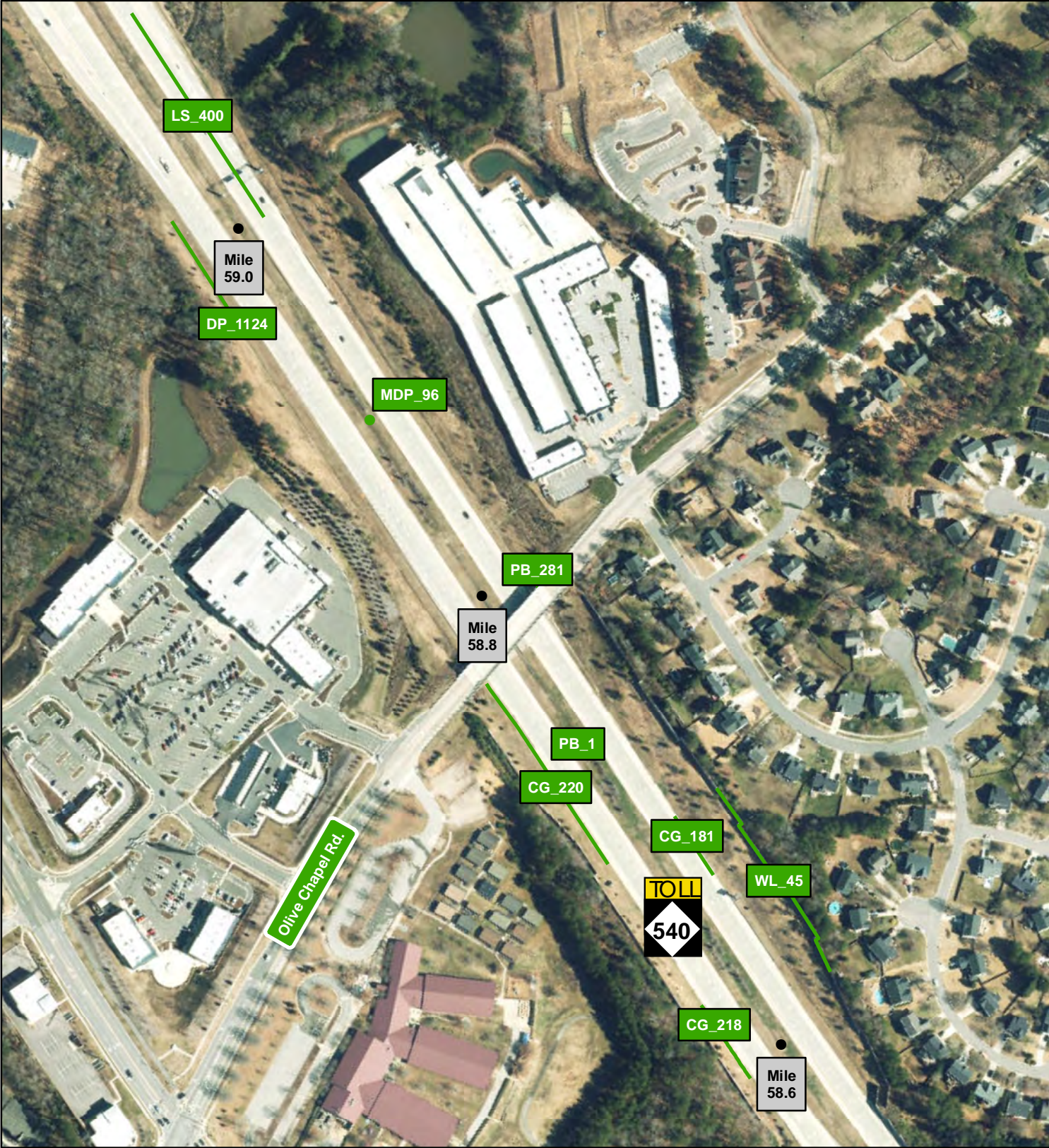


Passing Asset







Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



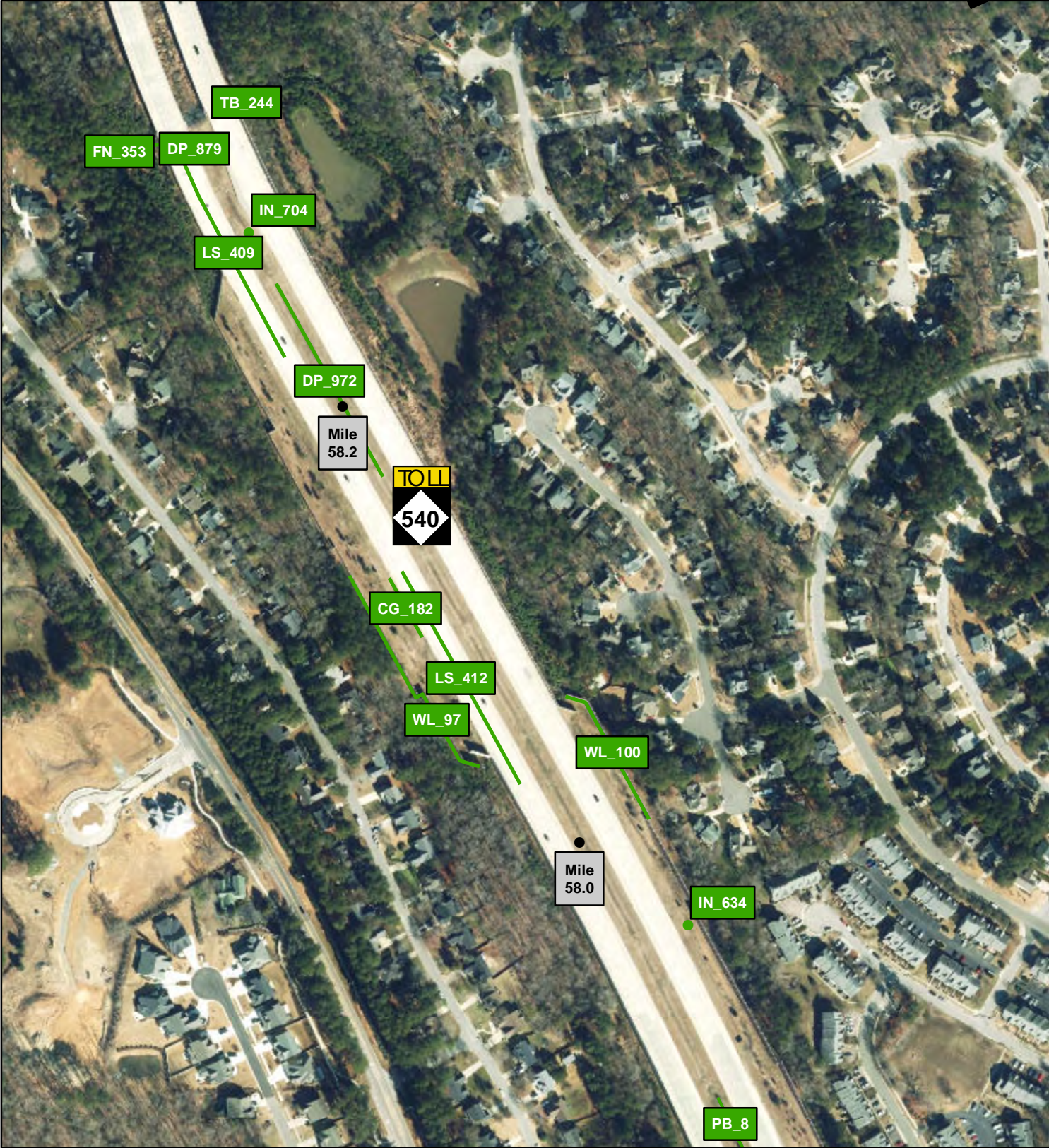
Legend

-  Failing Asset
-  Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend



Failing Asset

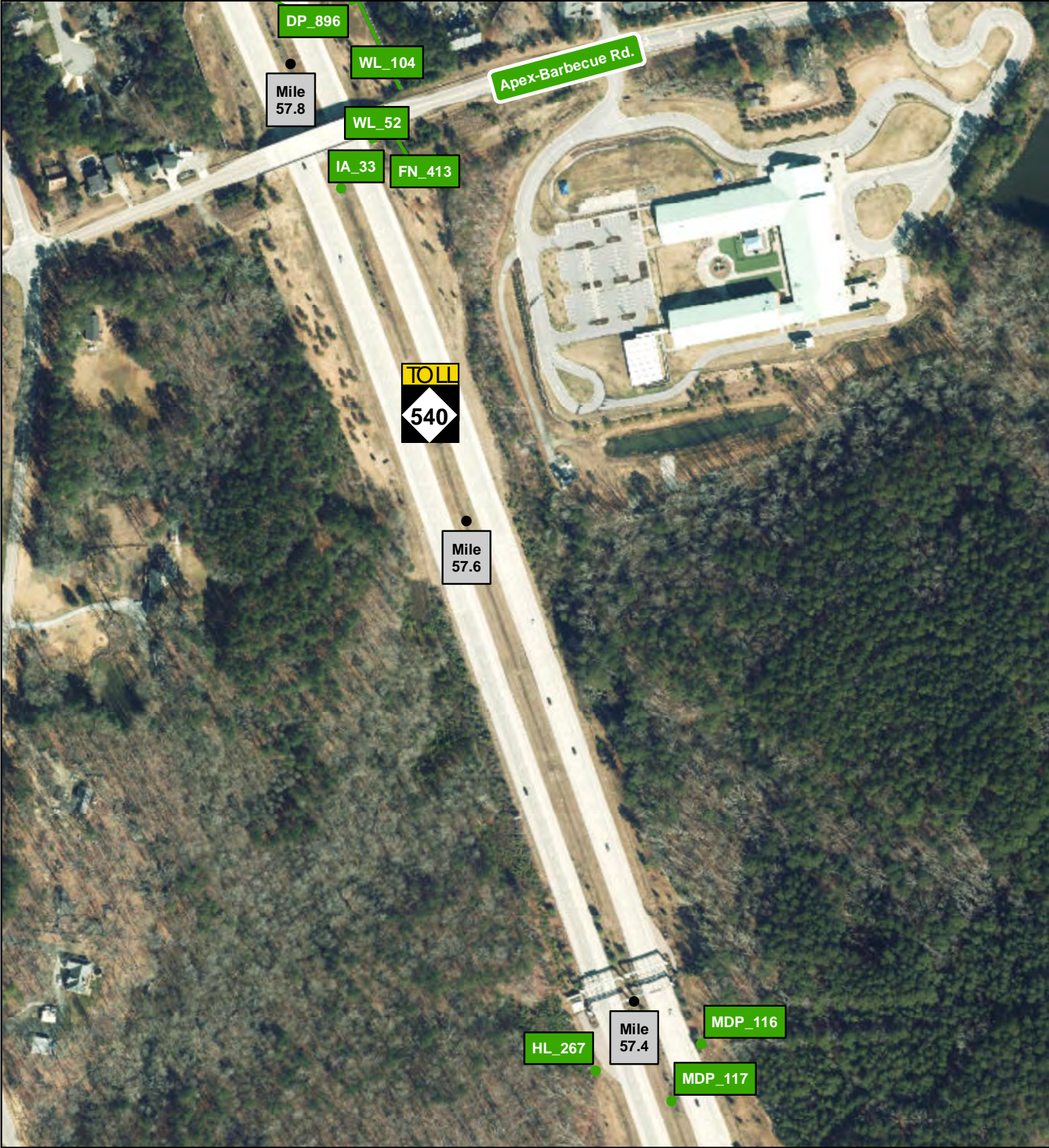


Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend



Failing Asset

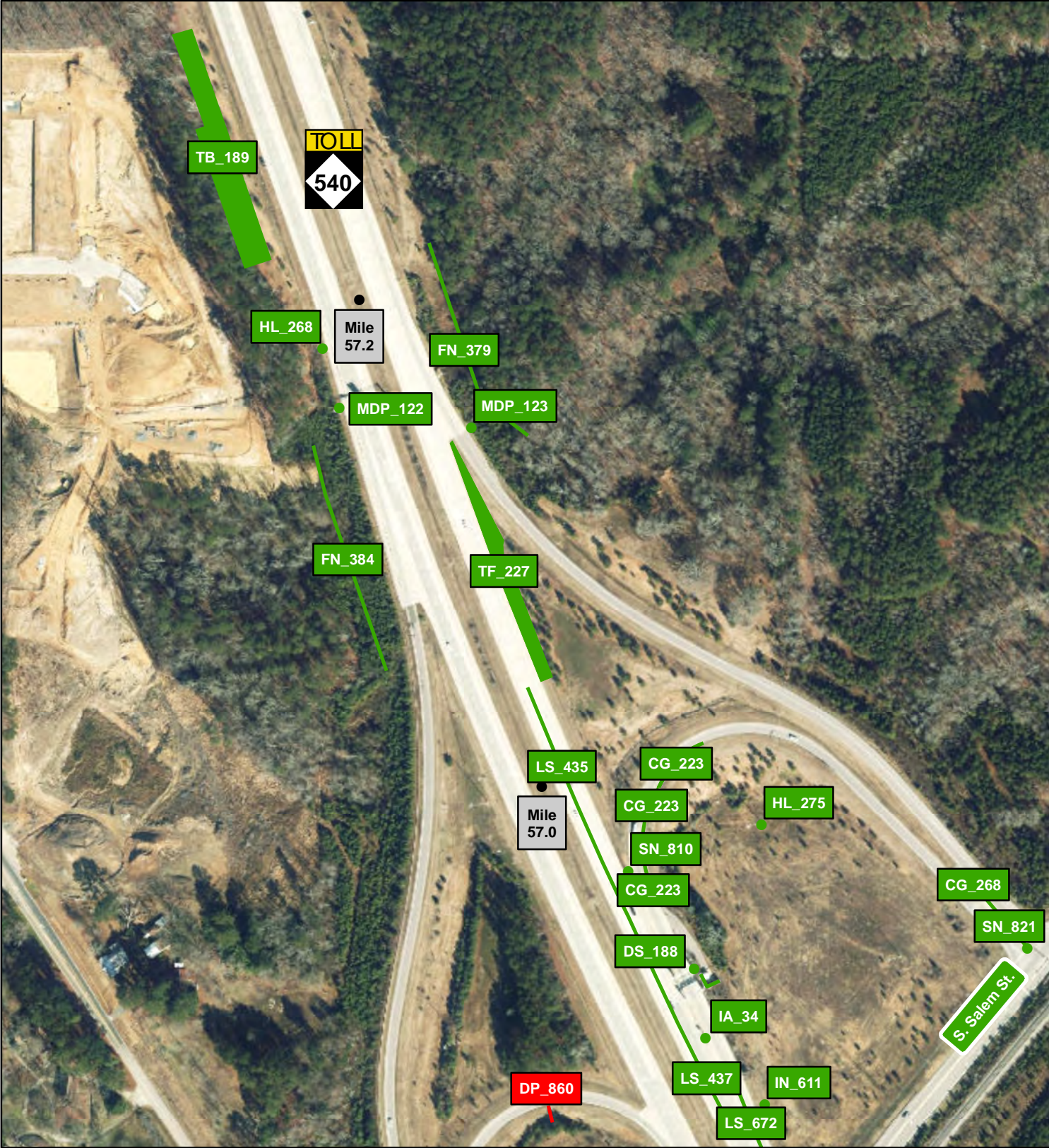


Passing Asset





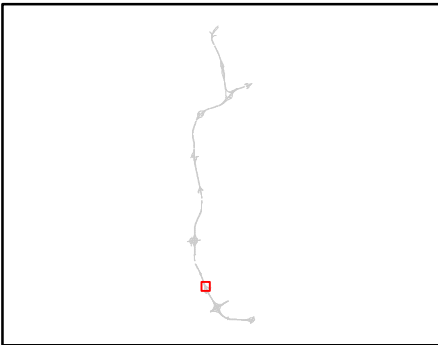


Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



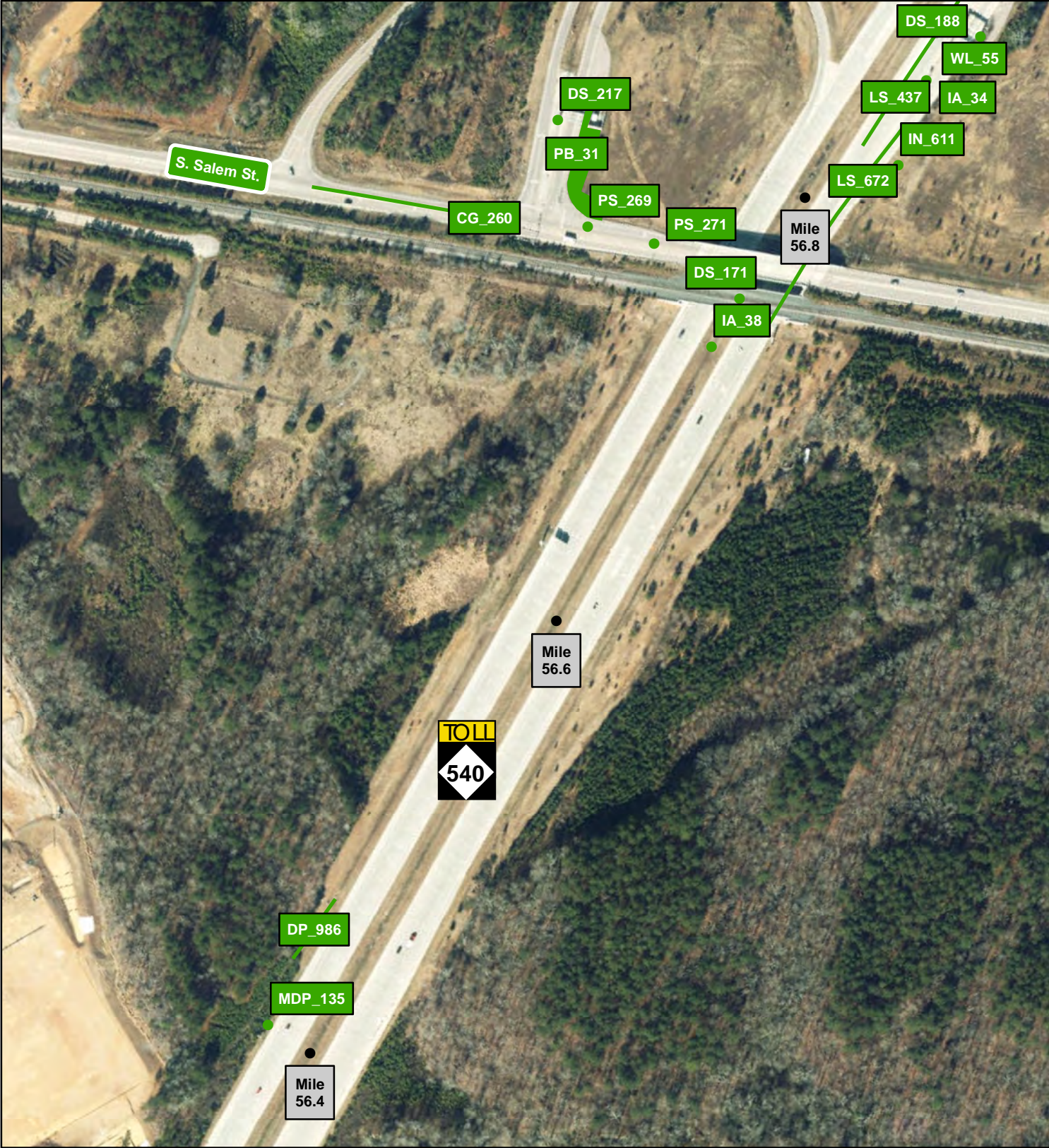
Legend

-  Failing Asset
-  Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



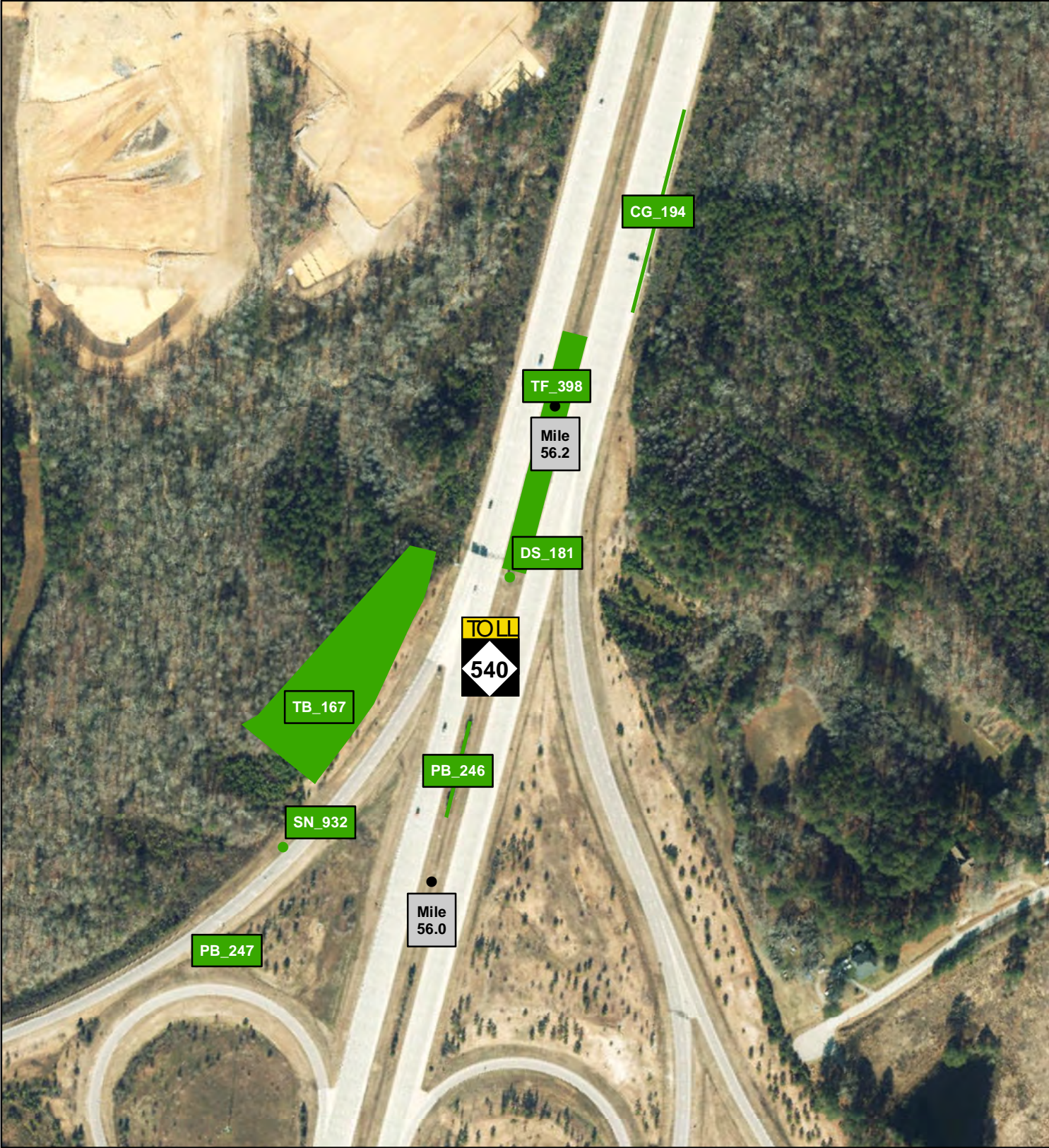
Legend

- Failing Asset
- Passing Asset





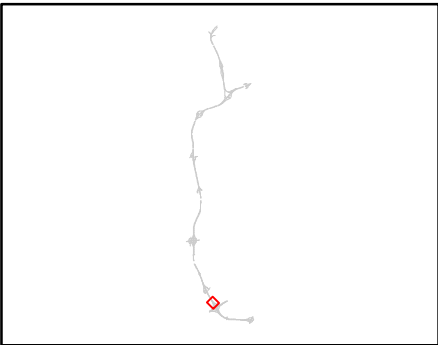


Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



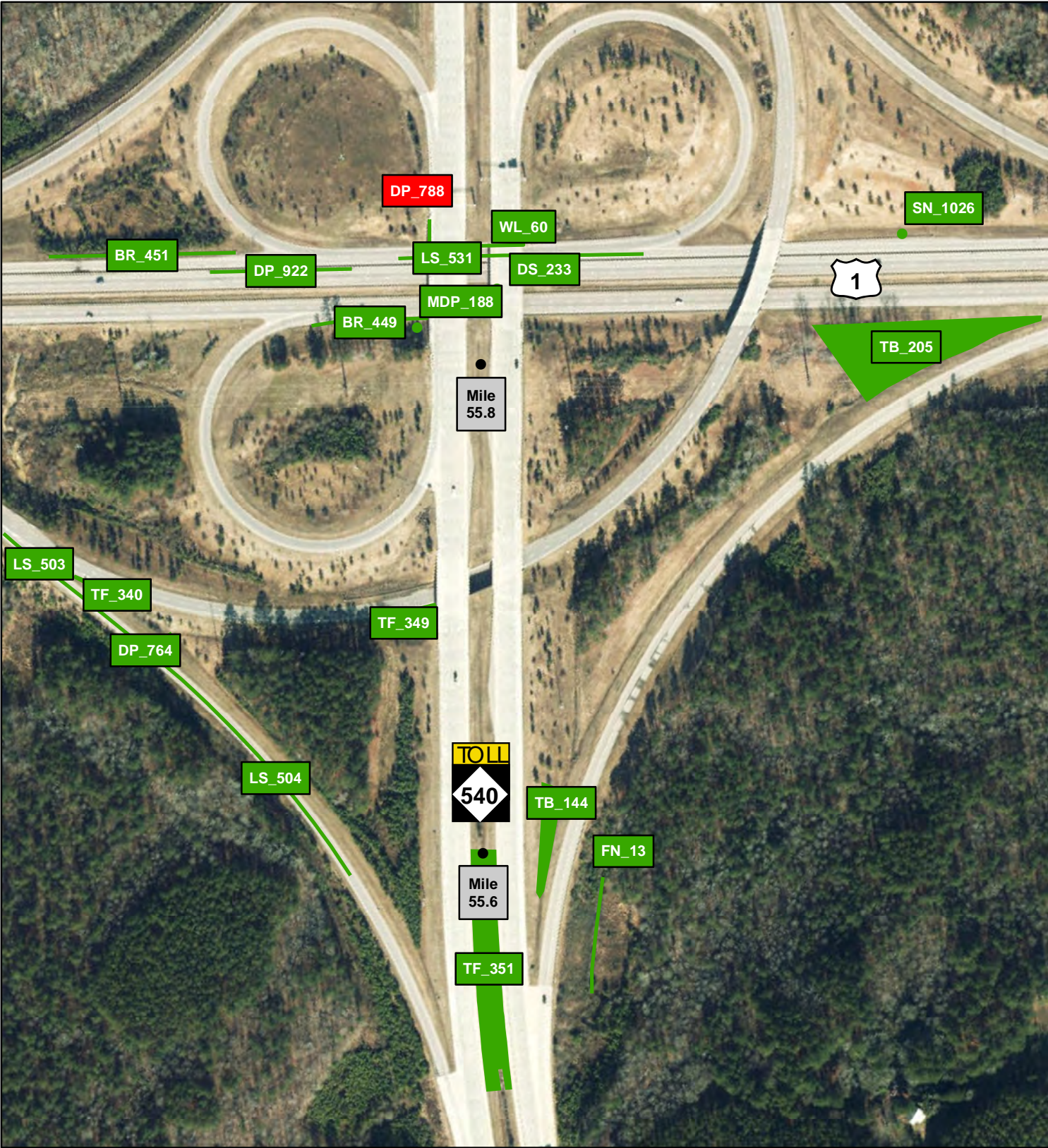
Legend

-  Failing Asset
-  Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend



Failing Asset



Passing Asset





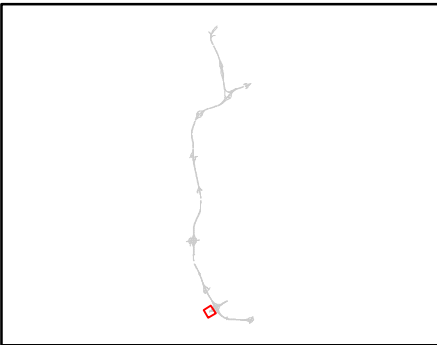


Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend

-  Failing Asset
-  Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



**Legend**



Failing Asset

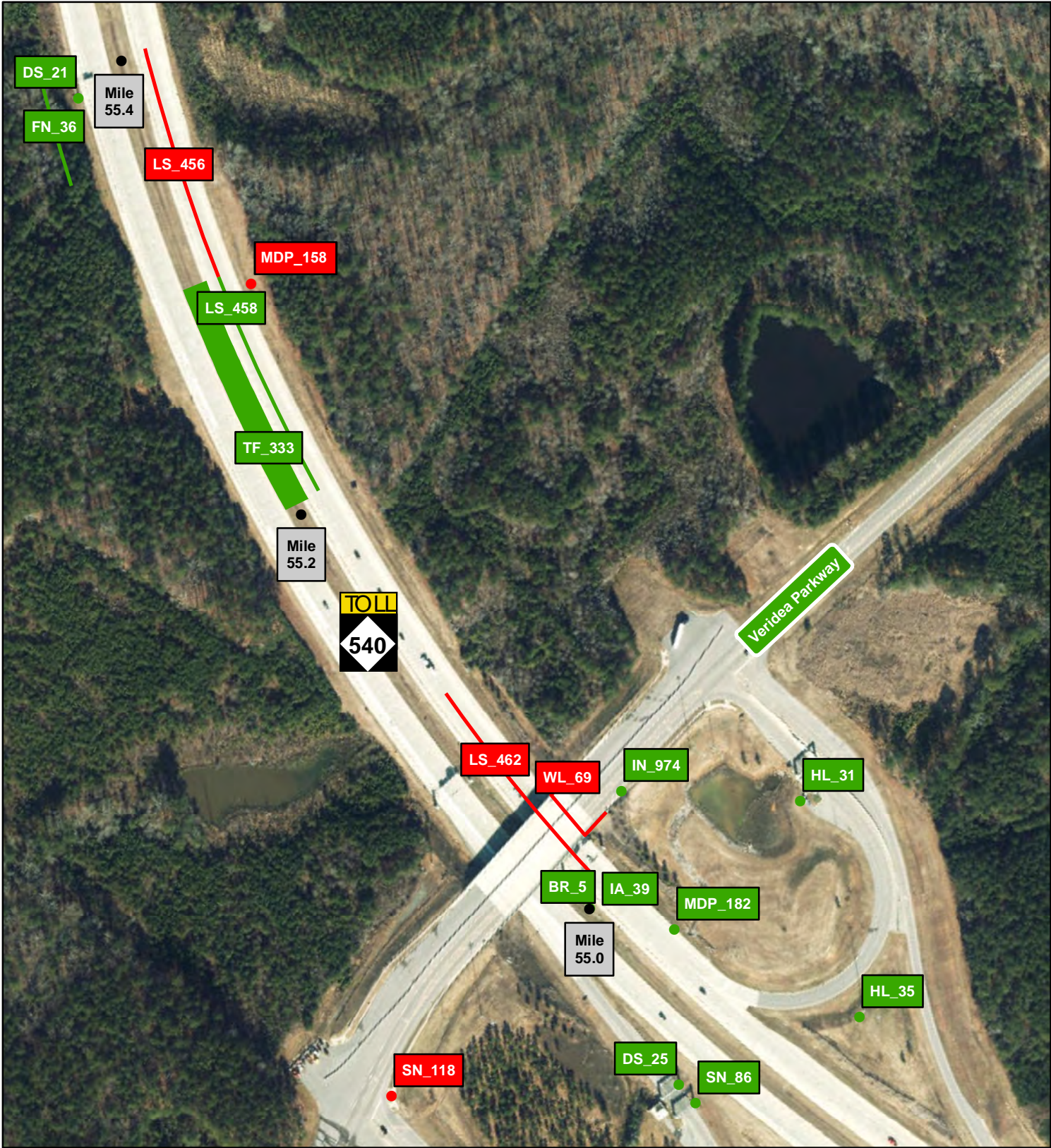


Passing Asset







Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



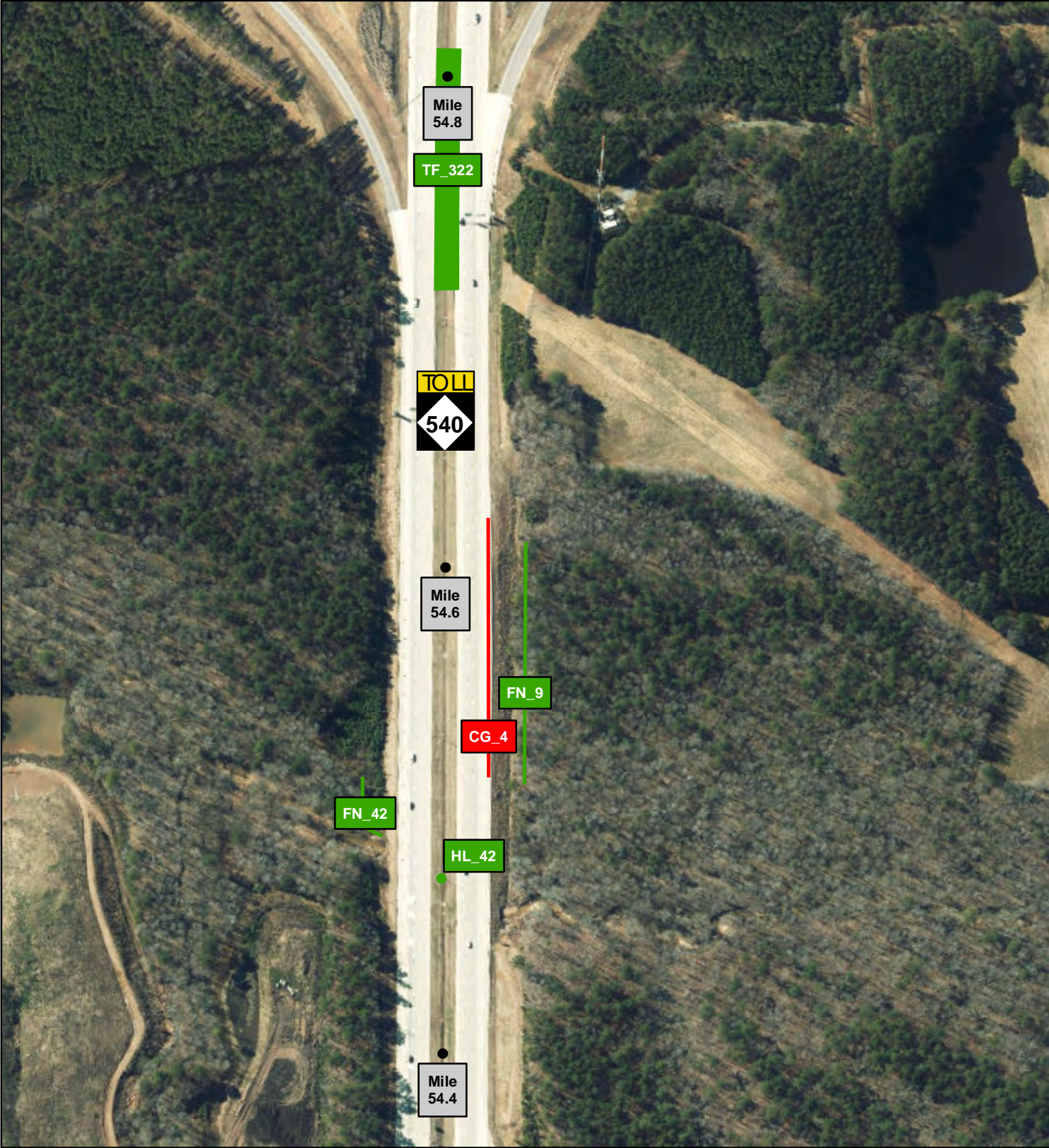
Legend

-  Failing Asset
-  Passing Asset





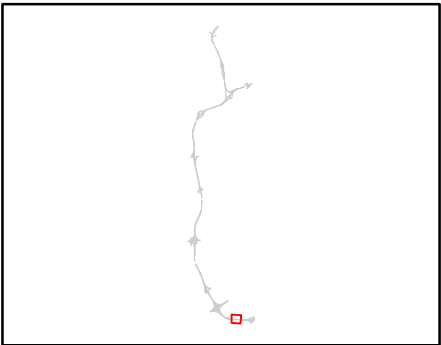


Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



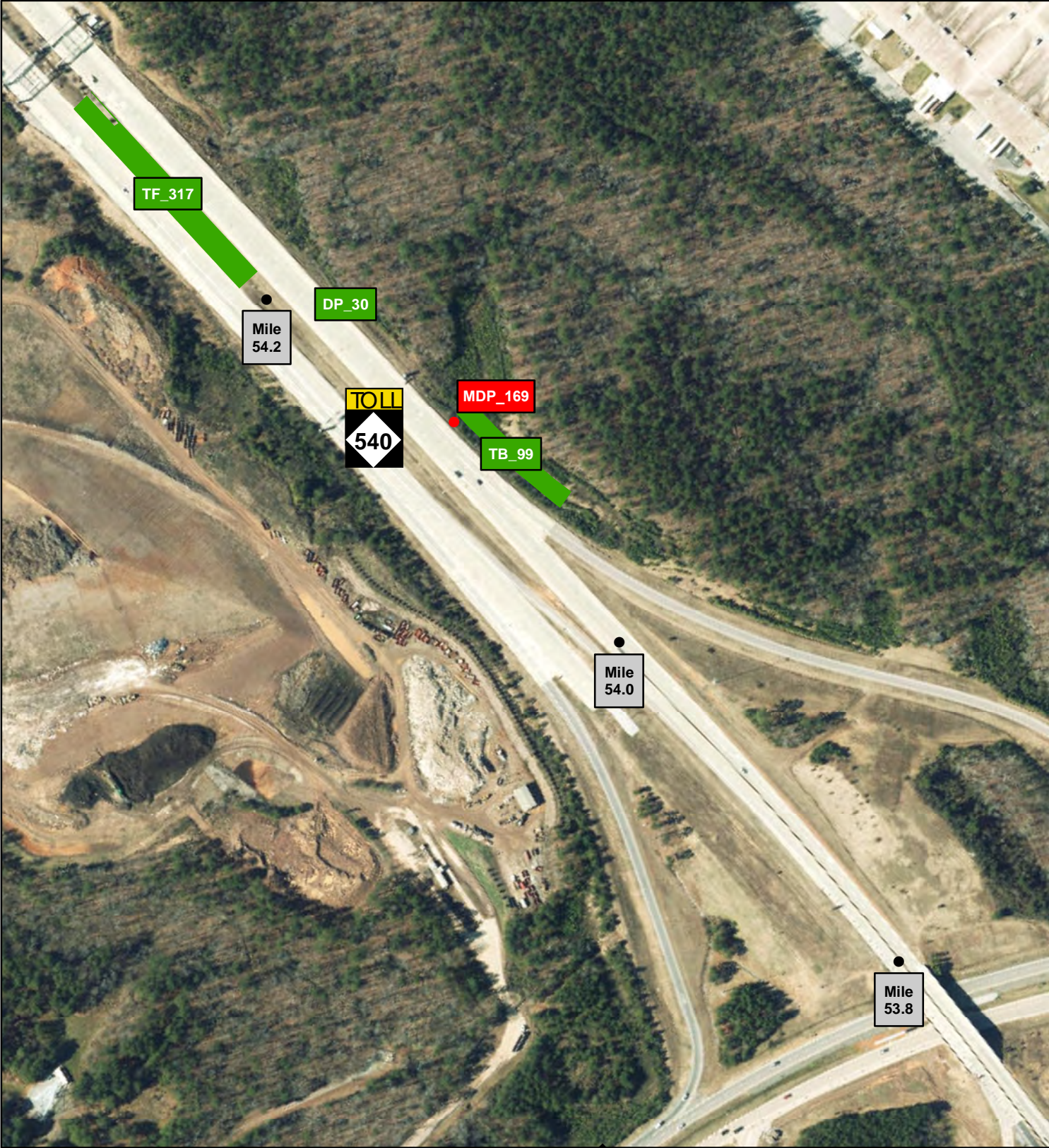
Legend

-  Failing Asset
-  Passing Asset





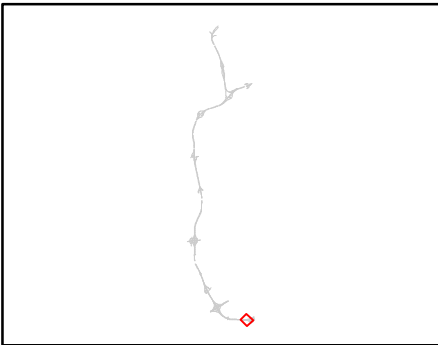


Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend

-  Failing Asset
-  Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



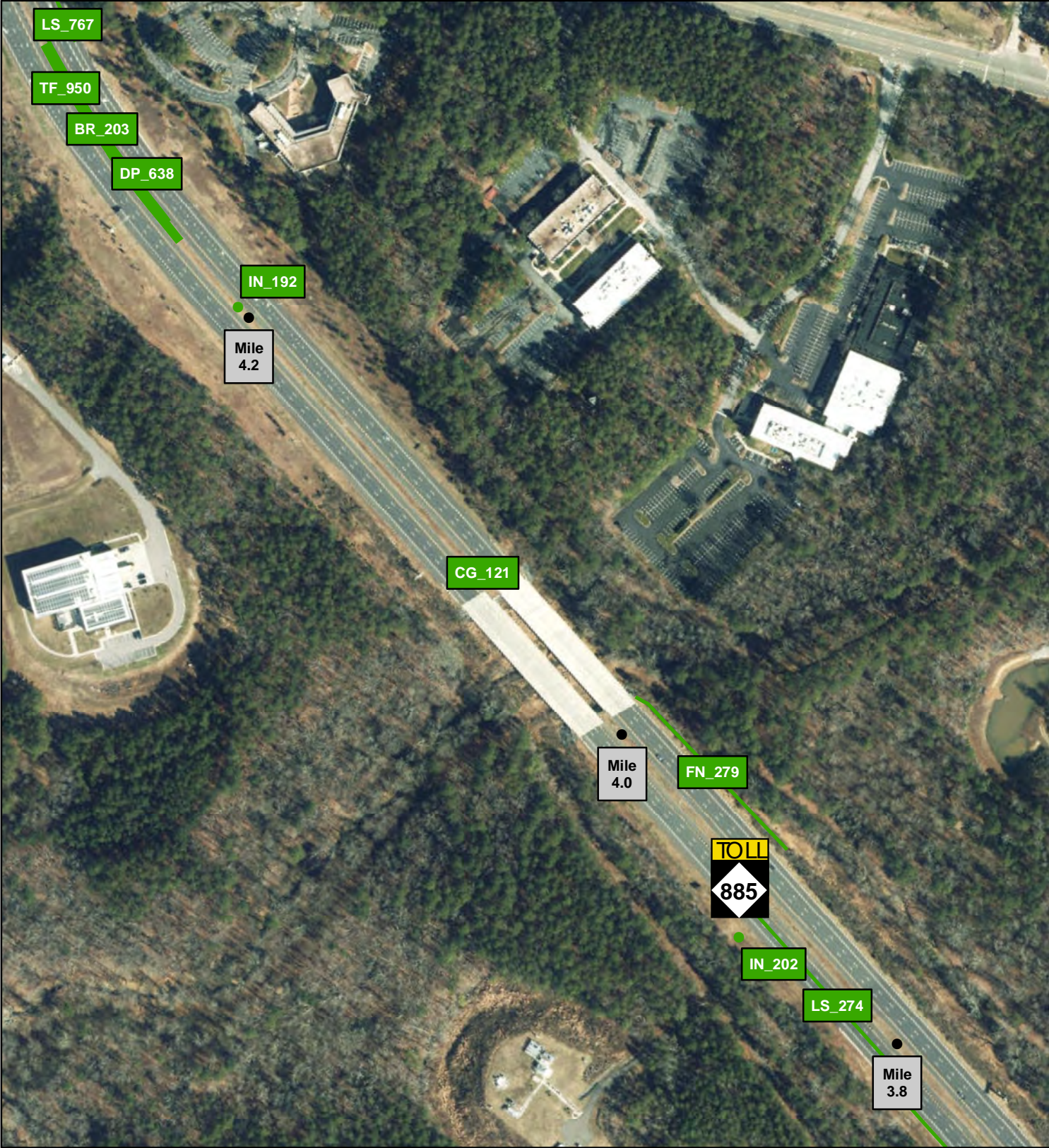
Legend

- Failing Asset
- Passing Asset







Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



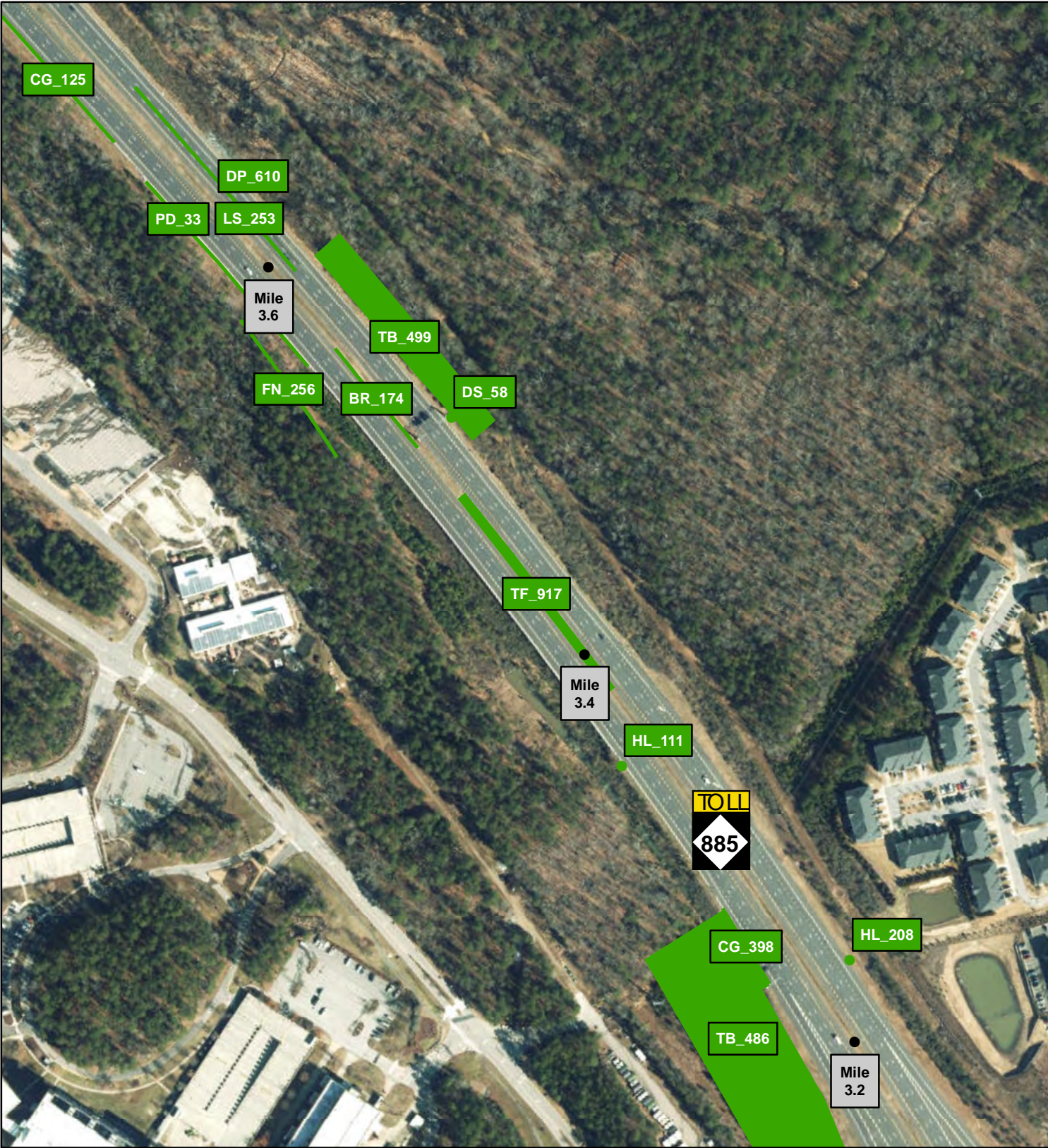
Legend

-  Failing Asset
-  Passing Asset





Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



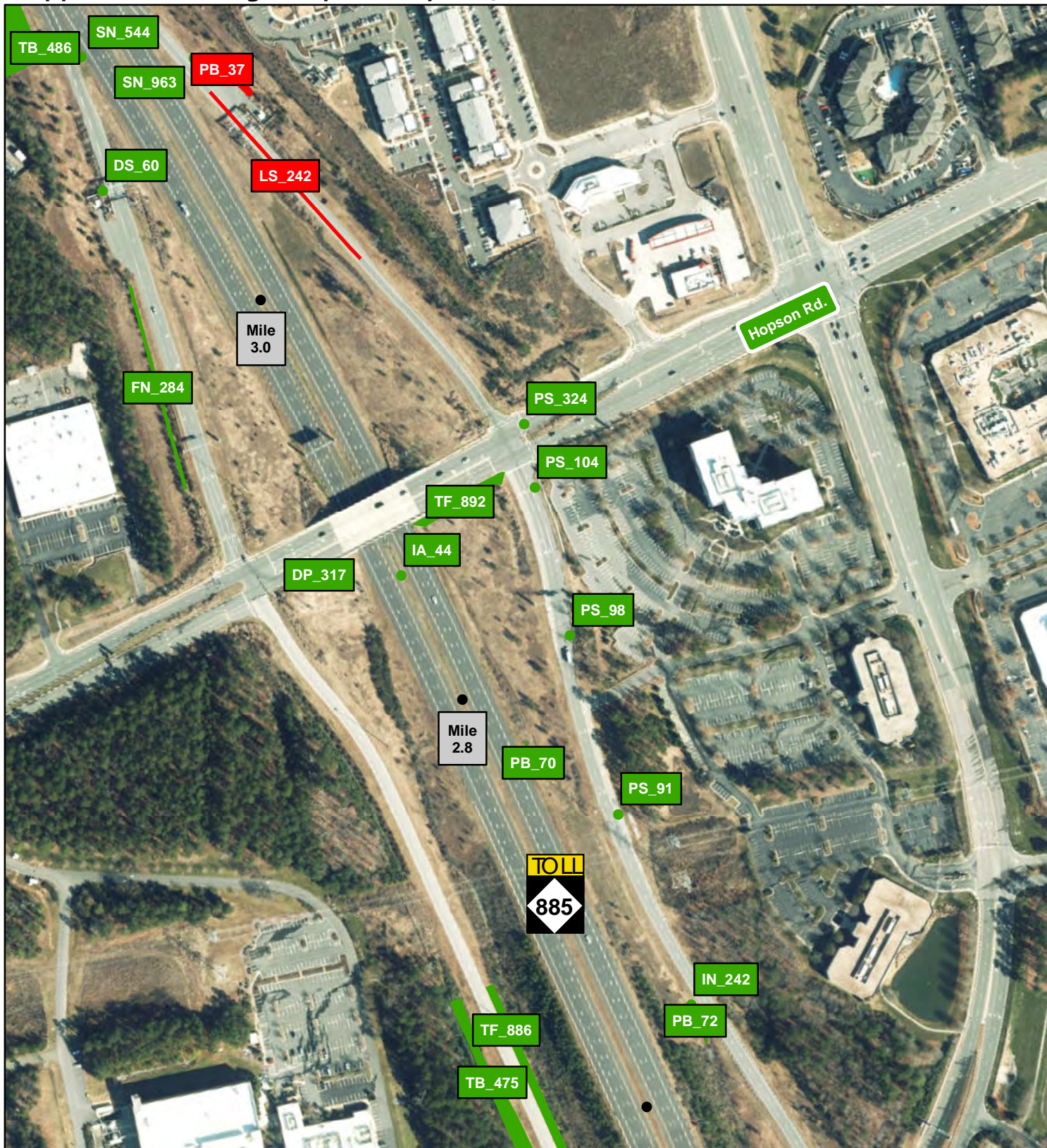
Legend

- Failing Asset
- Passing Asset





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



## Legend

- Failing Asset
- Passing Asset







Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



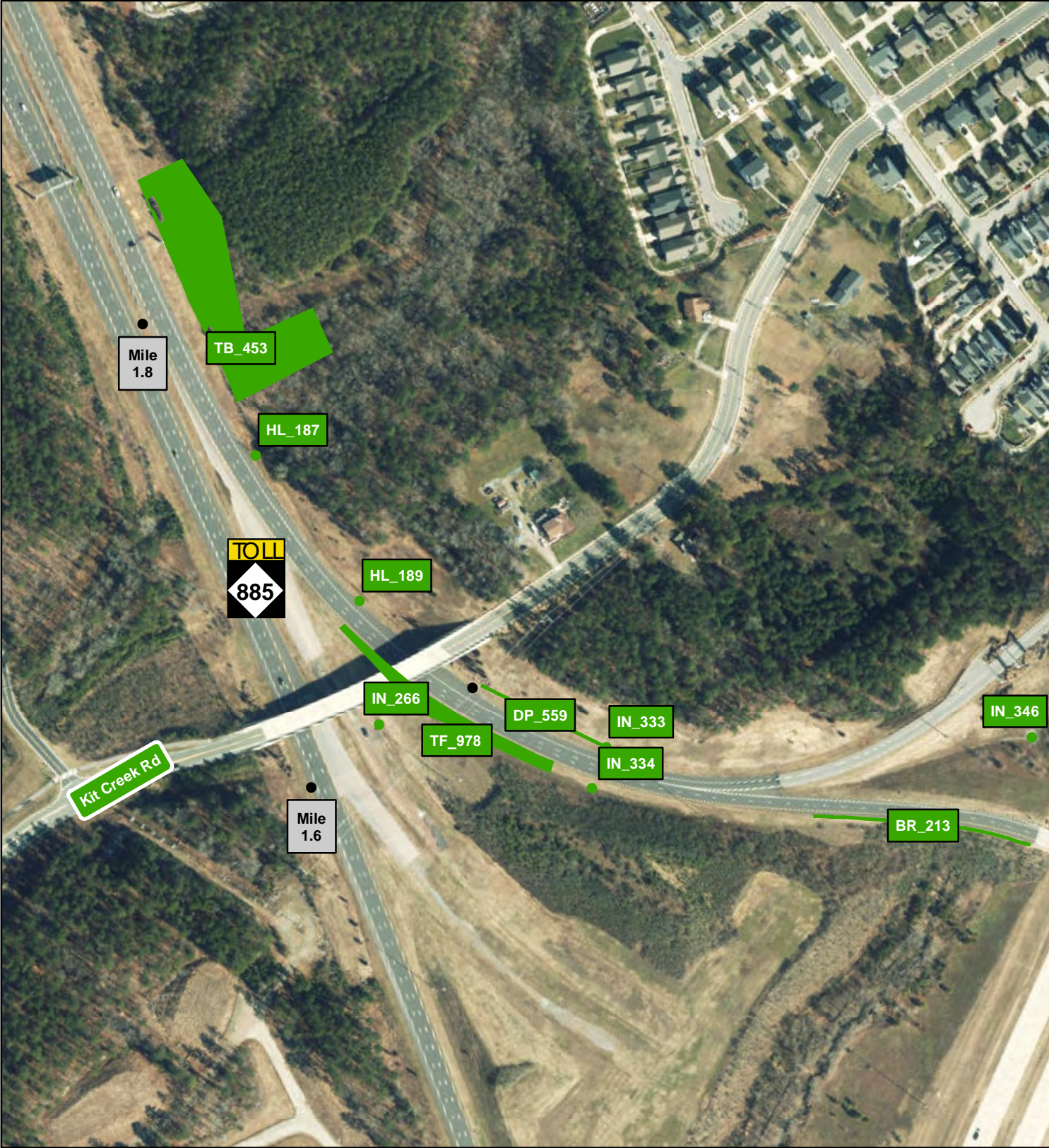
Legend

-  Failing Asset
-  Passing Asset







Appendix A: Triangle Expressway 2023 First Quarter Asset Assessment Locations



Legend

-  Failing Asset
-  Passing Asset





## **Appendix B**

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

## Appendix B: Triangle Expressway 2023 First 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).....	B1
Curb and Gutter (CG).....	B2
Decorative Supports (DS).....	B3
Drainage Pipes (DP).....	B4
Misc. Drainage Structure (MDP) .....	B5
Fence and Control of Access (FN) .....	B6
Graffiti (GR).....	B8
Highway Lighting (HL) .....	B9
Impact Attenuators (IA).....	B10
Inlets (IN).....	B11
Landscaping (PB).....	B12
Paved Lanes – Asphalt (LS) .....	B13
Paved Lanes – Concrete (LS).....	B13
Paved Shoulders (LS) .....	B14
Unpaved Shoulders (LS) .....	B14
Front/Back Slopes (LS) .....	B15
Unpaved Lateral and Outfall Ditches (LS) .....	B15
Litter (LS).....	B16
Roadway Sweeping (LS).....	B16
Pavement Striping (LS) .....	B17
Pavement Markers (LS) .....	B17
Delineators (LS) .....	B17
Paved Ditches (PD).....	B18
Pavement Words and Symbols (PS) .....	B19
Signs (SN) .....	B20
Tree and Brush (TB).....	B21
Turf Condition (TF) .....	B22
MSE/Retaining Walls, Sound Barrier Walls, and Screen Walls (WL) .....	B23




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

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Guardrail	BR_498	Missing Part		A24
2	Guardrail	BR_657	Post Damage		A5



## Curb and Gutter (CG)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Shoulder Berm Gutter	CG_4	Misalignment		A27







## Decorative Supports (DS)

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







## Drainage Pipes (DP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Drain	DP_227	End Protection		A12
2	Drain	DP_709	Obstruction		A2
3	Drain	DP_788	Obstruction		A23
4	Drain	DP_860	Obstruction		A20







## Misc. Drainage Structure (MDP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Shoulder Drain	MDP_41	End Damage		A10
2	Shoulder Drain	MDP_53	End Damage		A12
3	Shoulder Drain	MDP_158	Rodent Screen		A26
4	Shoulder Drain	MDP_169	Rodent Screen		A28







## Fence and Control of Access (FN)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Woven	FN_63	Height		A5
2	Woven	FN_217	Height		A2
3	Woven	FN_248	Height		A29
4	Woven	FN_301	Fence Hole		A29



## Fence and Control of Access (FN)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Woven	FN_310	Fence Hole		A1
6	Woven	FN_328	Height		A16
7	Woven	FN_356	Height		A15
8	Woven	FN_486	Fence Hole		A15




## 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
1	Double Roadway	HL_142	Functional Damage		A4

## Impact Attenuators (IA)

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



## Inlets (IN)

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

## Landscaping (PB)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Plant Bed	PB_37	Health		A32




### 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
1	Concrete	LS_462	Pothole		A26

### Paved Shoulders (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_318	Joint Separation		A2

### Unpaved Shoulders (LS)

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




## 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
1	Concrete	LS_456	Ditch Erosion		A26

## Litter (LS)

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

## 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
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This asset did not produce any failures.

## Pavement Markers (LS)

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

## Delineators (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_43	Missing		A12
2	Asphalt	LS_242	Nighttime Reflectivity		A32

## 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	Right Turn	PS_469	Nighttime Reflectivity	Not Available for Nighttime Failures	A5, A6
2	Ped Xing	PS_499	Nighttime Reflectivity, Daytime Assessment		A1

## Signs (SN)

#	Sign Type	Object ID	Failure Type	Photo	GIS Reference Page
1	NC Route	SN_118	Missing		A26
2	Mile Post	SN_224	Lateral Clearance		A9
3	Merge	SN_313	Sign Support		A12




Tree and Brush (TB)

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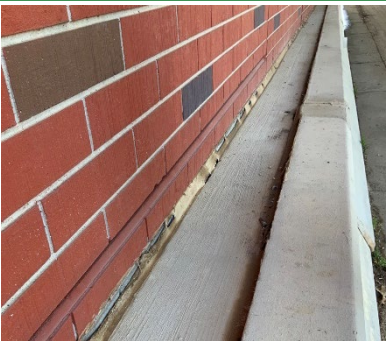
This asset did not produce any failures.

Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Turf	TF_177	Bare Ground		A12



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

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Bridge Wall	WL_5	Unsealed Cracks/Joints	 	A29
2	Bridge Wall	WL_10	Unsealed Cracks/Joints		A33
3	Bridge Wall	WL_69	Unsealed Cracks/Joints		A26