



NORTH CAROLINA
Turnpike Authority

Maintenance Rating Program

Triangle Expressway

2020 Second Quarter Report

1 S. Wilmington Street
Raleigh, NC 27601



Last Updated:
August 21, 2020

CONSULTANT CERTIFICATION OF COMPLETION

August 21, 2020

Dennis Jernigan, P.E.
Director of Highway Operations, NCTA
1 South Wilmington Street
Raleigh, NC 27601

NCTA Triangle Expressway Roadway Maintenance Performance Rating Program; Q2, FY 2020 Rating

This is to certify that I, Ken M. McEntire, PE am an authorized official representative of the company The Kercher Group, Inc., which is 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,

The Kercher Group, Inc.

A handwritten signature in blue ink that reads "Ken M. McEntire". The signature is written in a cursive style with a large initial "K" and "M".

Ken M. McEntire, PE
Principal

1100 Navaho Drive, Suite 125
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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 2020 second quarter assessment of the Triangle Expressway.

The overall 2020 second quarter maintenance rating of the Triangle Expressway was 91.0, meeting 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 2020 Second Quarter Assessment		
Element	MRP Rating	Target Rating
Road Surface	93.8	85.0
Unpaved Shoulders and Ditches	92.5	85.0
Drainage	92.5	85.0
Roadside	91.7	85.0
Traffic Control Devices	87.0	85.0
Overall MRP Performance Rating	91.0	90.0

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 92.7.

Table 2: MRP Rolling Element Results					
Element	Q3 2019 Rating	Q4 2019 Rating	Q1 2020 Rating	Q2 2020 Rating	Rolling Rating
Road Surface	96.9	89.5	94.9	93.8	93.8
Unpaved Shoulders and Ditches	94.7	99.1	98.7	92.5	96.3
Drainage	92.3	98.1	91.9	92.5	93.7
Roadside	94.7	96.2	94.7	91.7	94.3
Traffic Control Devices	86.6	90.9	90.4	87.0	88.7
Overall MRP Performance Rating	92.5	93.6	93.6	91.0	92.7

In addition, the report provides findings of the Green Level Historic District signs inspection. This quarter, two of three signs were inspected. One sign has been temporarily removed due to a nearby redevelopment project. Both signs were found to be in good physical condition; however, the landscaped area around one sign was found to not meet 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 thresholds 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.

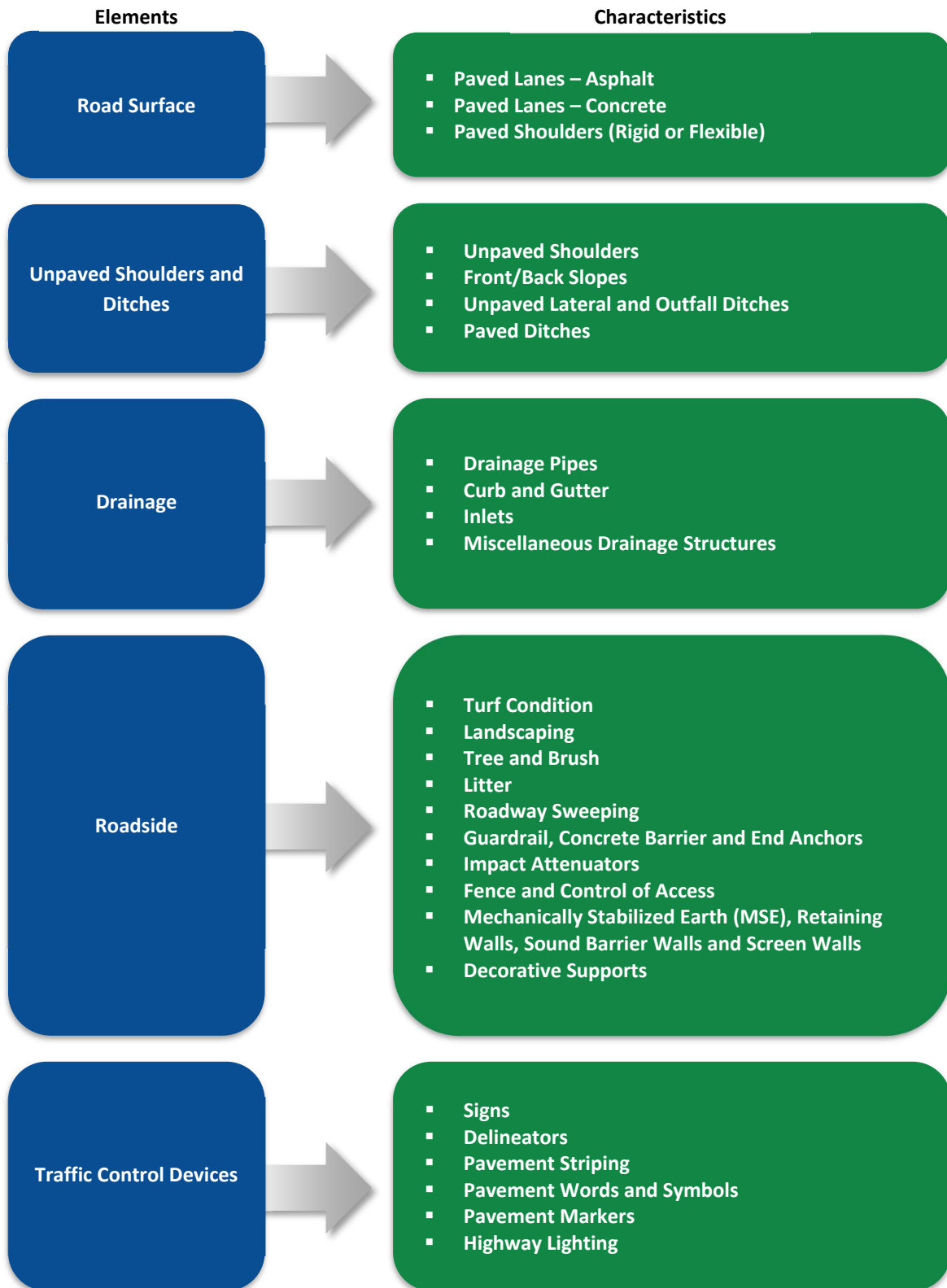
The NCTA performance standards, threshold criteria, and maintenance rating program were developed through a collaborative effort by NCTA managers, NCDOT maintenance staff, and consultants.

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 V6*, roadway assets or characteristics on NCTA facilities have been grouped into elements. These elements and corresponding characteristics can be seen in **Figure 1**:

Figure 1: Maintenance Elements and Characteristics



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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 samples 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.

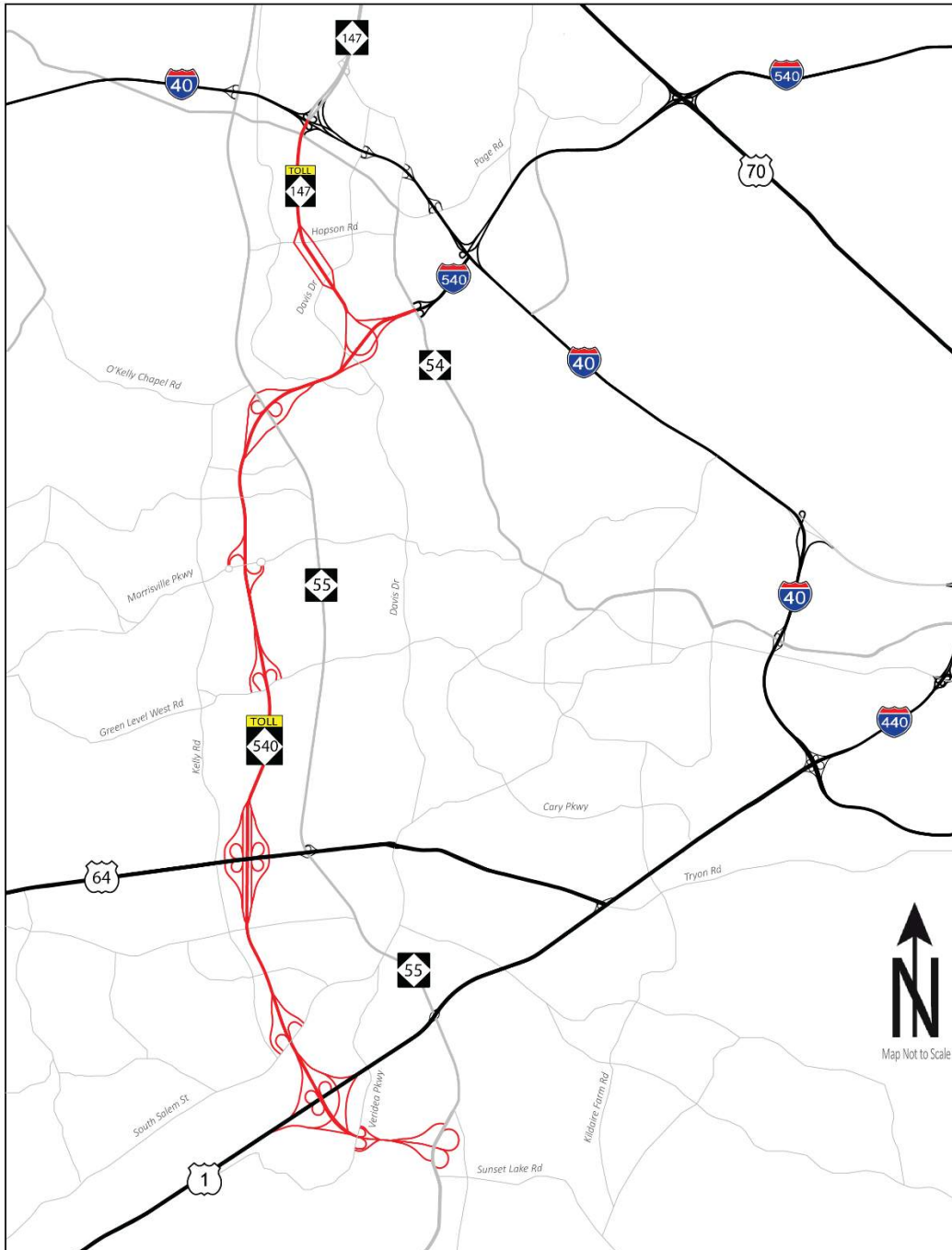
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4.0 TRIANGLE EXPRESSWAY DESCRIPTION

The Triangle Expressway extends for approximately 18.8 miles from the interchange of I-40 and Toll NC-147 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-147 interchange to the NC-54 interchange. The Triangle Expressway consists of twelve interchanges and twenty all-electronic toll collection zones.

Figure 2: Triangle Expressway Map



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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 near McCrimmon Parkway were removed from the inventory due to the Morrisville Parkway Interchange toll zone construction project. **Table 3** presents the updated number of assets that are currently available for inspections.

Table 3: Asset Inventory		
Assets	Total Inventory	2020 Eligible Inventory
Barriers	801	743
Curb and Gutter	428	393
Decorative Supports	297	279
Drainage	1180	1105
Misc. Drainage	221	221
Fences	508	472
Highway Lighting	435	398
Impact Attenuators	47	45
Inlets	1126	1080
Linear Segments	795	767
Plant Beds	266	262
Paved Ditches	2	2
Pavement Symbols	638	602
Signs	1215	1096
Tree and Brush	603	539
Turf	1074	1039
Walls	88	85

6.0 MRP SECOND QUARTER ASSESSMENT

6.1 Quarterly Results

The overall 2020 second quarter maintenance rating of the Triangle Expressway was 91.0, meeting NCTA’s target overall rating of 90. All elements assessed achieved ratings above the target rating of 85 established for element groups.

During the second quarter, NCTA led a paint removal and rehabilitation project to improve the condition of concrete barrier, decorative support columns, and retaining walls throughout Triangle Expressway. Due to this ongoing project, the scaling criteria of the Decorative Supports and Retaining Walls and Sound Barrier Walls characteristics was evaluated but did not affect the characteristics rating. Once this project is completed, the scaling criteria for Decorative Supports and Retaining Walls and Sound Barrier Walls characteristics rating will resume and will be included in the Roadside element and overall scoring.

It is important to note that these results are only representative of the second 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 at the end of each calendar year, provides a 95% confidence level in statistical sampling. The second quarter MRP performance ratings for elements and characteristics are presented in **Table 4** and **Table 5**, respectively.

Table 4: MRP Element Results for Q2 2020	
Element	Q2 2020 MRP Rating
Road Surface	93.8
Unpaved Shoulders and Ditches	92.5
Drainage	92.5
Roadside	91.7
Traffic Control Devices	87.0
Overall MRP Performance Rating	91.0

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Table 5: MRP Characteristic Results for Q2 2020

Road Surface	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q2 Rating
Paved Lanes Asphalt	10	11	9	90	99	91
Paved Lanes Concrete	20	21	9	180	189	95
Paved Shoulder	30	32	5	150	160	94
Element Total				420	448	93.8
Unpaved Shoulders and Ditches	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q2 Rating
Unpaved Shoulder	27	32	9	243	288	84
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
Element Total				631	682	92.5
Drainage	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q2 Rating
Drainage Pipes	30	33	7	210	231	91
Curb and Gutter	28	28	6	168	168	100
Inlets	30	32	7	210	224	94
Misc. Drainage Structure	23	28	4	92	112	82
Element Total				680	735	92.5
Roadside	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q2 Rating
Turf Condition	41	51	7	287	357	80
Landscaping	25	25	4	100	100	100
Trees and Brush	29	30	4	116	120	97
Litter	29	32	4	116	128	91
Roadway Sweeping	32	32	5	160	160	100
Guardrail, Concrete Barrier and End Anchors	29	32	9	261	288	91
Impact Attenuators	9	9	9	81	81	100
Fence, Control Access	18	20	7	126	140	90
Retaining Walls and Sound Barrier Walls	11	15	5	55	75	73*
Decorative Supports	29	29	5	145	145	100*
Graffiti and Stain Removal	44	44	4	176	176	100
Element Total				1623	1770	91.7
Traffic Control Devices	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q2 Rating
Signs	31	32	7	224	238	97
Delineators	27	32	3	78	96	84
Pavement Striping/Marking	28	32	8	224	256	88
Words and Symbols	35	39	7	245	273	90
Pavement Markers	26	32	9	225	288	81
Highway Lighting	25	31	6	174	210	81
Element Total				1170	1361	87.0

*Scaling criteria not included in the quarter rating for this characteristic while the paint removal contract is ongoing.

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

6.2 Analysis and Recommendations

Elements

During the second quarter, all elements exceeded NCTA's quarter score threshold criteria of 85. Furthermore, all elements exceeded a rolling rating higher than 85 as well.

Road Surface (93.8) experienced an increase of 0.3 points in rolling rating compared to the previous quarter's rolling rating. Paved Lanes Asphalt (91) obtaining quarter scores less than 90 for the last two quarters. Traffic Control Devices (87.0) experienced a 0.3 decrease in rolling rating from the previous quarter's rolling rating. Pavement Markers (81) as well as Delineators (84) both experienced decreases in quarter ratings. Repaving and subsequent striping of all asphalt lanes is scheduled to begin this year.

Unpaved Shoulders and Ditches (92.5) experienced a decreased of 1.3 points in rolling rating. The rating for this element was 6.2 points lower than the previous quarter rating. The decrease was predominately due to the decrease in rating for Unpaved Shoulders (84). The other characteristic rolling ratings within this element remained consistent with the previous quarter's rolling rating.

Drainage (92.5) experienced a decrease in rolling rating of 0.4 points. Misc. Drainage Structures (82) continued to score above the characteristic threshold score of 80 for four consecutive quarters. Both Drainage Pipes (91) and Curb and Gutter (100) maintained quarter scores consistent with the previous quarter.

Roadside (91.7) experienced a rolling rating decreased 0.3 points from the previous quarter. Turf Condition (80) while receiving a lower than the previous quarter, continued receiving a score greater than or equal to 80 for the last four quarters. Retaining Walls and Sound Barrier Walls (73) also decreased in ratings from the previous quarter.

Characteristics

This quarter all but one characteristic, Retaining Walls and Sound Barrier Walls (73), met the NCTA target threshold criteria of 80. A description of the characteristics' conditions and future work planning recommendations are provided below. Pictures of all characteristic failures are included in **Appendix B**.

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Retaining Walls and Sound Barrier Walls (73 rating – 4 of the 15 assets did not pass): Out of the 4 retaining wall and sound barrier wall structures that did not pass inspection, 3 had unsealed joints and 1 exhibited cracking and unwanted vegetation growth. Two of the wall segments that did not pass inspection are presented in **Figure 3**.

Figure 3: Retaining and Sound Barrier Walls Inspection Results Sample



In accordance with *NCTA Roadway and Facility Maintenance Standards V6*, referenced below, it is recommended that the maintenance provider plan for and schedule joint repairs within the annual work program and that unwanted vegetation is removed upon observation.

Retaining Walls and Sound Barrier Walls Maintenance Program Standards:

- 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.

Standards 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 in excess of 1 inch deep over 5 SF.
- 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.

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7.0 CURRENT ROLLING MRP RATING

The rolling maintenance rating of the Triangle Expressway was 92.7, exceeding NCTA’s target overall rating of 90. All elements exceeded NCTA’s rolling rating threshold criteria of 85. Also, all characteristic ratings met or exceeded the target rating of 80.

The 2019/2020 results are presented in **Tables 6 and 7**. These results are a collection of the four quarterly inspections conducted in the last year.

Table 6: MRP Element Results for 2020					
Element	Q3 2019 Rating	Q4 2019 Rating	Q1 2020 Rating	Q2 2020 Rating	Rolling Rating
Road Surface	96.9	89.5	94.9	93.8	93.8
Unpaved Shoulders and Ditches	94.7	99.1	98.7	92.5	96.3
Drainage	92.3	98.1	91.9	92.5	93.7
Roadside	94.7	96.2	94.7	91.7	94.3
Traffic Control Devices	86.6	90.9	90.4	87.0	88.7
Overall MRP Performance Rating	92.5	93.6	93.6	91.0	92.7

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Table 7: MRP Rolling Element Results					
Road Surface	Q3 2019 Rating	Q4 2019 Rating	Q1 2020 Rating	Q2 2020 Rating	Rolling Rating
Paved Lanes Asphalt	93	75	83	91	86
Paved Lanes Concrete	100	100	100	95	99
Paved Shoulder	97	88	97	94	94
Element Total	96.9	89.5	94.9	93.8	93.8
Unpaved Shoulders and Ditches	Q3 2019 Rating	Q4 2019 Rating	Q1 2020 Rating	Q2 2020 Rating	Rolling Rating
Unpaved Shoulder	88	100	97	84	92
Front/Back Slopes	100	97	100	100	99
Lateral and Outfall Ditches, Unpaved	100	100	100	97	99
Ditches, Paved	100	100	100	100	100
Element Total	94.7	99.1	98.7	92.5	96.3
Drainage	Q3 2019 Rating	Q4 2019 Rating	Q1 2020 Rating	Q2 2020 Rating	Rolling Rating
Drainage Pipes	97	100	91	91	95
Curb and Gutter	93	100	100	100	98
Inlets	94	97	91	94	94
Misc. Drainage Structure	81	95	83	82	86
Element Total	92.3	98.1	91.9	92.5	93.7
Roadside	Q3 2019 Rating	Q4 2019 Rating	Q1 2020 Rating	Q2 2020 Rating	Rolling Rating
Turf Condition	91	91	88	80	87
Landscaping	100	100	100	100	100
Trees and Brush	97	100	100	97	98
Litter	94	100	84	91	92
Roadway Sweeping	100	100	100	100	100
Guardrail, Concrete Barrier and End Anchors	94	97	97	91	95
Impact Attenuators	100	100	100	100	100
Fence, Control Access	97	93	90	90	93
Retaining Walls and Sound Barrier Walls	86	86	93*	73*	84
Decorative Supports	84	92	100*	100*	94
Graffiti and Stain Removal	100	100	100	100	100
Element Total	94.7	96.2	94.7	91.7	94.3
Traffic Control Devices	Q3 2019 Rating	Q4 2019 Rating	Q1 2020 Rating	Q2 2020 Rating	Rolling Rating
Signs	94	100	94	97	96
Delineators	100	88	100	84	93
Pavement Striping/Marking	78	88	88	88	85
Words and Symbols	84	90	90	90	89
Pavement Markers	84	91	94	81	88
Highway Lighting	89	86	81	81	84
Element Total	86.6	90.9	90.4	87.0	88.7

*Scaling criteria not included in the quarter rating for this characteristic while the paint removal contract is ongoing.

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 Green Level Historic District signs to conduct a visual inspection of each sign and ensure they are in good standing. One sign, shown first in **Figure 4**, at the corner of Beaver Dam Rd and Green Level W Rd was found to be overgrown and in need of maintenance to the landscaped area. The other sign in the inspection inventory was found to be in good condition, with the landscaped area being well maintained. **Figure 4** shows the two signs assessed.

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



9.0 CONCLUSION

This report presents the 2020 second 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 second quarter 2020 overall rating was 91.0 and the rolling rating was 92.7, both ratings met the target rating of 90.

All element ratings were above the target ratings for the quarter and rolling assessment. During the second quarter assessment, all characteristics, with the exception of Retaining Walls and Sound Barrier Walls, met or exceeded the target rating of 80.

The characteristics that have rolling ratings less than 90 and have received quarter scores less than 80 in the last four quarters include Paved Lanes Asphalt and Pavement Striping/Marking. To maintain/improve the condition ratings, it is recommended the pavement striping/marketing replacement cycles are completed as planned in the capital budget.

This quarter, the two Green Level Historic District signs inspected were found to be in good condition while the third sign was identified to have been removed for a Town of Cary development project near Green Level West Road. The landscaped area surrounding one of the two signs was found to be overgrown and in need of maintenance. The landscape area around the other sign on Green Level Church Road was found to be well maintained.

Appendix A

Triangle Expressway 2020 Second Quarter Asset Assessment Locations

Appendix A: Triangle Expressway 2020 Second 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:

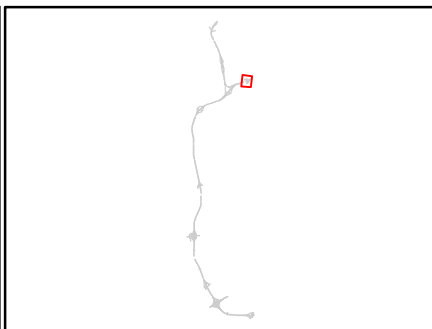
- Guardrail, Concrete Barrier and End Anchors – BR
- Curb and Gutter – CG
- Decorative Supports – DS
- Drainage Pipes – DP
- Misc. Drainage Structures – MDP
- Fence and Control of Access – FN
- Graffiti - GF
- Highway Lighting – HL
- Impact Attenuators – IA
- Inlets – IN
- Landscaping – PB
- Linear Samples – 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 2020 Second Quarter Asset Assessment Locations



Legend



- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations



Legend

-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

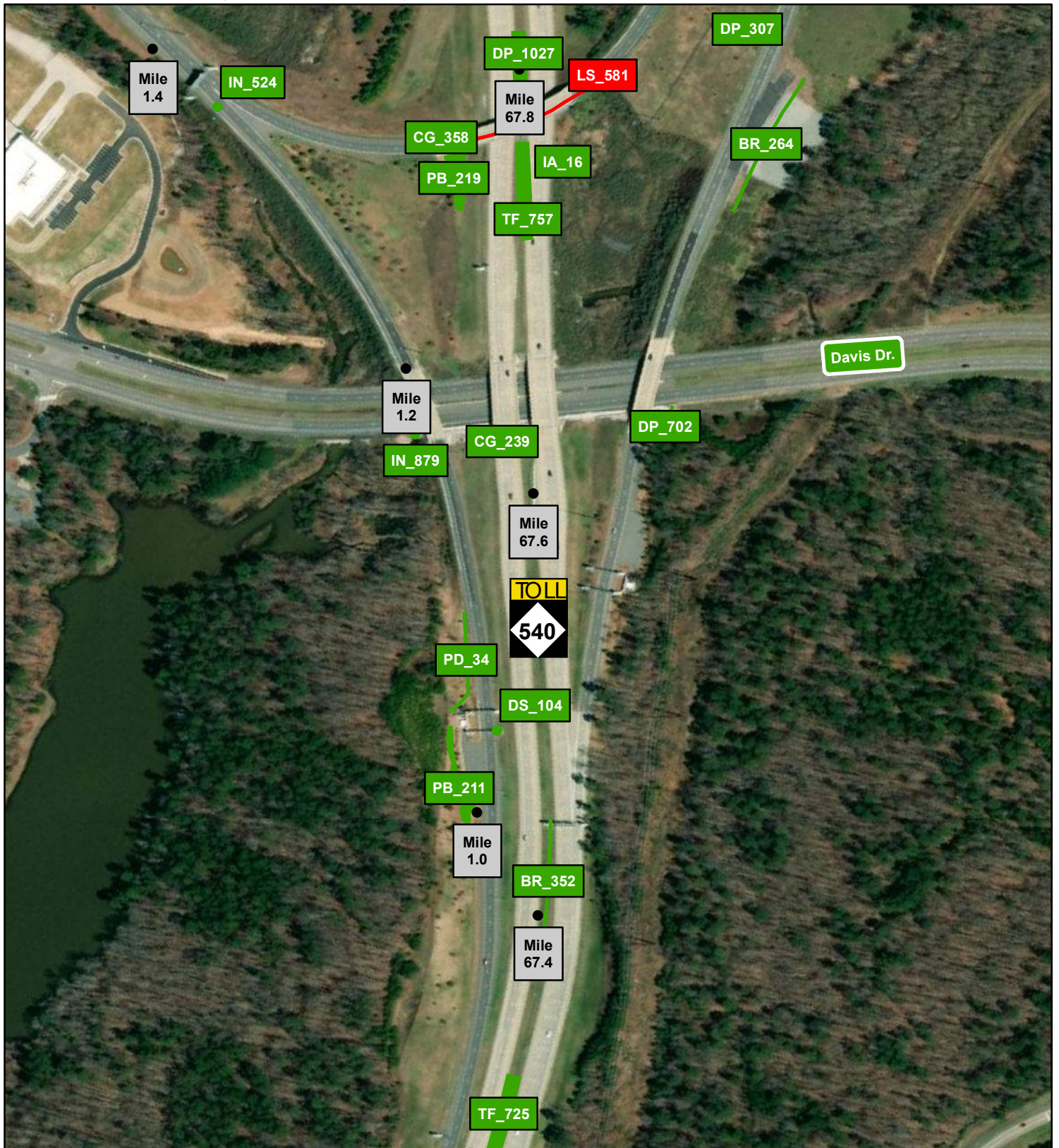


Legend

- Failing Asset
- Passing Asset



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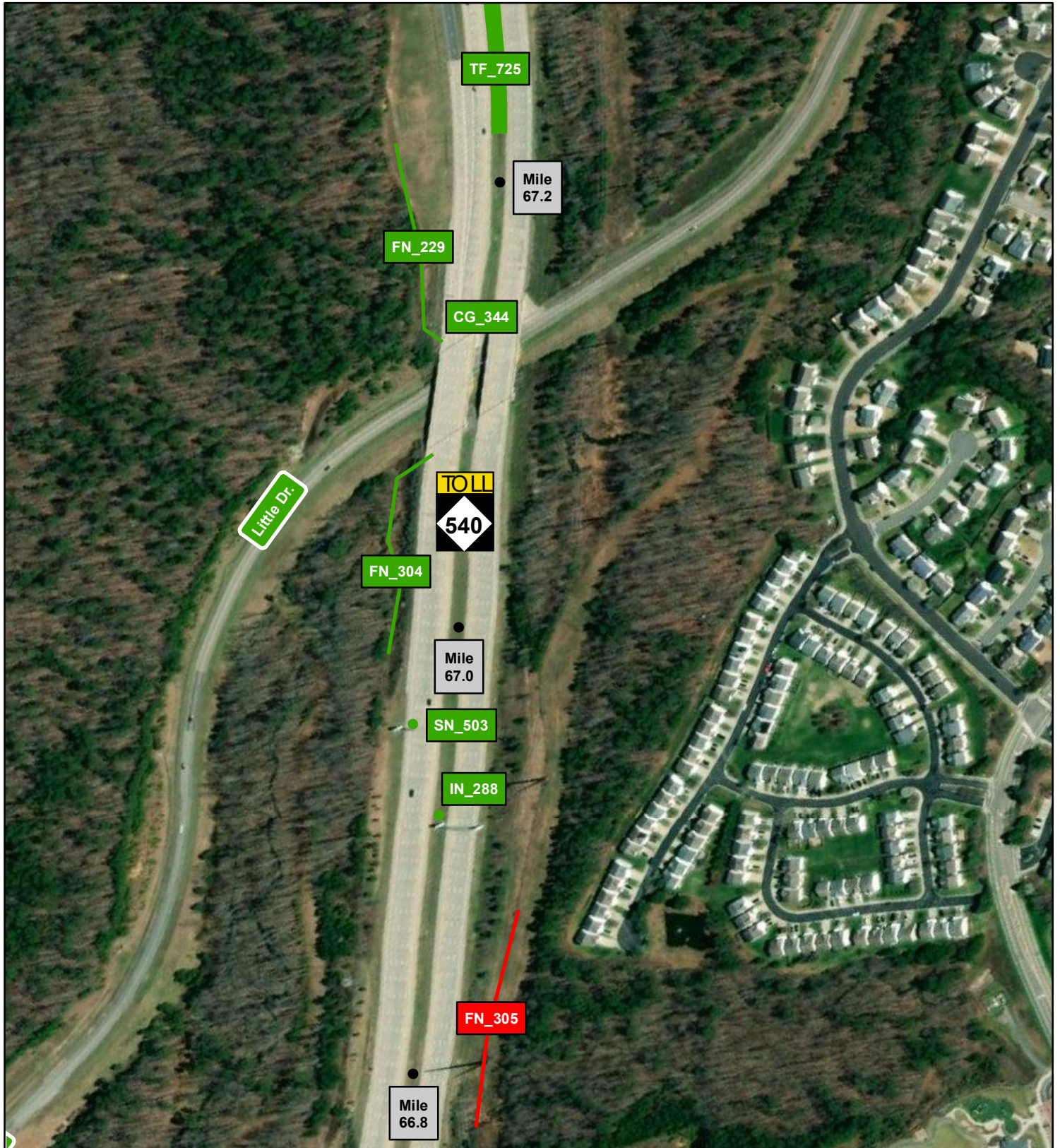


Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

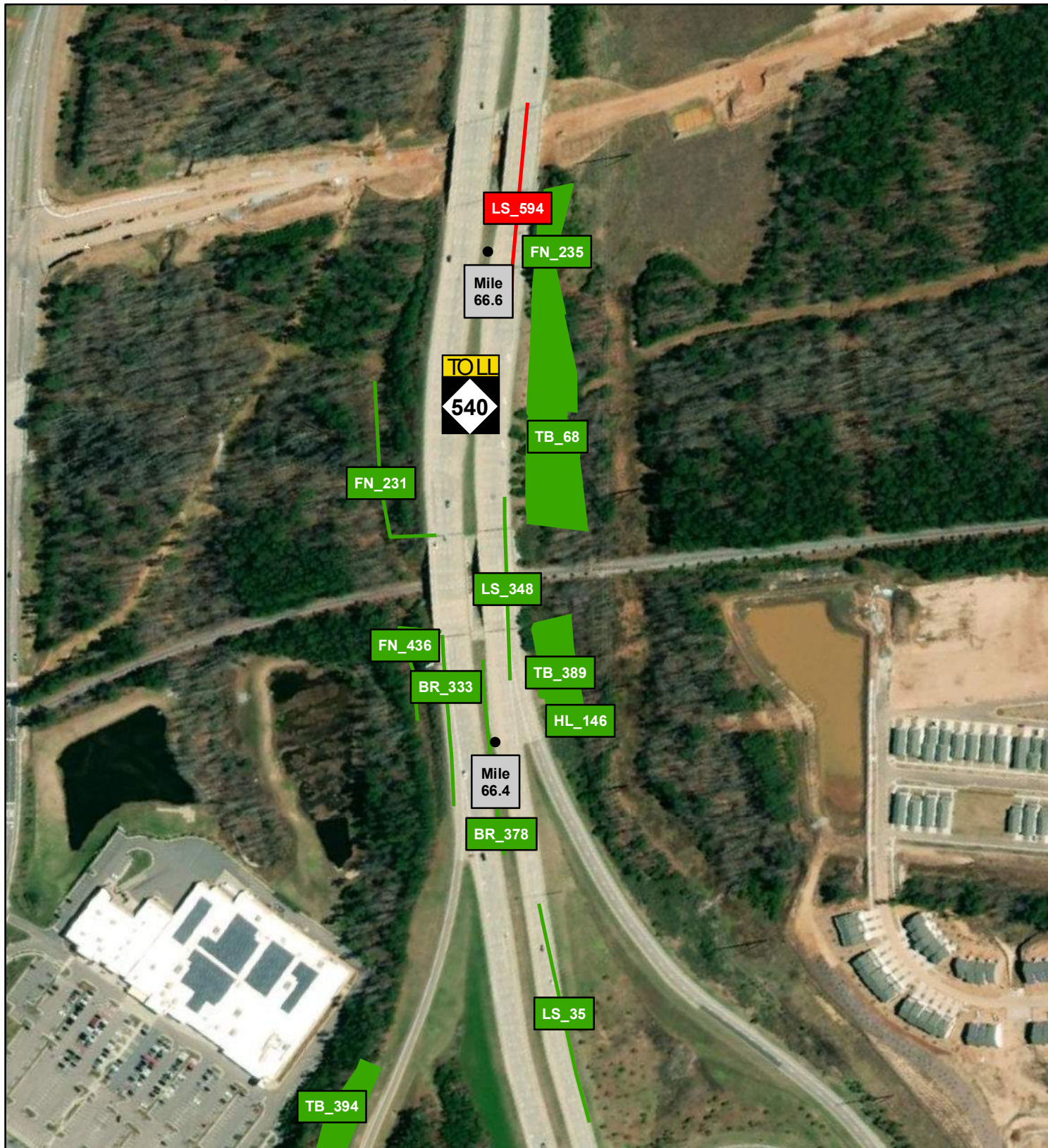


Legend

- Failing Asset
- Passing Asset



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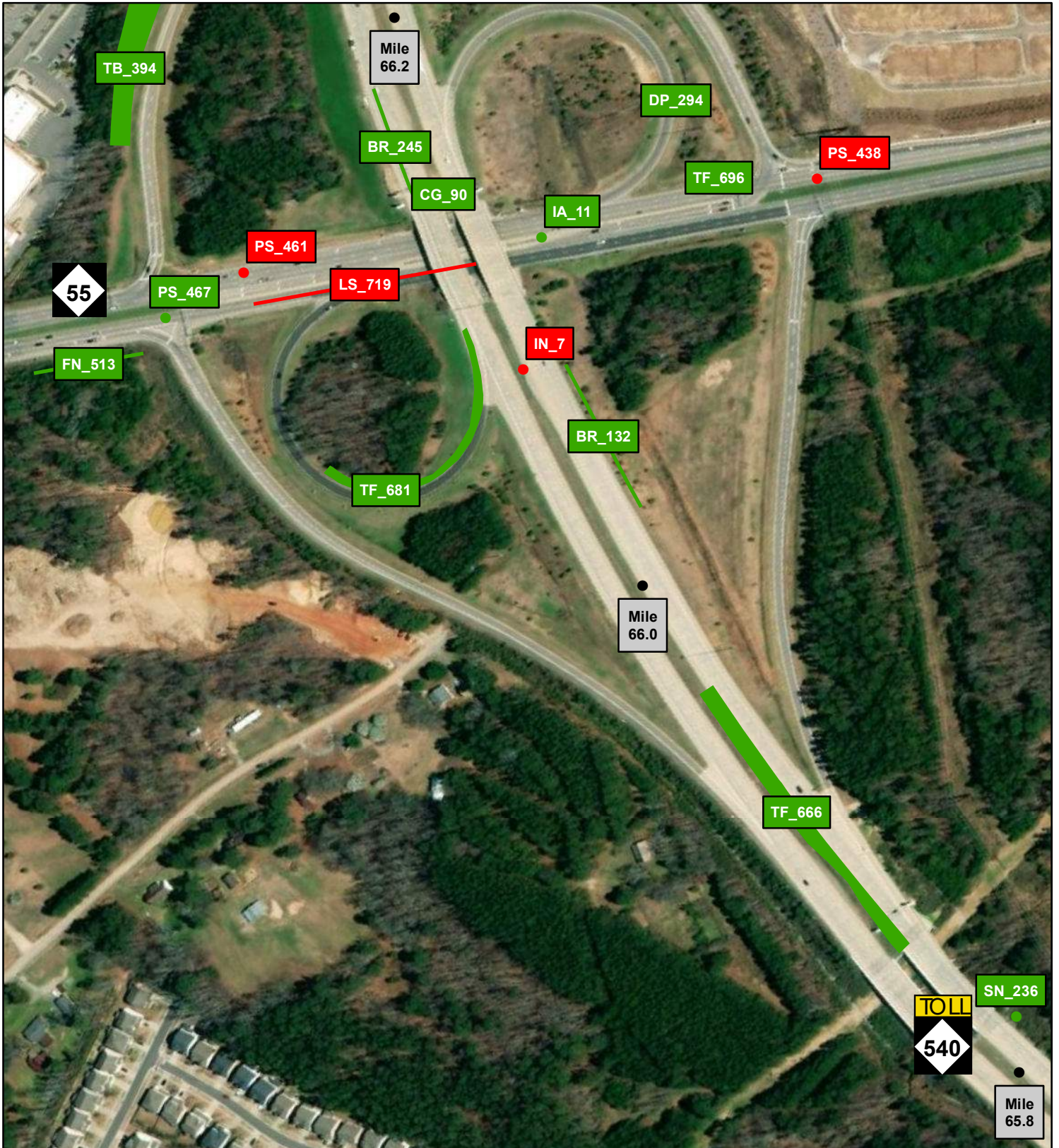


Legend

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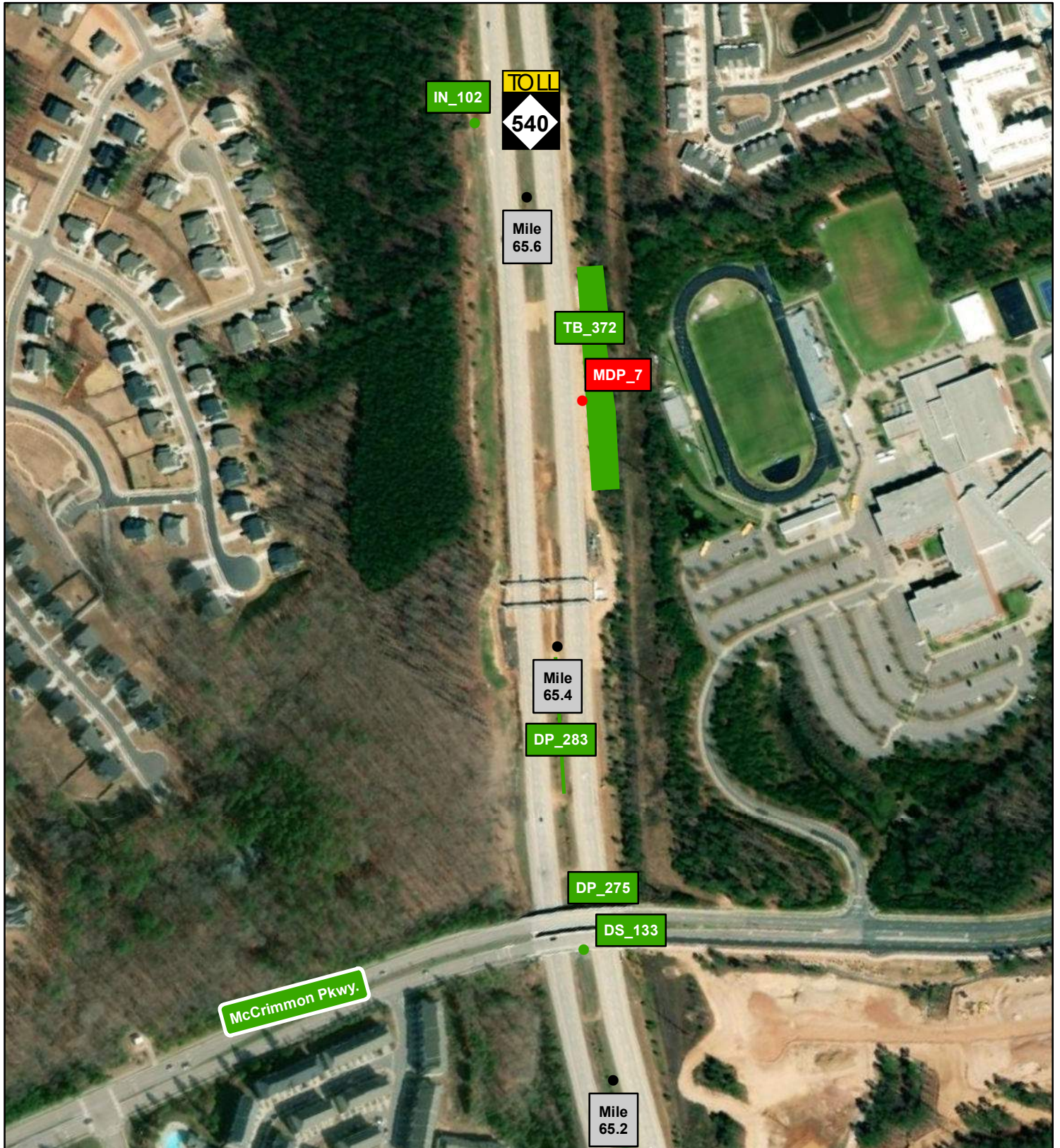


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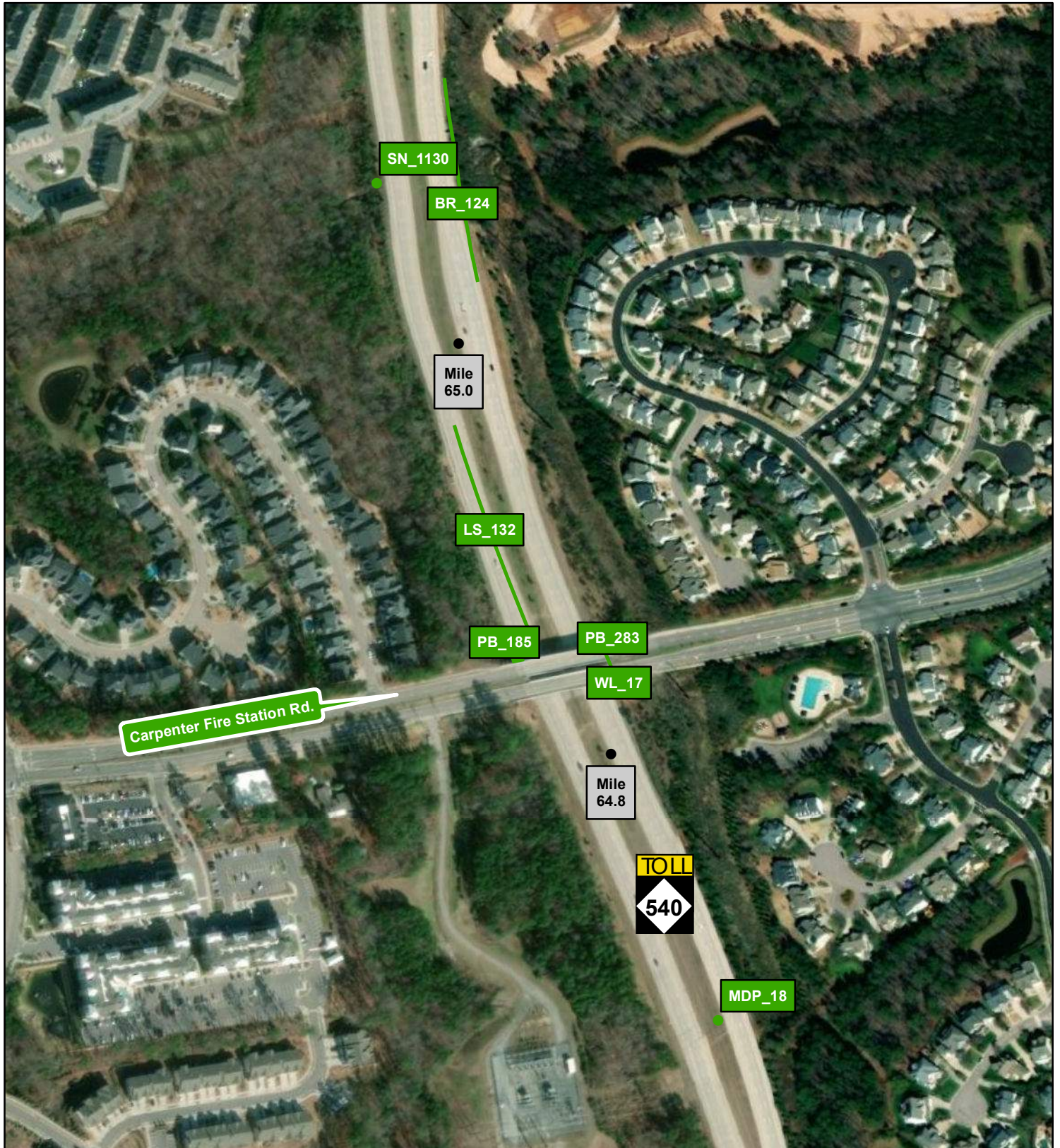


Legend



- Failing Asset
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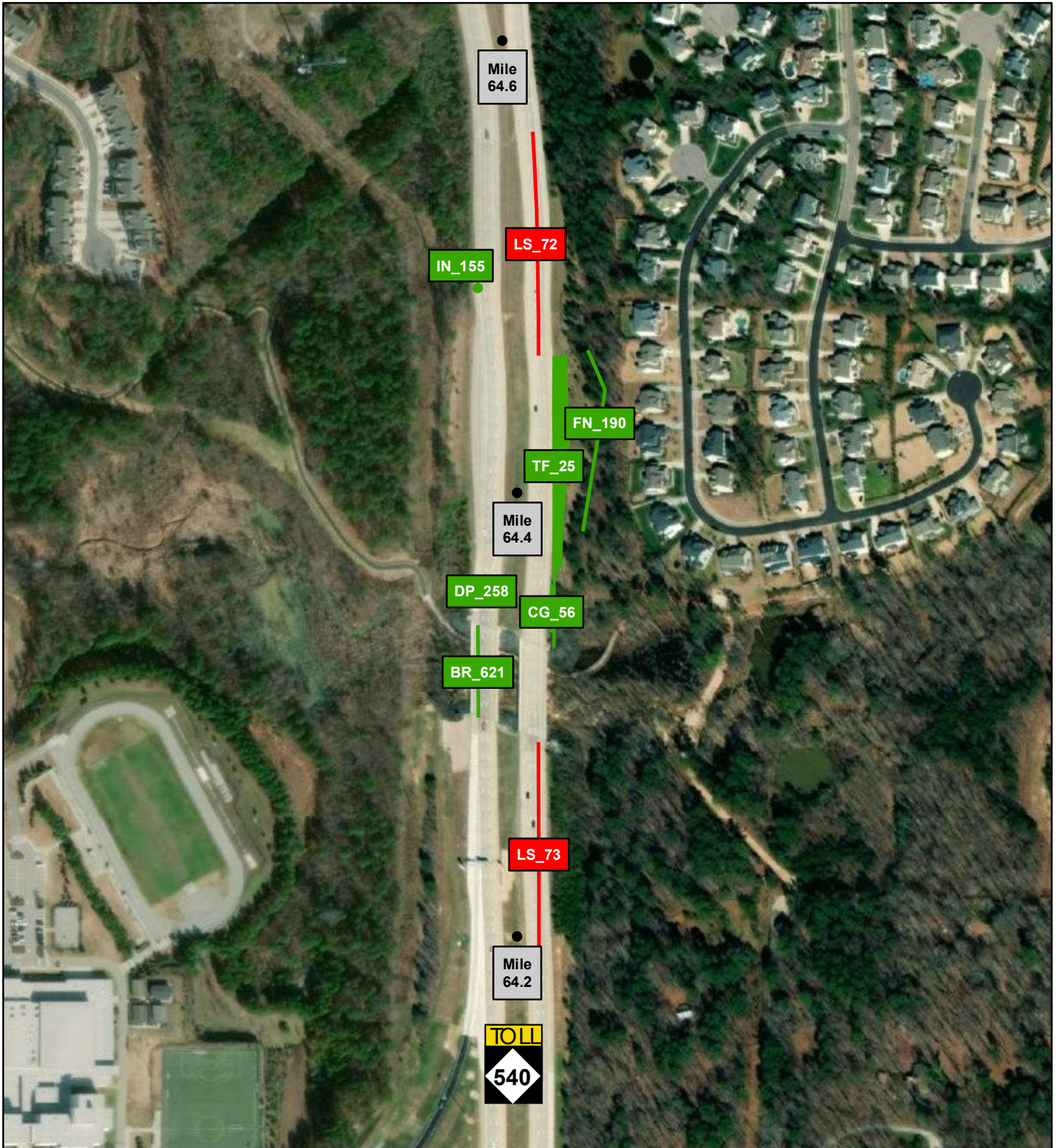


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-  Passing Asset



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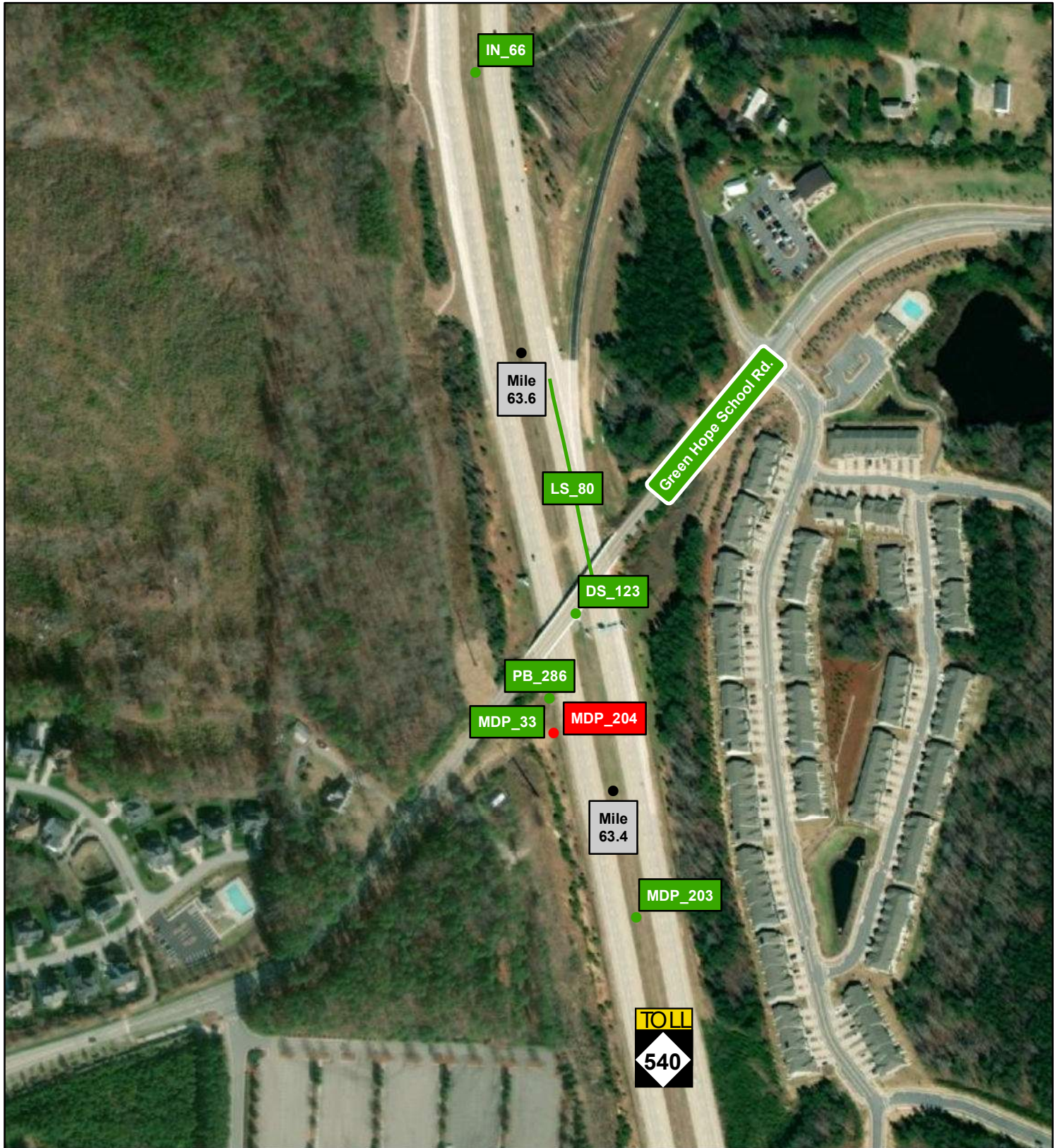


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-  Failing Asset
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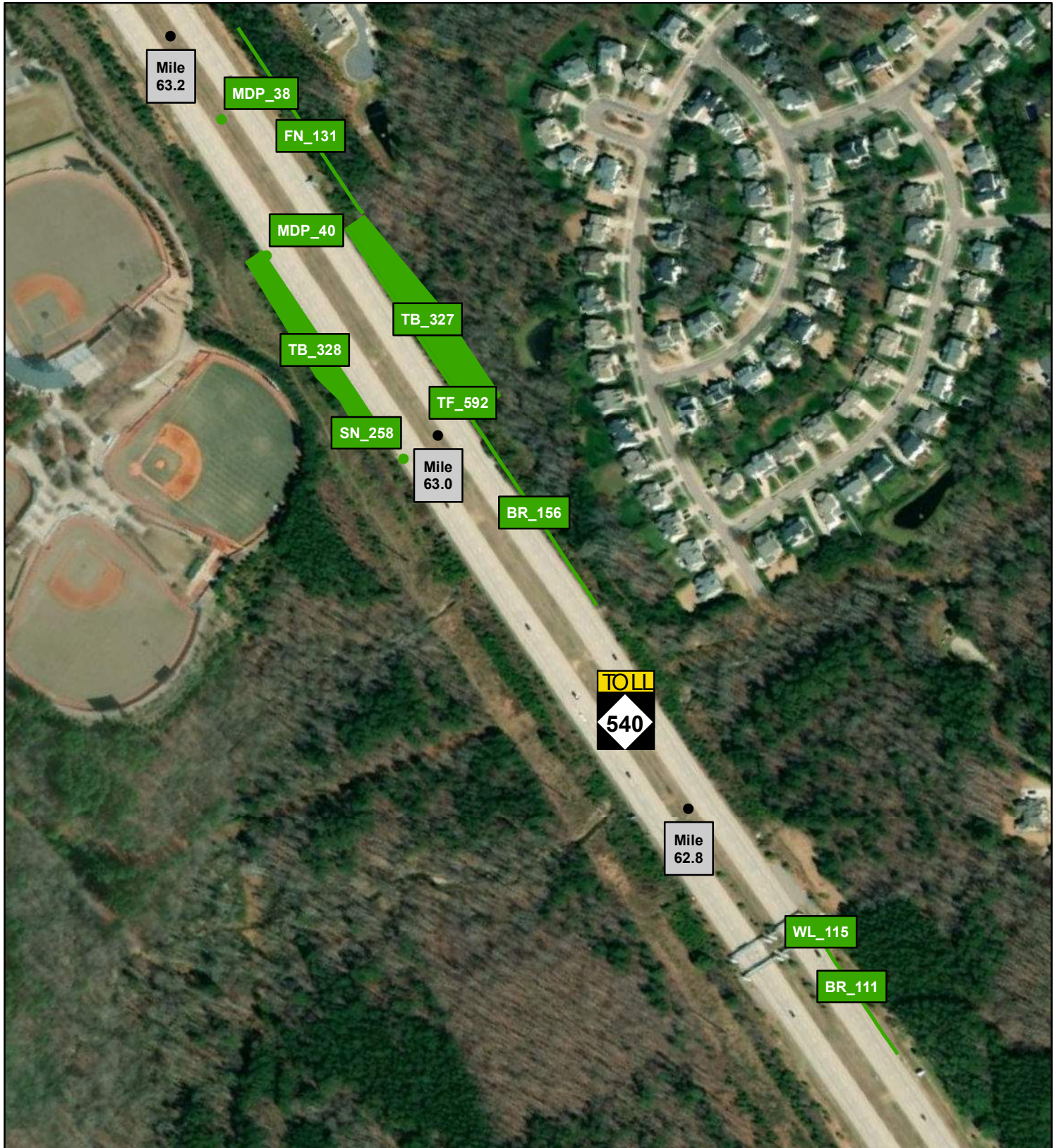


Legend

-  Failing Asset
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Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

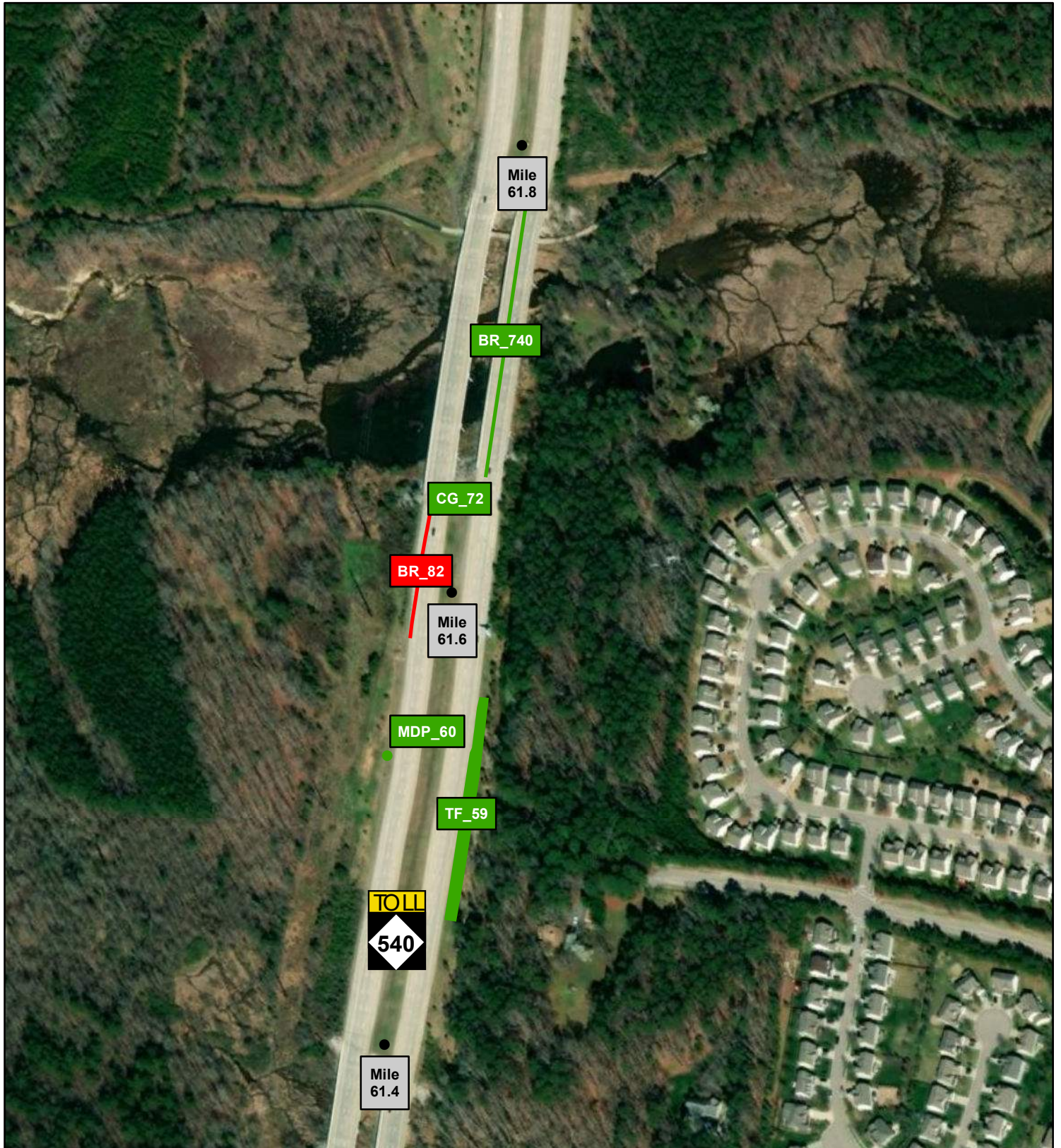


Legend



- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

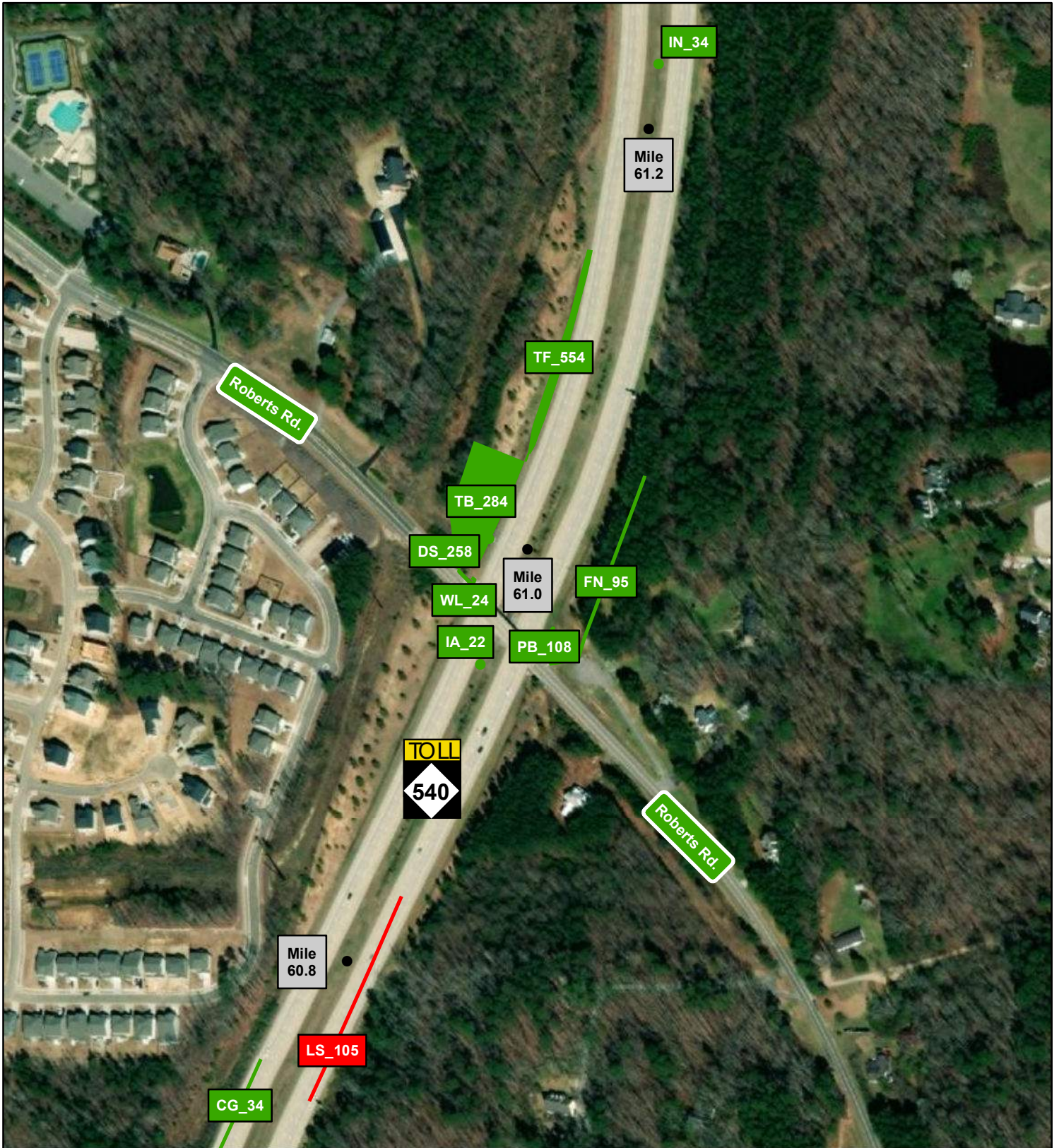


Legend

-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

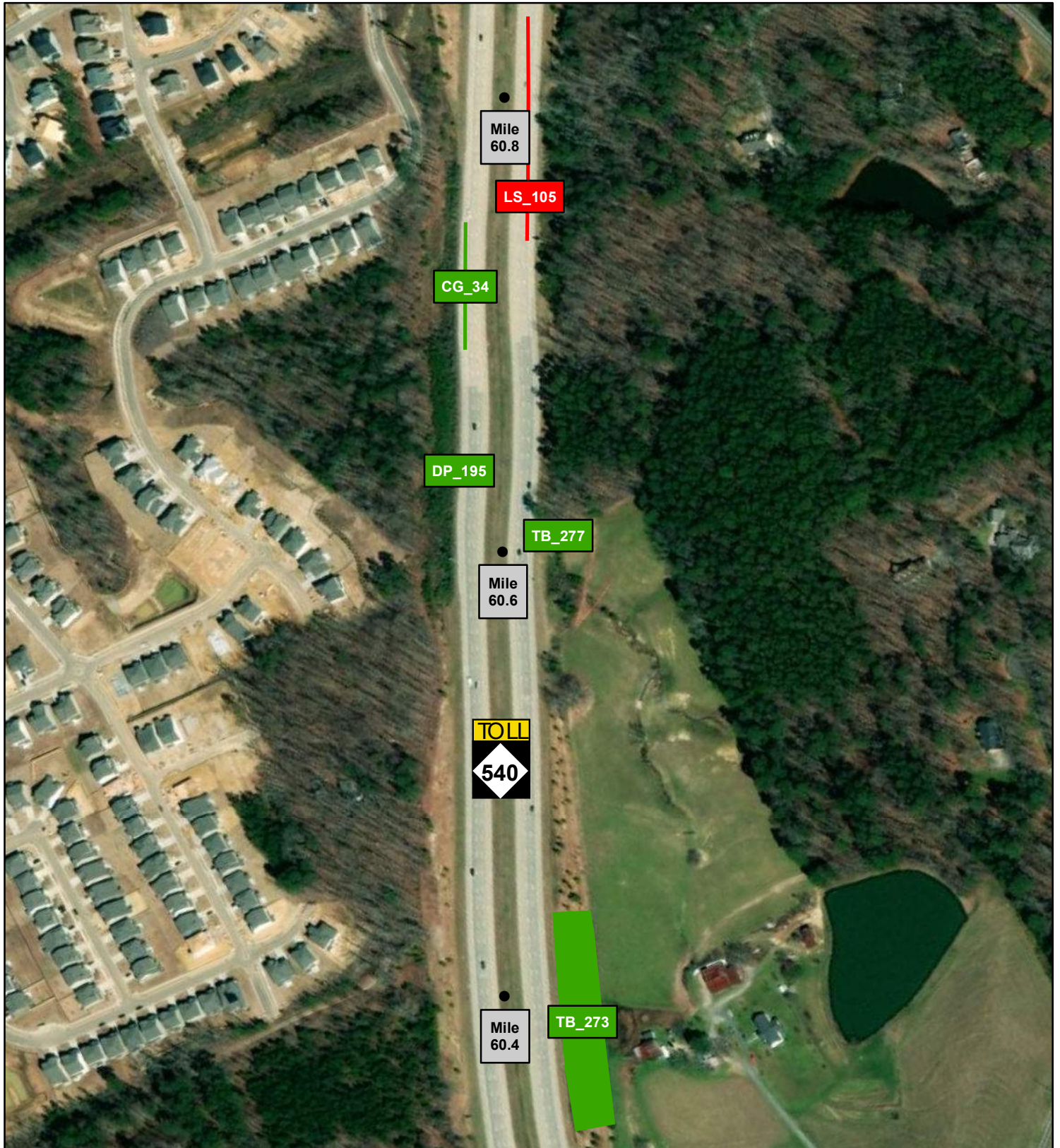


Legend



- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

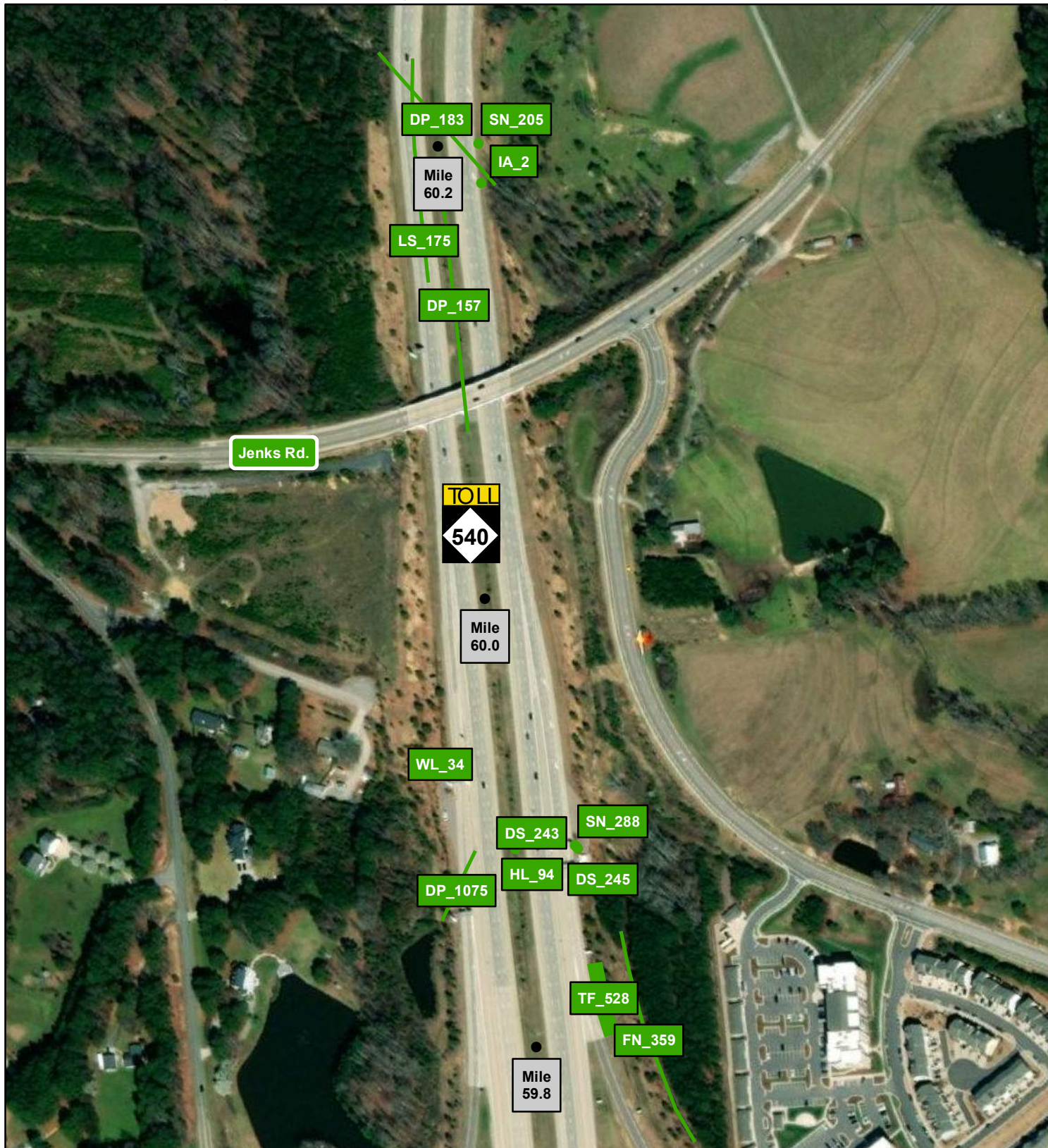


Legend

-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

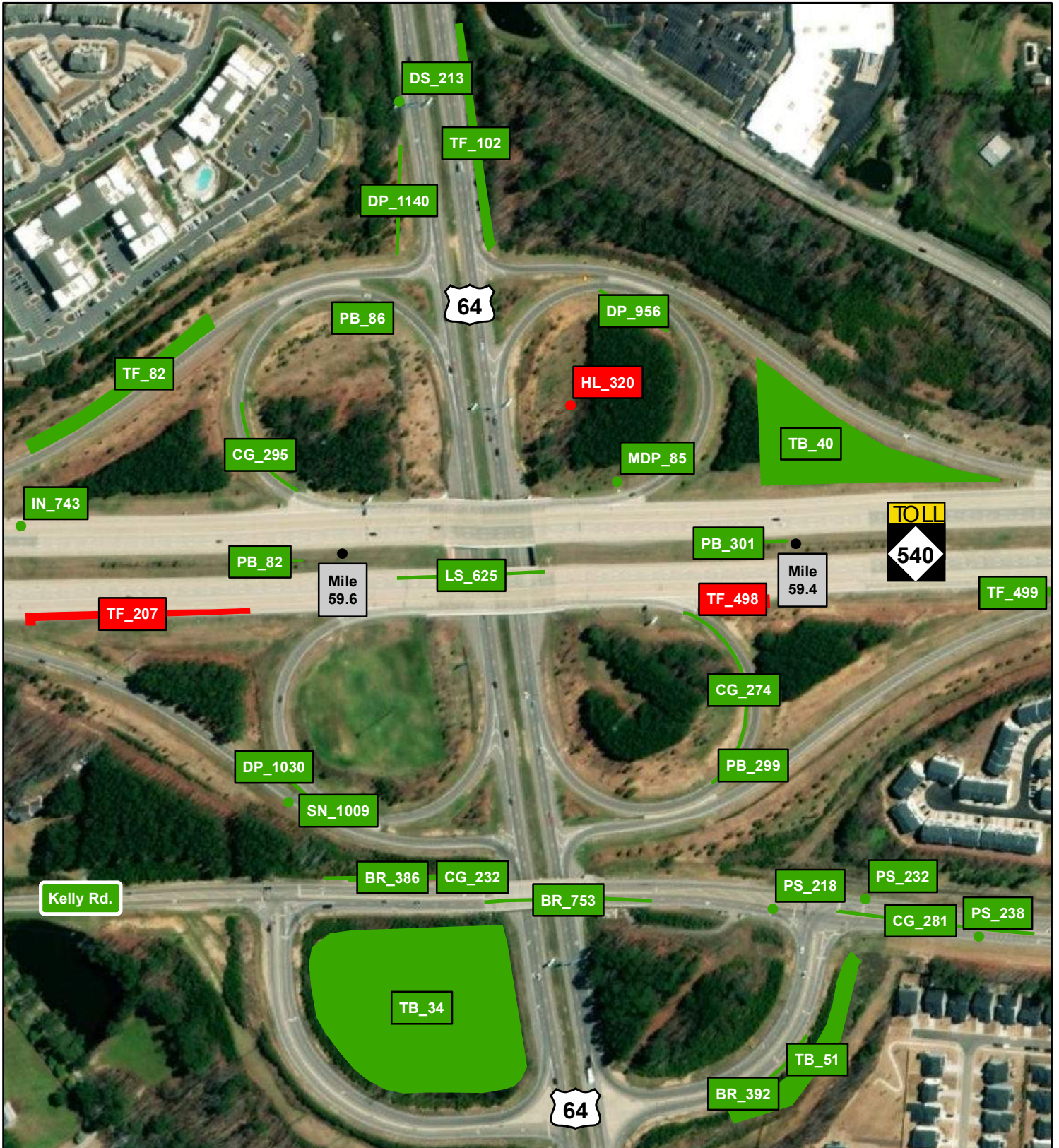


Legend

- Failing Asset
- Passing Asset

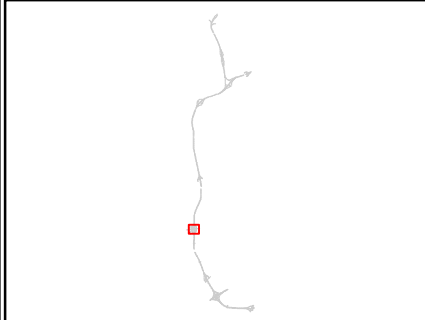


Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset

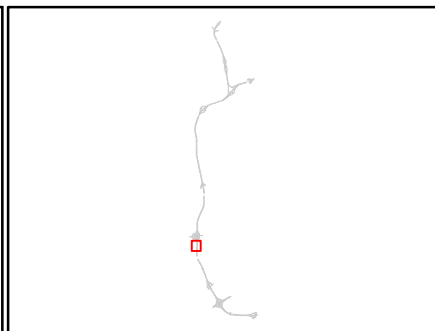


Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset

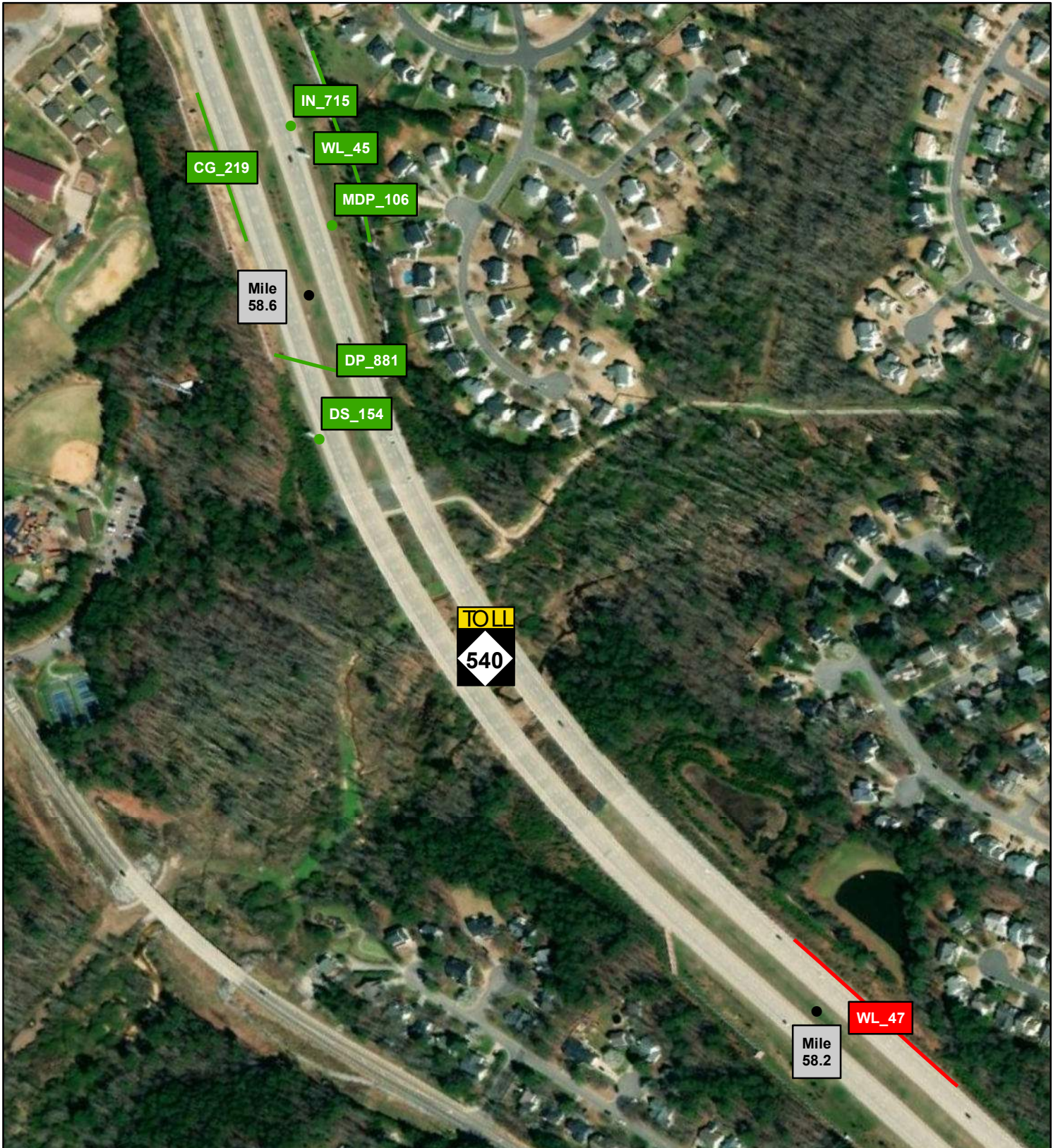








A19

Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

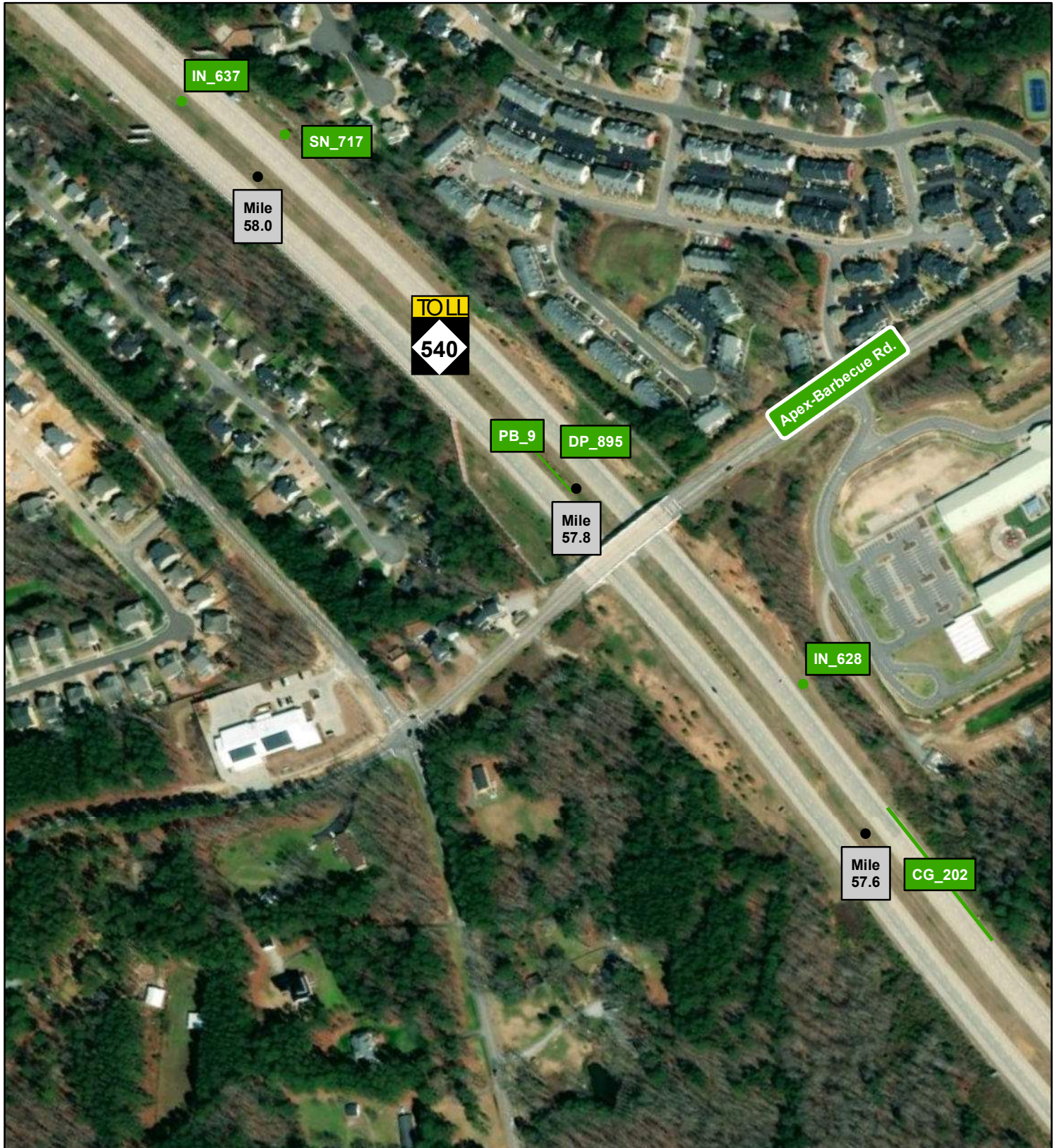


Legend



-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

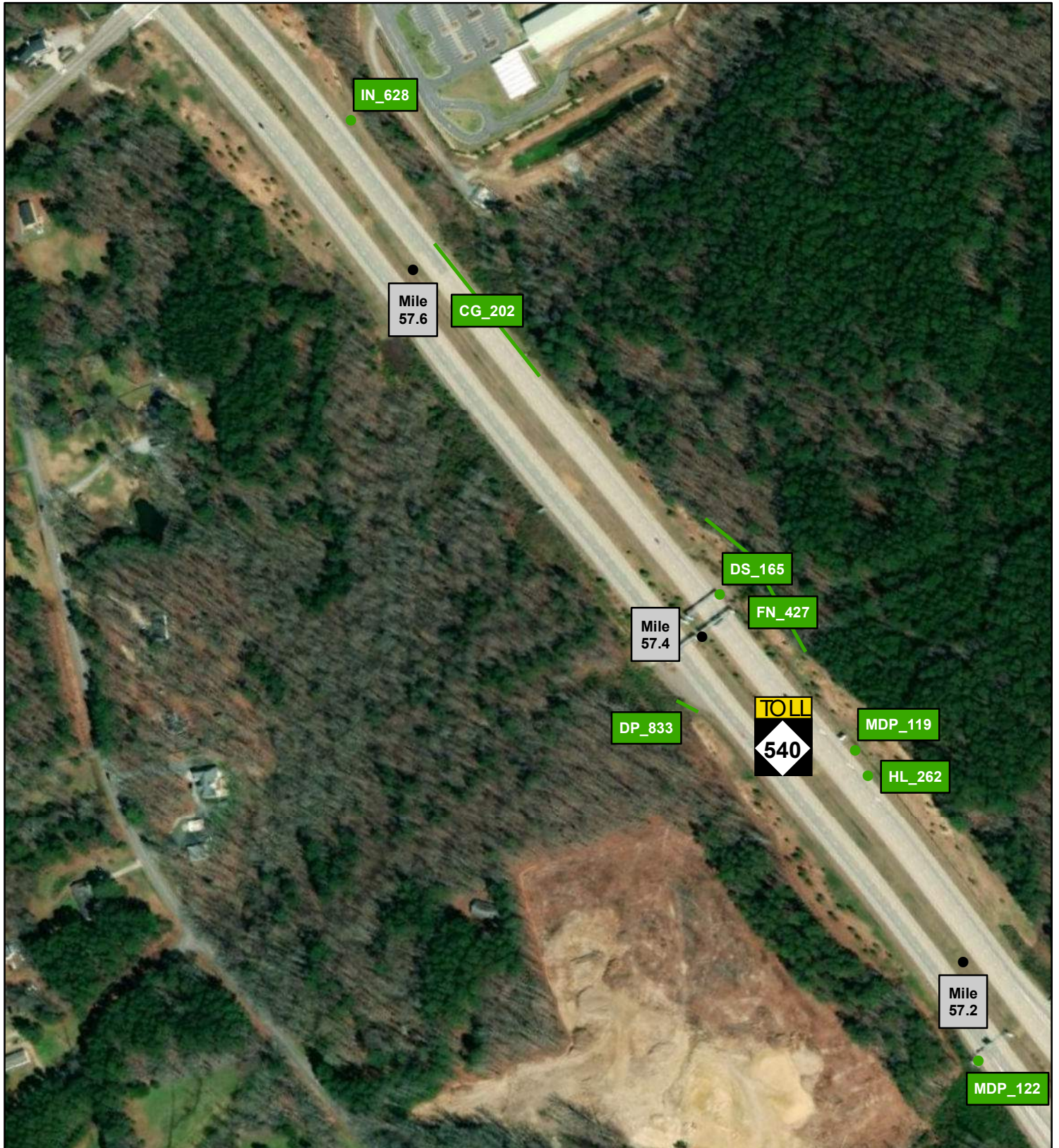


Legend

-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

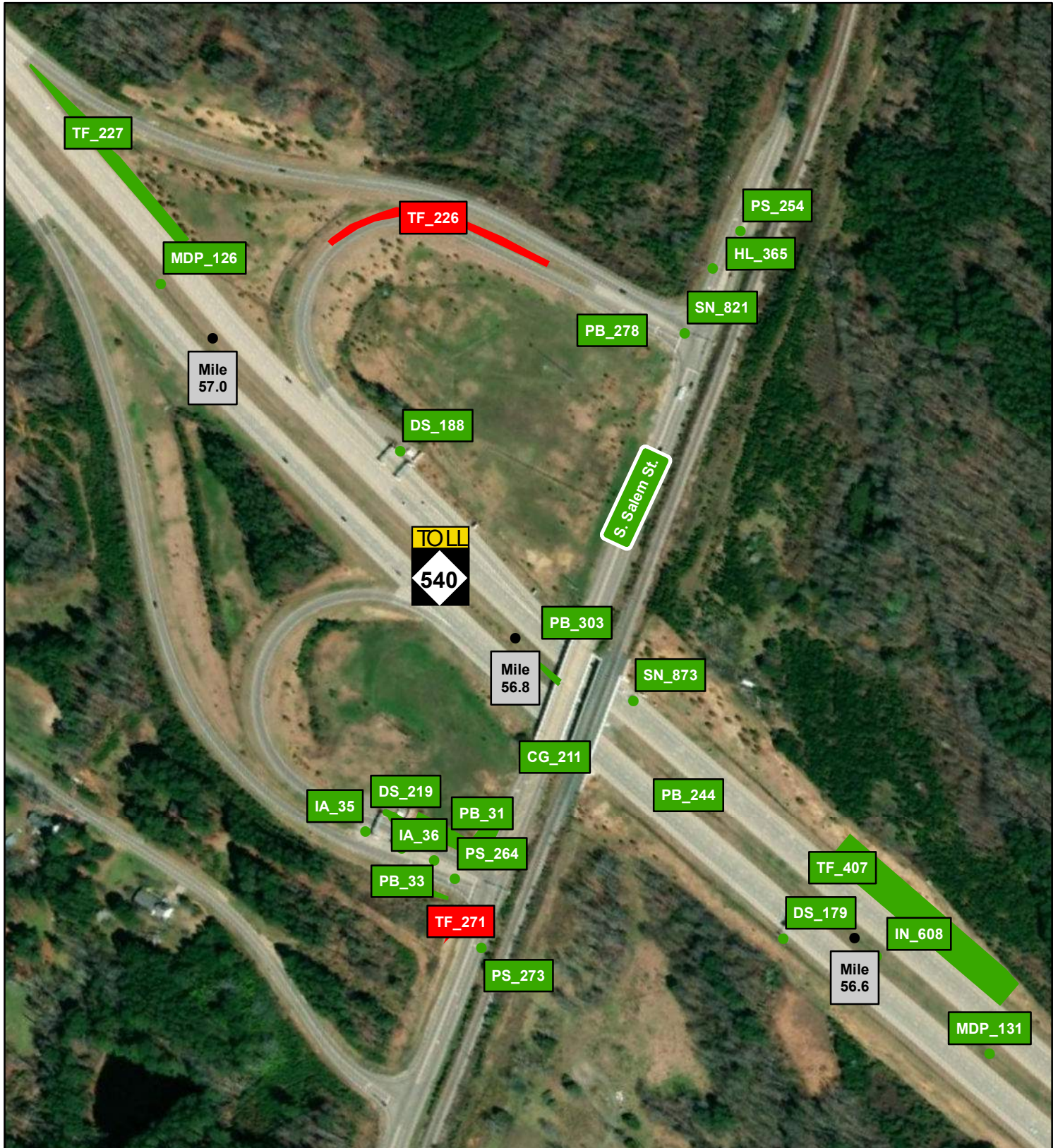


Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

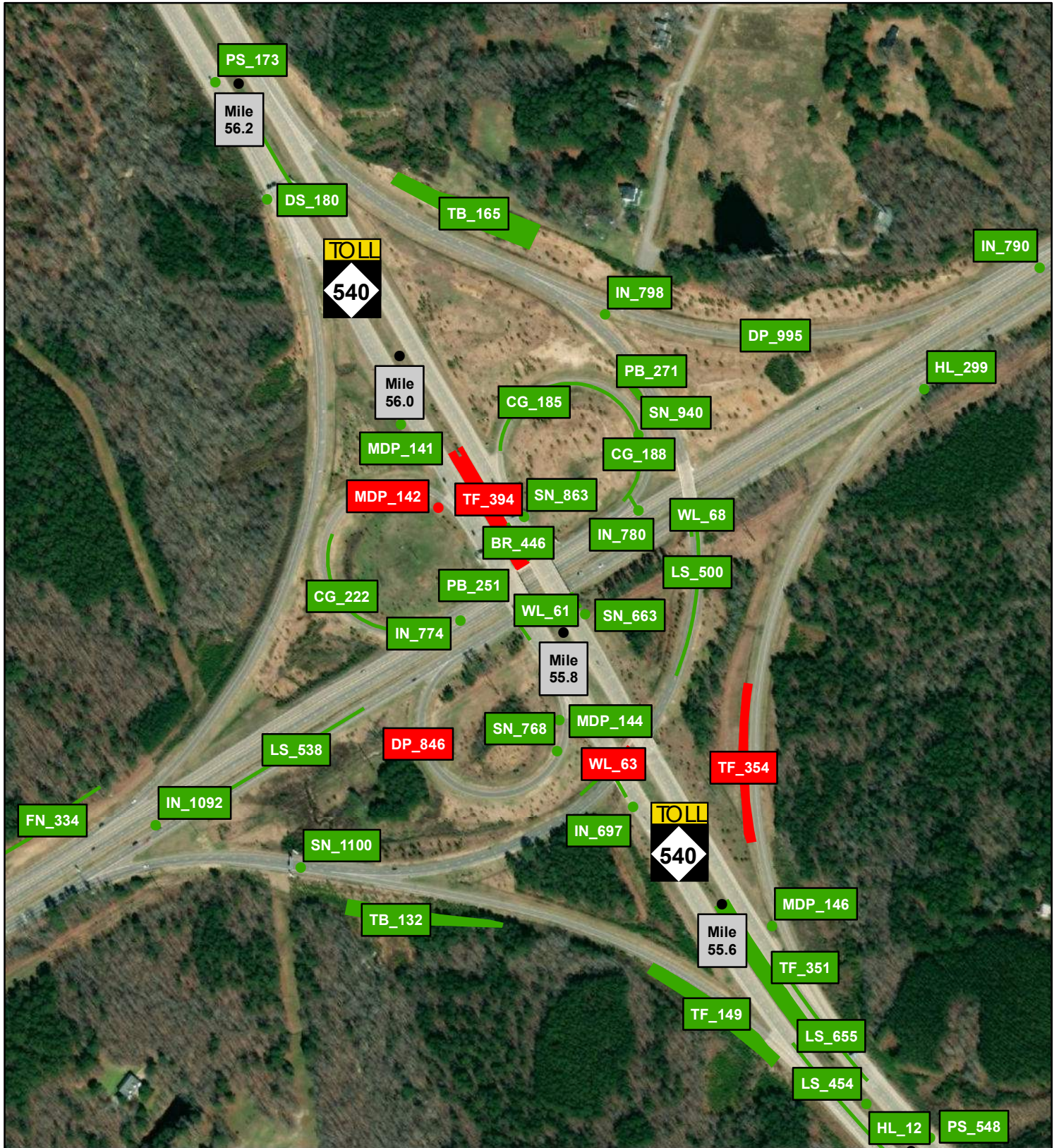


Legend

- Failing Asset
- Passing Asset

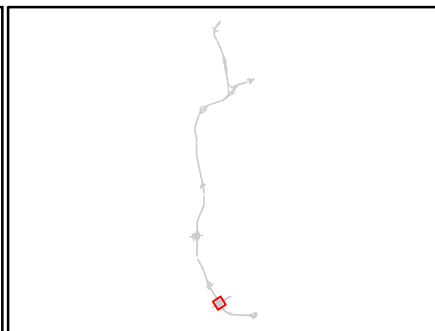


Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset

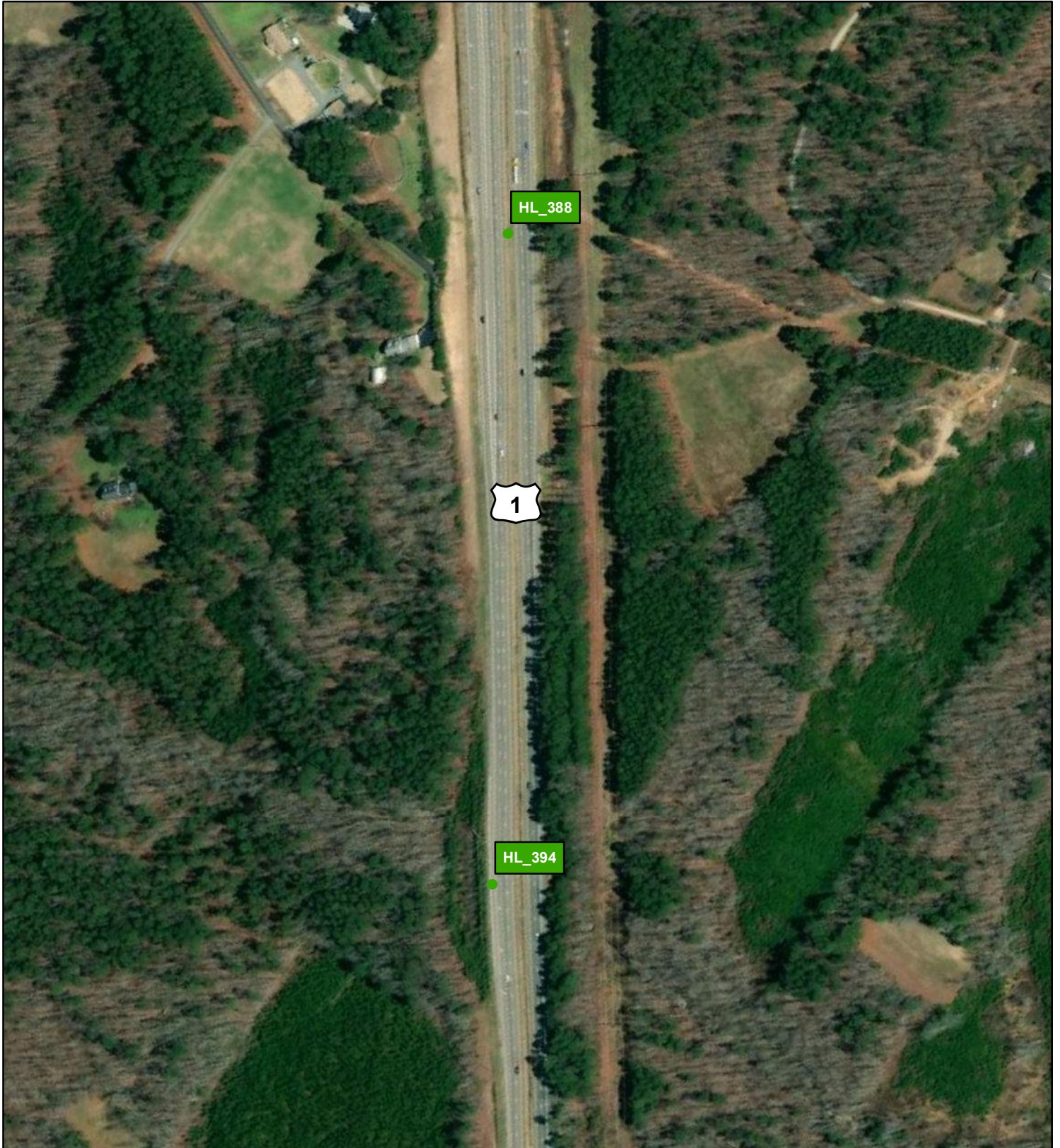






NORTH CAROLINA
Turnpike Authority

A24

Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

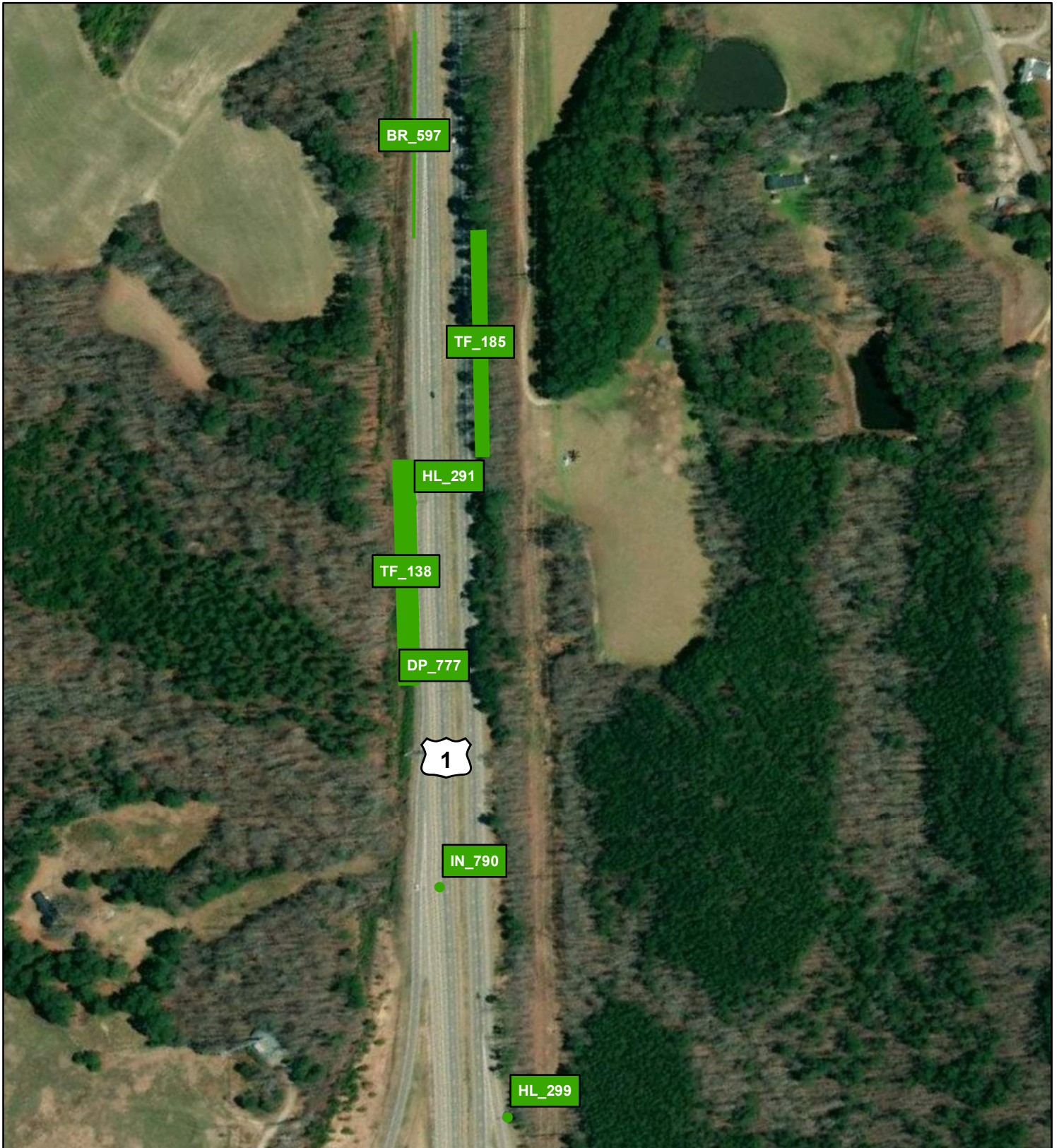


Legend



-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

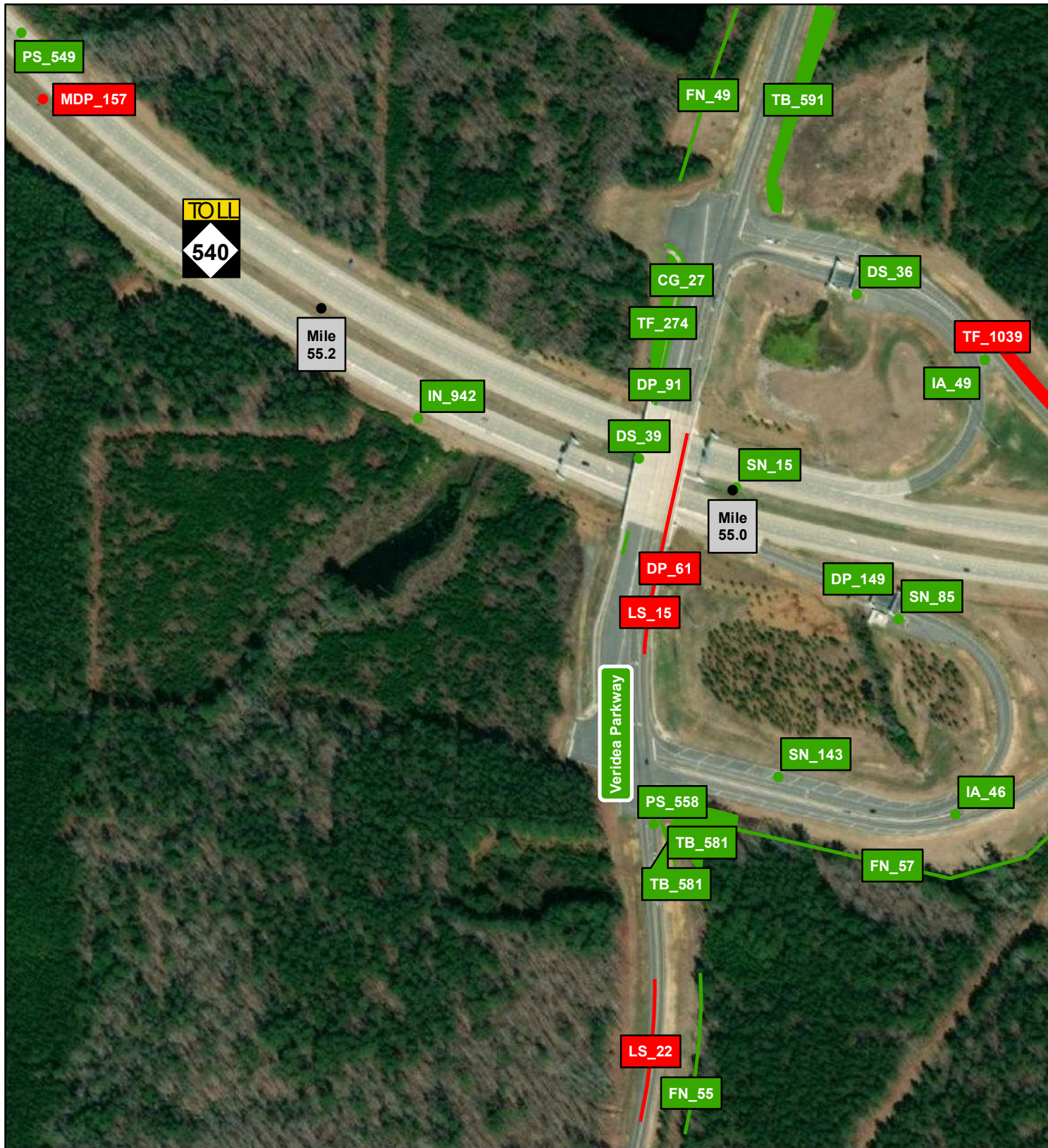


Legend

-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

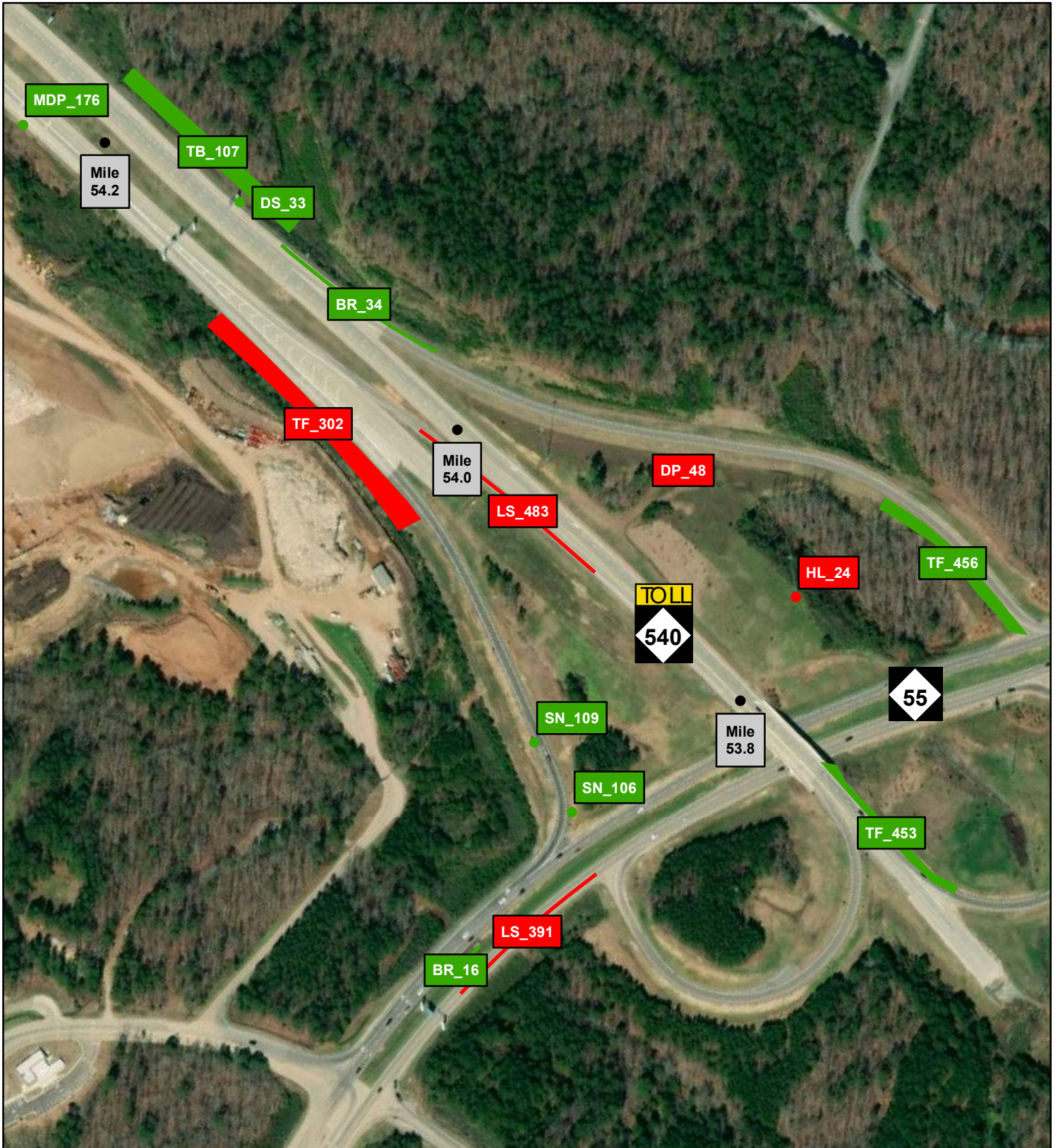


Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

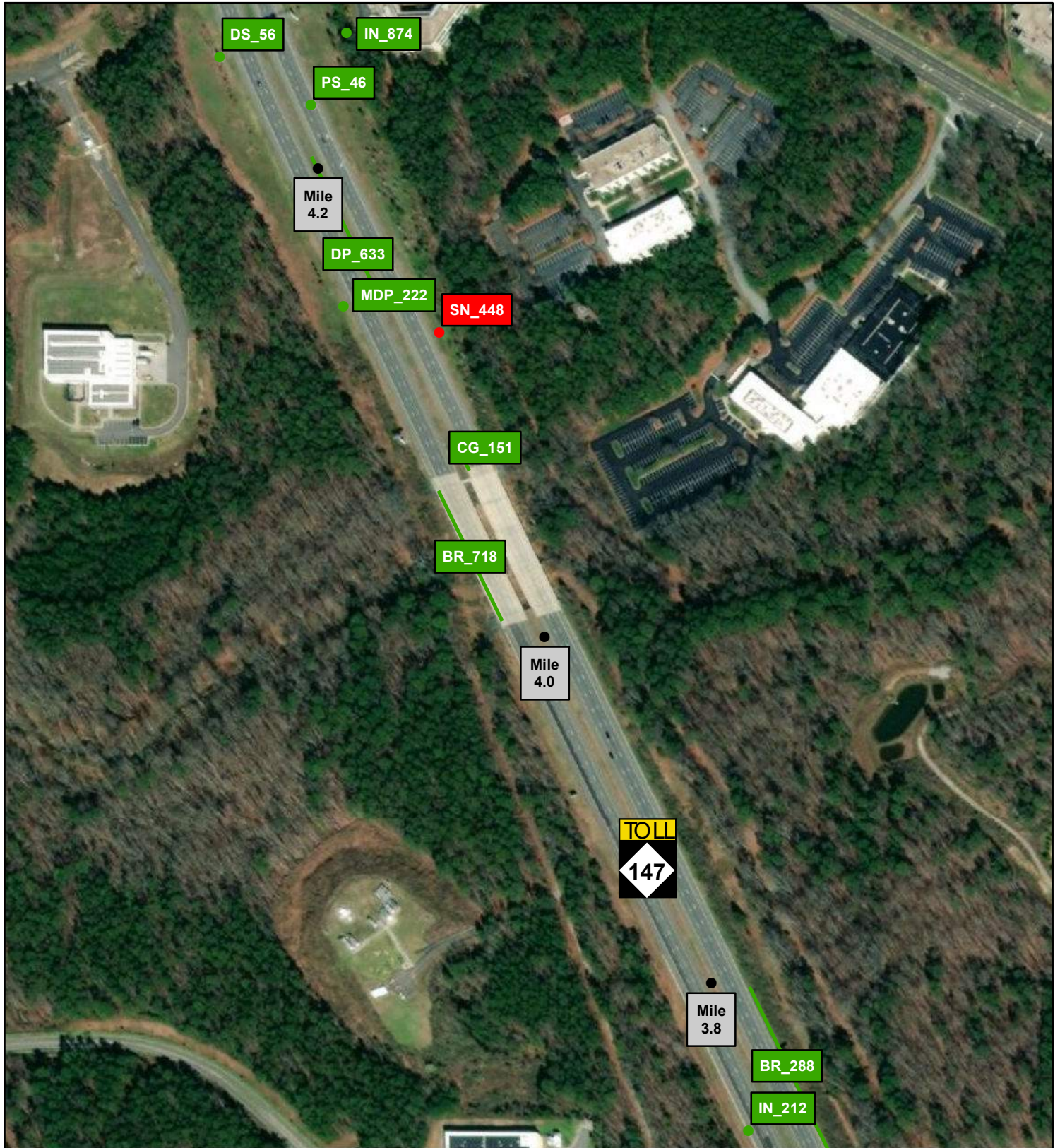


Legend



- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations



Legend



-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

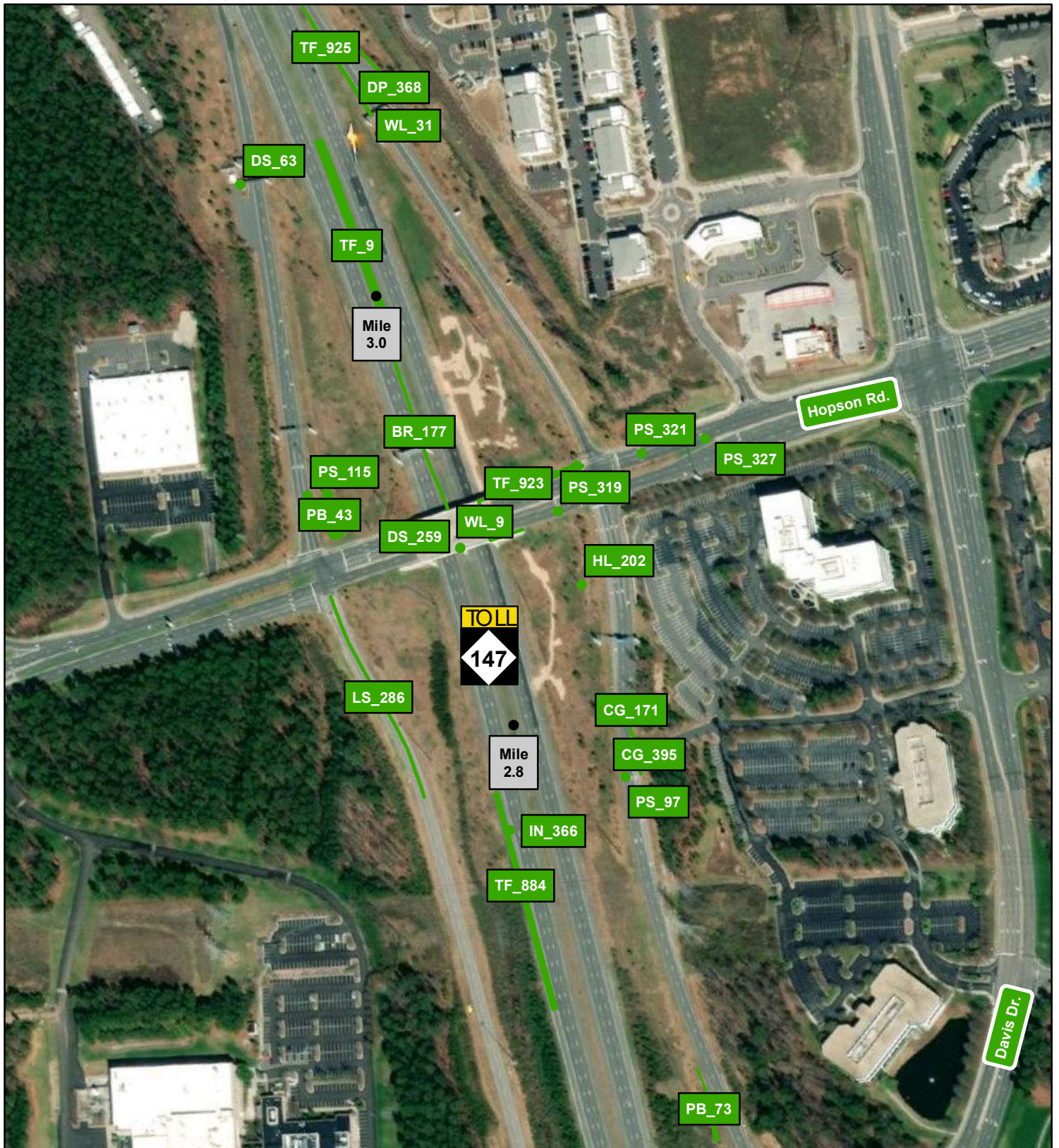


Legend

-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

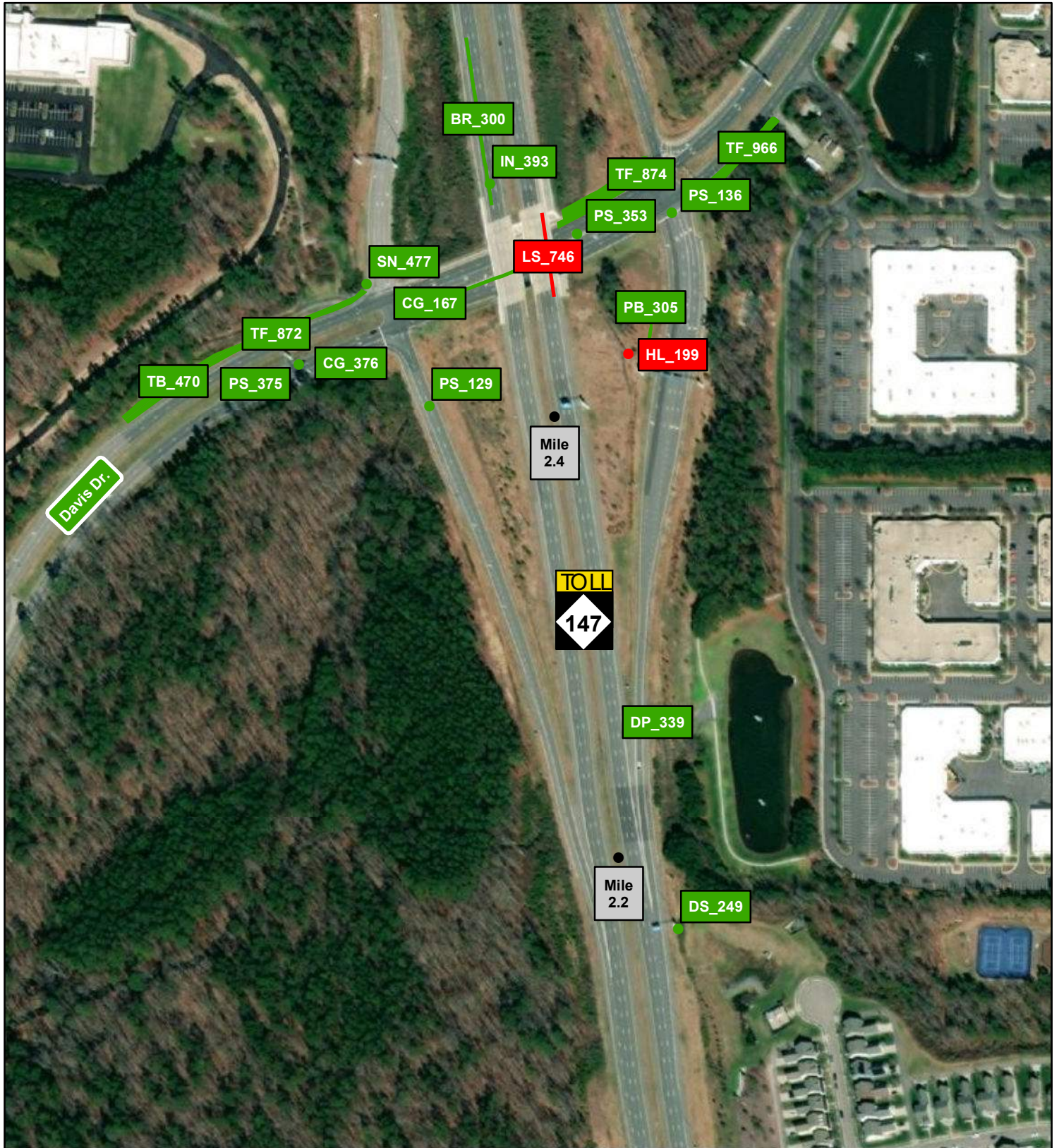


Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations

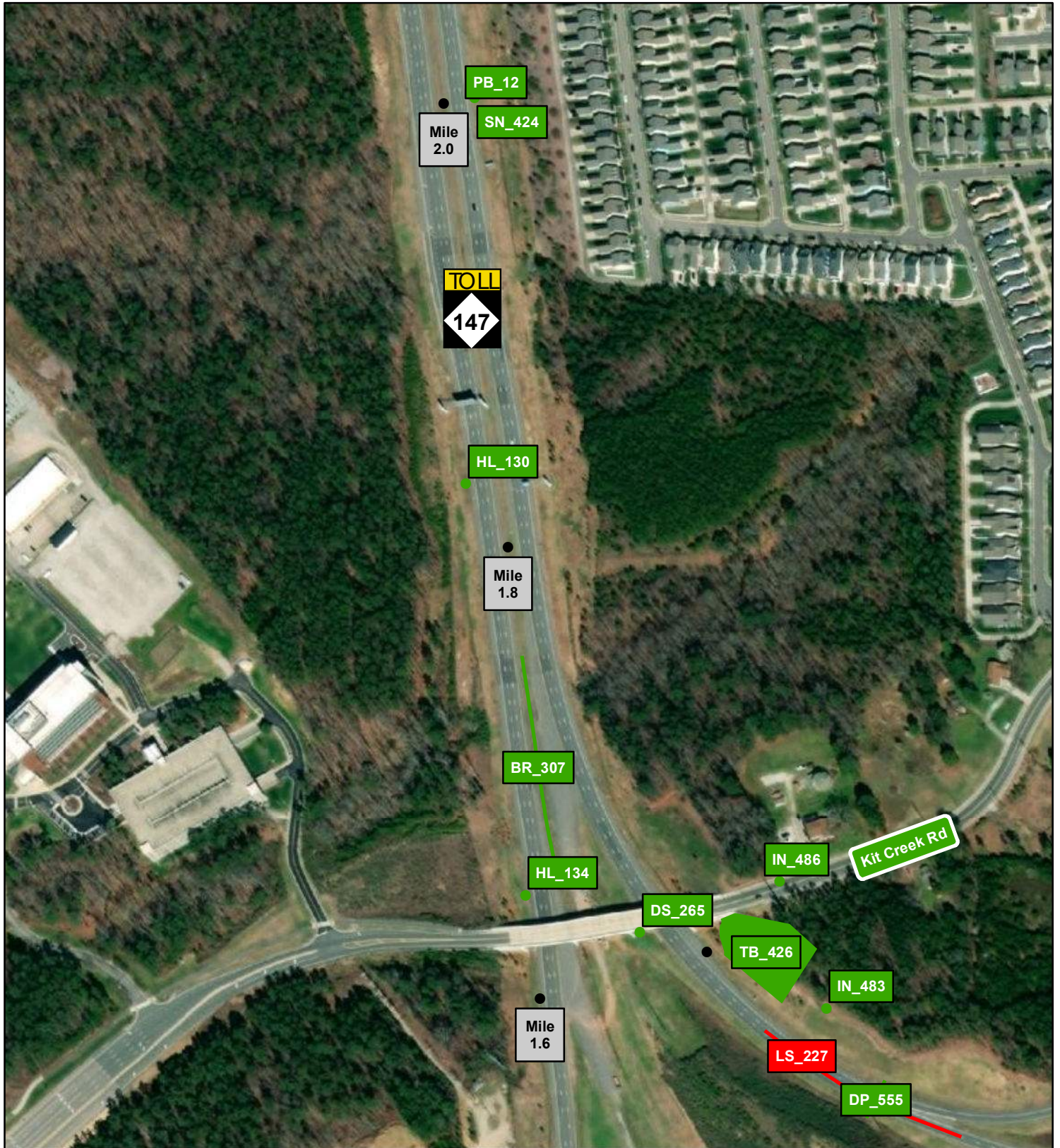


Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2020 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset



Appendix B

Triangle Expressway 2020 Second Quarter Table Results of Assets Failing MRP




Appendix B: Triangle Expressway 2020 Second 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)	6
Fence and Control of Access (FN)	8
Graffiti (GR)	9
Highway Lighting (HL)	10
Impact Attenuators (IA)	12
Inlets (IN)	13
Landscaping (PB)	14
Linear Sample (LS)	15
Paved Lanes – Asphalt (LS)	15
Paved Lanes – Concrete (LS)	15
Paved Shoulders (LS)	16
Unpaved Shoulders (LS)	17
Front/Back Slopes (LS)	18
Unpaved Lateral and Outfall Ditches (LS)	18
Litter (LS)	19
Roadway Sweeping (LS)	19
Pavement Striping (LS)	20
Pavement Markers (LS)	21
Delineators (LS)	22
Paved Ditches (PD)	23
Pavement Words and Symbols (PS)	24
Signs (SN)	25
Tree and Brush (TB)	26
Turf Condition (TF)	27
MSE/Retaining Walls, Sound Barrier Walls and Screen Walls (WL)	30

Guardrail, Concrete Barrier and End Anchors (BR)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Guardrail	BR_82	Functional Damage		A14
2	Guardrail	BR_202	Twisted Blocks		A30
3	Guardrail	BR_260	Functional Damage		A1



Curb and Gutter (CG)

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


Decorative Supports (DS)

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





Drainage Pipes (DP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Drainage Pipe	DP_48	Erosion / Water Infiltration		A29
2	Drainage Pipe	DP_61	Obstruction / Roadway Settlement		A27


Drainage Pipes (DP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
3	Drainage Pipe	DP_846	Erosion		A24

Misc. Drainage Structure (MDP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Shoulder Drain	MDP_7	Obstruction		A8
2	Shoulder Drain	MDP_55	Rodent Screen		A13
3	Shoulder Drain	MDP_142	Obstruction		A24
4	Shoulder Drain	MDP_157	Obstruction / End Damage		A27

Misc. Drainage Structure (MDP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Shoulder Drain	MDP_204	End Damage		A11

Fence and Control of Access (FN)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Woven	FN_305	Fence Hole		A5
2	Woven	FN_484	Fence Height		A13



Graffiti (GR)

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

Highway Lighting (HL)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	High Mast	HL_24	Part Damage		A29
2	Single Roadway	HL_170	Part Damage		A2
3	Double Roadway	HL_177	Part Damage		A2
4	High Mast	HL_199	Rodent Screen		A34



Highway Lighting (HL)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	High Mast	HL_232	Rodent Screen		A3
6	High Mast	HL_320	Part Damage		A18

Impact Attenuators (IA)

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

Inlets (IN)


#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Inlet	IN_7	Obstruction		A7
2	Inlet	IN_302	Eroded Area		A3

Landscaping (PB)


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

Linear Sample (LS)



Paved Lanes – Asphalt (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_227	Unsealed Cracks		A3, A35





Paved Lanes – Concrete (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_208	Joint Malfunction		A30


Paved Shoulders (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_73	Joint Separation		A10
2	Concrete	LS_483	Joint Separation		A29

Unpaved Shoulders (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_22	Drop Off		A27
2	Asphalt	LS_46	Drop Off		A13
3	Concrete	LS_72	Build Up		A10
4	Asphalt	LS_391	Build Up		A29


Unpaved Shoulders (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Concrete	LS_594	Build Up		A6




Front/Back Slopes (LS)

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

Unpaved Lateral and Outfall Ditches (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_692	Ditch Erosion		A1




Litter (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_594	Litter		A6
2	Asphalt	LS_719	Litter		A7
3	Concrete	LS_732	Litter		A1

Roadway Sweeping (LS)

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





Pavement Striping (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_105	Line Missing		A15, A16
2	Concrete	LS_363	Nighttime Reflectivity	Not Available for Nighttime Failure	A1
3	Asphalt	LS_581	Line Width		A3, A4
4	Asphalt	LS_692	Line Missing		A1

Pavement Markers (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_15	Reflective Markers Missing		A27
2	Asphalt	LS_581	Nighttime Reflectivity	Not Available for Nighttime Failure	A3, A4
3	Concrete	LS_594	Reflective Markers Missing / Nighttime Reflectivity		A6
4	Concrete	LS_688	Nighttime Reflectivity	Not Available for Nighttime Failure	A1
5	Asphalt	LS_719	Reflective Markers Missing / Nighttime Reflectivity		A7
6	Concrete	LS_746	Reflective Markers Missing / Nighttime Reflectivity		A34


Delineators (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_46	Delineators Missing / Nighttime Reflectivity		A13
2	Concrete	LS_316	Delineators Missing / Nighttime Reflectivity		A2
3	Concrete	LS_363	Delineators Missing / Nighttime Reflectivity		A1
4	Asphalt	LS_391	Nighttime Reflectivity	Not Available for Nighttime Failure	A29
5	Concrete	LS_732	Delineators Missing / Nighttime Reflectivity		A1

Paved Ditches (PD)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
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_414	Daytime Assessment / Nighttime Reflectivity		A1
2	Stop Bar	PS_430	Daytime Assessment / Nighttime Reflectivity		A1
3	Thru Arrow	PS_438	Daytime Assessment / Nighttime Reflectivity		A7
4	Thru Arrow	PS_461	Daytime Assessment / Nighttime Reflectivity		A7

Signs (SN)

#	Sign Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Exit	SN_448	Support Damage / Slip Base		A31

Tree and Brush (TB)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Tree and Brush	TB_430	Sight Distance		A2



Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Turf	TF_45	Bare Ground		A13
2	Turf	TF_207	Bare Ground		A18
3	Turf	TF_226	Bare Ground		A23
4	Turf	TF_271	Bare Ground		A23





Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Turf	TF_302	Bare Ground		A29
6	Turf	TF_316	Bare Ground		A28
7	Turf	TF_354	Bare Ground		A24
8	Turf	TF_394	Bare Ground		A24

Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
9	Turf	TF_498	Bare Ground		A18
10	Turf	TF_1039	Bare Ground		A27, A28

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

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Sound Wall	WL_47	Unsealed Joints		A20
2	Bridge Wall	WL_63	Unsealed Joints		A24
3	Retaining Wall	WL_116	Unsealed Cracks		A28
4	Sound Wall	WL_117	Unsealed Joints		A32