

Maintenance Rating Program

Triangle Expressway

August 11, 2021

2021 Second Quarter Report

CONSULTANT CERTIFICATION OF COMPLETION

August 10, 2021

Dennis Jernigan, P.E.
Deputy Chief Engineer of Highway Operations, NCTA
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NCTA Triangle Expressway Roadway Maintenance Performance Rating Program; Q2, FY 2021 Rating

This is to certify that I, Ken M. McEntire, PE am an authorized official representative of the company The Kercher Group, a Division of Mott MacDonald, and 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, a Division of Mott MacDonald

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 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 2021 Second Quarter Assessment of the Triangle Expressway.

The overall 2021 second quarter maintenance rating of the Triangle Expressway was **95.2**, 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 2021 Second Quarter Assessment

Element	MRP Rating	Target Rating
Road Surface	96.8 ¹	85.0
Unpaved Shoulders and Ditches	99.3	85.0
Drainage	94.0	85.0
Roadside	95.5	85.0
Traffic Control Devices	92.5 ¹	85.0
Overall MRP Performance Rating	95.2¹	90.0

¹Excludes asphalt surface pavement condition as well as markers, striping, and symbols on mainline NC-147 and all ramps/loops.

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 91.6.

Table 2: MRP Rolling Element Results

Element	Q3 2020 Rating	Q4 2020 Rating	Q1 2021 Rating	Q2 2021 Rating	Rolling Rating
Road Surface	96.3 ¹	96.2 ¹	90.5 ¹	96.8 ¹	95.1 ²
Unpaved Shoulders and Ditches	96.5	98.8	99.3	99.3	98.6
Drainage	89.2	87.6	88.6	94.0	89.9
Roadside	91.1	89.1	90.6	95.5	91.6
Traffic Control Devices	84.0 ¹	85.2 ¹	82.2 ¹	92.5 ¹	86.3 ²
Overall MRP Performance Rating	90.7¹	90.7¹	88.9¹	95.2¹	91.6²

¹Excludes asphalt surface pavement condition as well as markers, striping, and symbols on mainline NC-147 and all ramps/loops.

²Excludes 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, and the landscaped areas around the signs were 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 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.

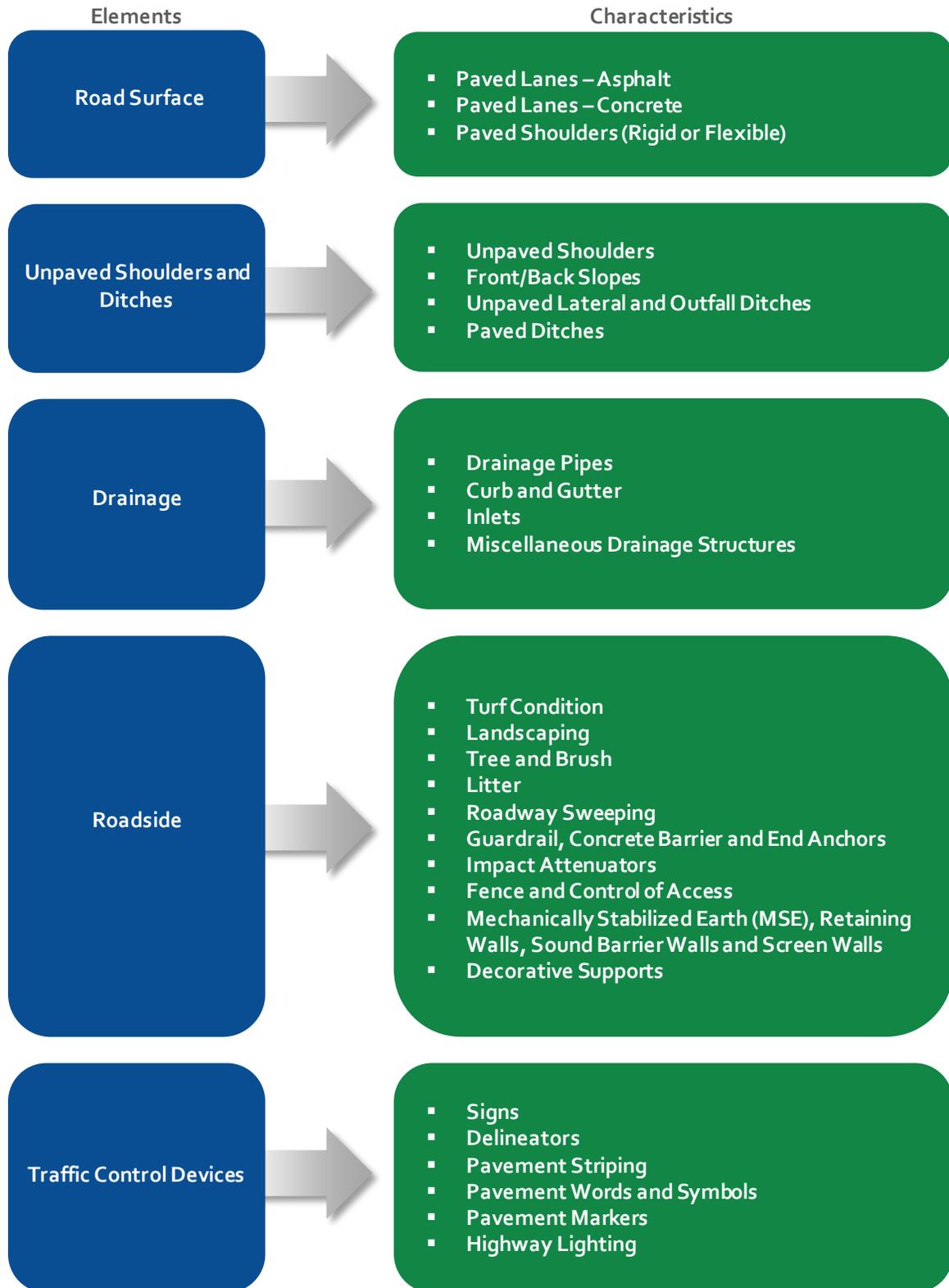
The NCTA performance standards, threshold criteria, and maintenance rating program were developed through a collaborative effort by NCTA managers, NCDOT maintenance staff, and consultants.

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 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:

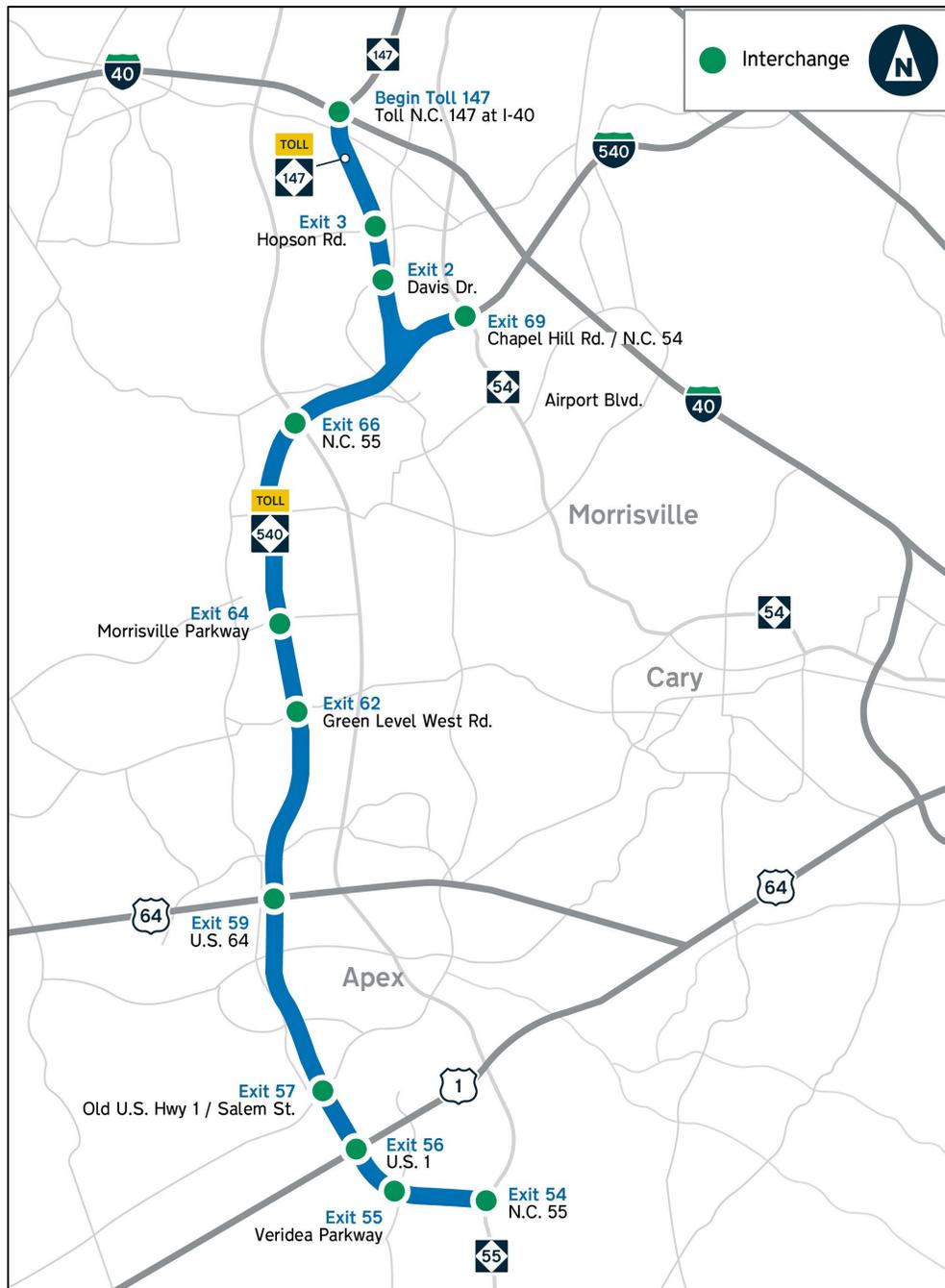
Road Surface =	25%
Unpaved Shoulders =	13%
Drainage =	15%
Roadside =	17%
Traffic Control Devices =	30%
Total	100%

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-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-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	2021 Eligible Inventory
Barriers	799	627
Curb and Gutter	428	397
Decorative Supports	305	298
Drainage	1179	1131
Misc. Drainage	211	200
Fences	508	484
Highway Lighting	435	431
Impact Attenuators	47	45
Inlets	1126	1080
Linear Segments	795	737
Plant Beds	266	261
Paved Ditches	2	2
Pavement Symbols	652	593
Signs	1221	1169
Tree and Brush	603	569
Turf	1074	978
Walls	88	84

6.0 MRP Second Quarter Assessment

6.1 Quarterly Results

The overall 2021 second quarter maintenance rating of the Triangle Expressway was 95.2, above NCTA's target overall rating of 90. All elements assessed achieved quarter ratings above the target rating of 85 established for element groups. Furthermore, all characteristics achieved a quarter score above the target rating of 80.

Last year, NCTA let a resurfacing project to improve asphalt pavement condition as well as the condition of pavement striping, characters, symbols, and markers on mainline NC-147 and asphalt surface ramps/loops throughout Triangle Expressway. Due to this ongoing project, the Paved Lanes Asphalt, Paved Shoulder, Pavement Striping, Pavement Characters and Symbols, and Pavement Markers characteristics were only inspected on pavement surfaces not included in the resurfacing project contract. Once this project is completed, the characteristics rating for the entire facility will resume and will be included in the Road Surface element rating, Traffic Control Devices element rating 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 as the rolling rating, provide 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 2021

Element	MRP Rating
Road Surface	96.8 ¹
Unpaved Shoulders and Ditches	99.3
Drainage	94.0
Roadside	95.5
Traffic Control Devices	92.5 ¹
Overall MRP Performance Rating	95.2¹

¹Excludes asphalt surface pavement condition as well as markers, striping, and symbols on mainline NC-147 and all ramps/loops.

Table 5: MRP Characteristics Results for Q2 2021

Road Surface	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q2 Rating
Paved Lanes Asphalt	18	19	9	162	171	95 ¹
Paved Lanes Concrete	20	21	9	180	189	95
Paved Shoulder	40	40	5	200	200	100 ¹
Element Total				542	560	96.8¹
Unpaved Shoulders and Ditches	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q2 Rating
Unpaved Shoulder	40	40	9	360	360	100
Front/Back Slopes	40	40	6	240	240	100
Lateral and Outfall Ditches, Unpaved	39	40	6	234	240	98
Ditches, Paved	2	2	5	10	10	100
Element Total				844	850	99.3
Drainage	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q2 Rating
Drainage Pipes	34	35	7	238	245	97
Curb and Gutter	27	27	6	162	162	100
Inlets	37	40	7	259	280	93
Misc. Drainage Structure	24	29	4	96	116	83
Element Total				755	803	94.0
Roadside	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q2 Rating
Turf Condition	52	57	7	364	399	91
Landscaping	24	25	4	96	100	96
Trees and Brush	31	31	4	124	124	100
Litter	39	40	4	156	160	98
Roadway Sweeping	40	40	5	200	200	100
Guardrail, Concrete Barrier, and End Anchors	28	30	9	252	270	93
Impact Attenuators	9	9	9	81	81	100
Fence, Control Access	29	32	7	203	224	91
Retaining Walls and Sound Barrier Walls	15	16	5	75	80	94
Decorative Supports	26	26	5	130	130	100
Graffiti and Stain Removal	44	44	4	176	176	100
Element Total				1857	1944	95.5
Traffic Control Devices	Sample Passed	Sample Total	Weighted Values	Actual Pts	Available Pts	Q2 Rating
Signs	32	35	7	224	245	91
Delineators	37	40	3	111	120	93
Pavement Striping/Marking	36	40	8	288	320	90 ¹
Words and Symbols	30	35	7	210	245	86 ¹
Pavement Markers	40	40	9	360	360	100 ¹
Highway Lighting	39	42	6	234	252	93
Element Total				1424	1542	92.5¹

¹Excludes asphalt surface pavement condition as well as markers, striping, and symbols on mainline NC-147 and all ramps/loops.

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 Quarterly Analysis and Recommendations

Elements

During the second quarter, all elements exceeded NCTA's quarter score threshold criteria of 85. Furthermore, all elements exceeded a quarter score higher than 90.

Road Surface (96.8) experienced an increase in rolling rating 1.0 point higher than the previous quarter's rolling rating. Both Paved Lanes Asphalt (95) and Paved Shoulder (100) increased in rolling rating. Asphalt resurfacing is ongoing and scheduled to be complete in September of this year.

Unpaved Shoulders and Ditches (99.3) experienced an increase in rolling rating. The rating for this element was 1.7 points higher than the previous quarter rolling rating. All characteristics within this element continued scoring above 95.

Drainage (94.0) experienced an increase in rolling rating of 0.4 points. Misc. Drainage Structures (83) scored above the characteristic threshold score of 80. Both Drainage Pipes (97) and Inlets (93) rolling ratings decreased from last quarter though continued scoring above the target rating.

Roadside (95.5) rolling rating increased 1.0 points from the previous quarter. Turf Condition (91) continued receiving a score greater than 85 for the last two quarters though the rolling rating remains below the target rating of 80. Litter (98) experienced an increase in quarter-to-quarter ratings by 10.0 points, raising the rolling rating by 1.9 points.

Traffic Control Devices (92.5) experienced a 1.7 point increase in rolling rating from the previous quarter. Pavement Striping/Marking (90) characteristic rolling rating increased by 1.6 points. Repaving and subsequent striping of all asphalt lanes is scheduled to begin next year.

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

Characteristics

This quarter, all characteristic met the NCTA target threshold criteria of 80. Pictures of all characteristic failures are included in **Appendix B**.

7.0 Current Rolling MRP Rating

The rolling maintenance rating of the Triangle Expressway was 91.6, 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 2020/2021 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 2020/2021

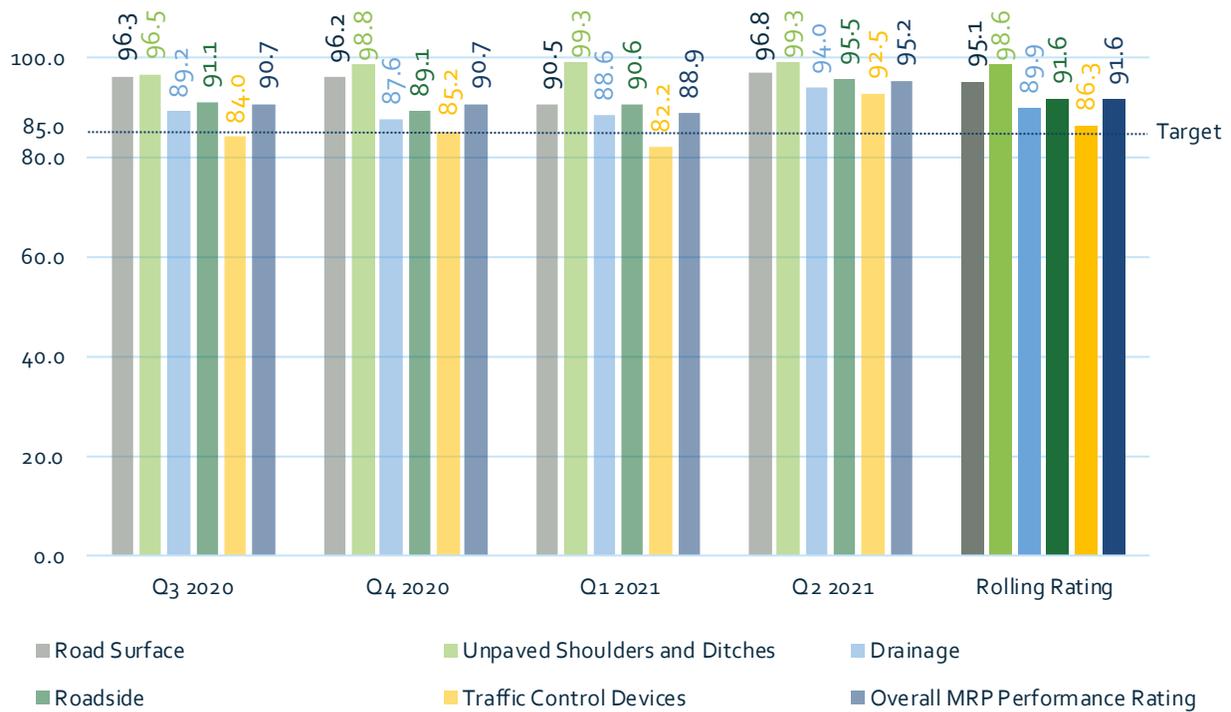


Table 6: MRP Rolling Element Results

Road Surface	Q3 2020 Rating	Q4 2020 Rating	Q1 2021 Rating	Q2 2021 Rating	Rolling Rating
Paved Lanes Asphalt	100	100	88	95	95
Paved Lanes Concrete	94	96	84	95	93
Paved Shoulder	96	96	100	100	98
Element Total	96.3	96.2	90.5	96.8	95.1
Unpaved Shoulders and Ditches	Q3 2020 Rating	Q4 2020 Rating	Q1 2021 Rating	Q2 2021 Rating	Rolling Rating
Unpaved Shoulder	94	97	100	100	98
Front/Back Slopes	100	100	98	100	99
Lateral and Outfall Ditches, Unpaved	97	100	100	98	99
Ditches, Paved	100	100	100	100	100
Element Total	96.5	98.8	99.3	99.3	98.6
Drainage	Q3 2020 Rating	Q4 2020 Rating	Q1 2021 Rating	Q2 2021 Rating	Rolling Rating
Drainage Pipes	91	88	88	97	91
Curb and Gutter	100	93	93	100	96
Inlets	82	86	92	93	89
Misc. Drainage Structure	83	83	75	83	81
Element Total	89.2	87.6	88.6	94.0	89.9
Roadside	Q3 2020 Rating	Q4 2020 Rating	Q1 2021 Rating	Q2 2021 Rating	Rolling Rating
Turf Condition	82	62	81	91	79
Landscaping	88	92	85	96	90
Trees and Brush	97	97	97	100	98
Litter	91	97	88	98	93
Roadway Sweeping	100	100	100	100	100
Guardrail, Concrete Barrier, and End Anchors	100	97	97	93	97
Impact Attenuators	100	100	100	100	100
Fence, Control Access	88	90	80	91	87
Retaining Walls and Sound Barrier Walls	80	93	94	94	90
Decorative Supports	100	100	100	100	100
Graffiti and Stain Removal	82	93	95	100	93
Element Total	91.1	89.1	90.6	95.5	91.5
Traffic Control Devices	Q3 2020 Rating	Q4 2020 Rating	Q1 2021 Rating	Q2 2021 Rating	Rolling Rating
Signs	86	94	89	91	90
Delineators	94	88	75	93	87
Pavement Striping/Marking	74	65	74	90	78
Words and Symbols	79	87	81	86	83
Pavement Markers	89	96	93	100	95
Highway Lighting	88	78	78	93	84
Element Total	84.0	85.2	82.2	92.5	86.3

¹Excludes asphalt surface pavement condition as well as markers, striping, and symbols on mainline NC-147 and all ramps/loops.

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 three 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, with the landscaped areas being well maintained. *Figure 3* shows the two signs assessed.

Figure 3: Green Level West Historic District Signs, Landscape Areas



9.0 Conclusion

This report presents the 2021 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 2021 overall rating was 95.2 and the rolling rating was 91.6, 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 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 includes Pavement Striping/Marking and Turf Condition. To maintain/improve the condition ratings, it is recommended that the pavement striping/marketing replacement cycles are completed as planned in the capital budget. Also, bare areas seeding/fertilization program efforts should continue during the spring and summer seasons to promote new turf growth.

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

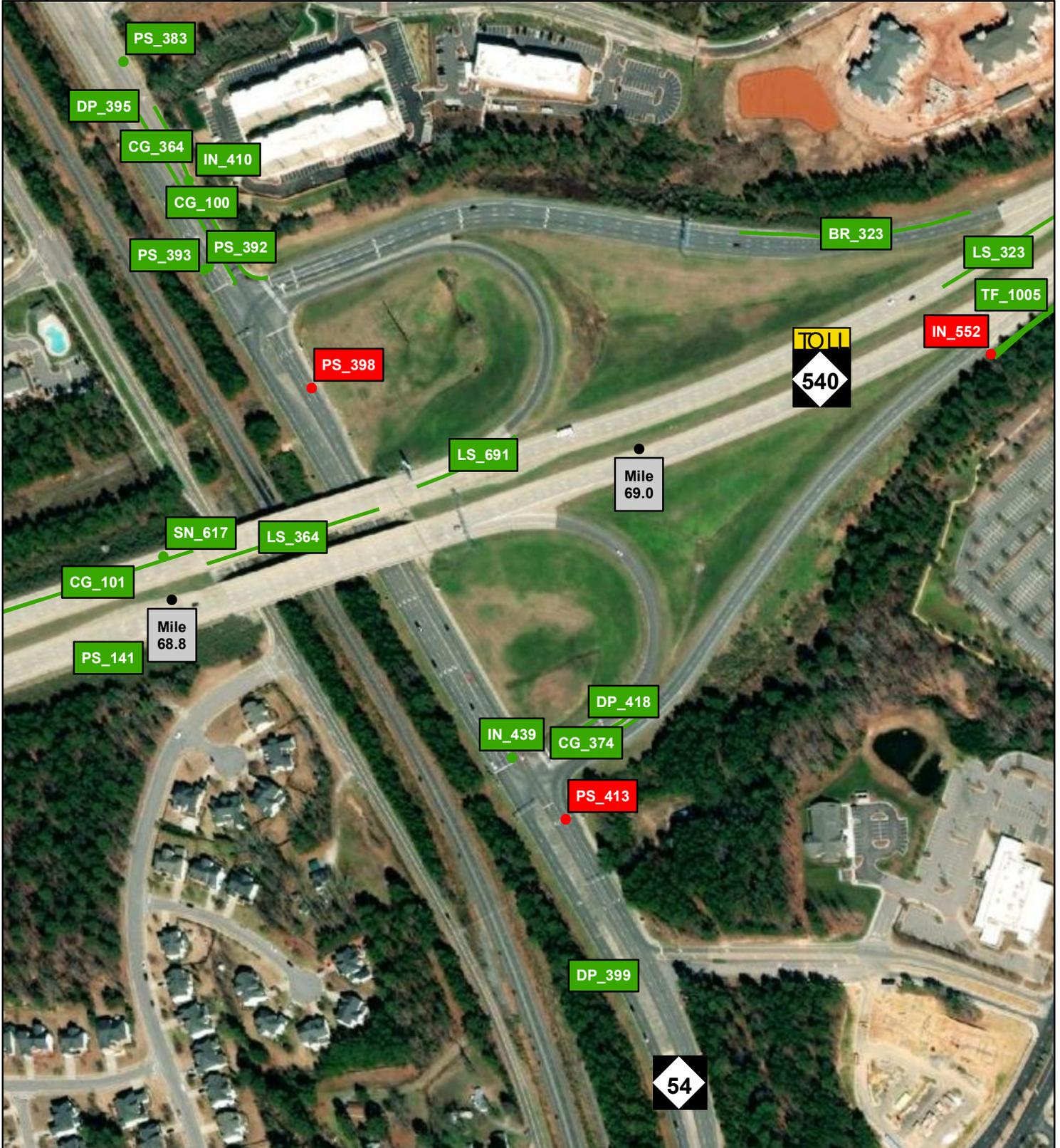
Triangle Expressway 2021 Second Quarter Asset Assessment Locations

Appendix A: Triangle Expressway 2021 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

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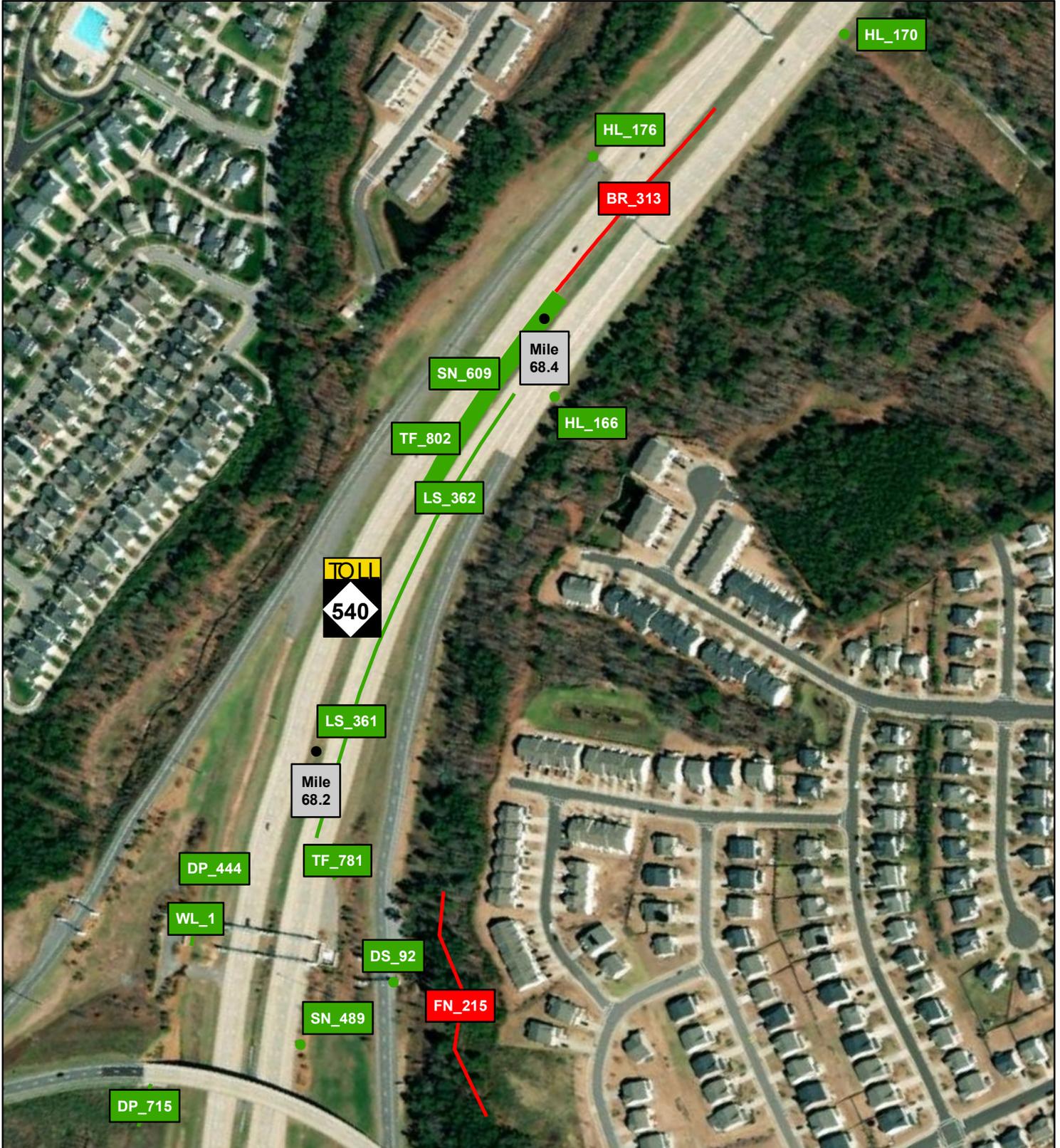


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- Failing Asset
- Passing Asset



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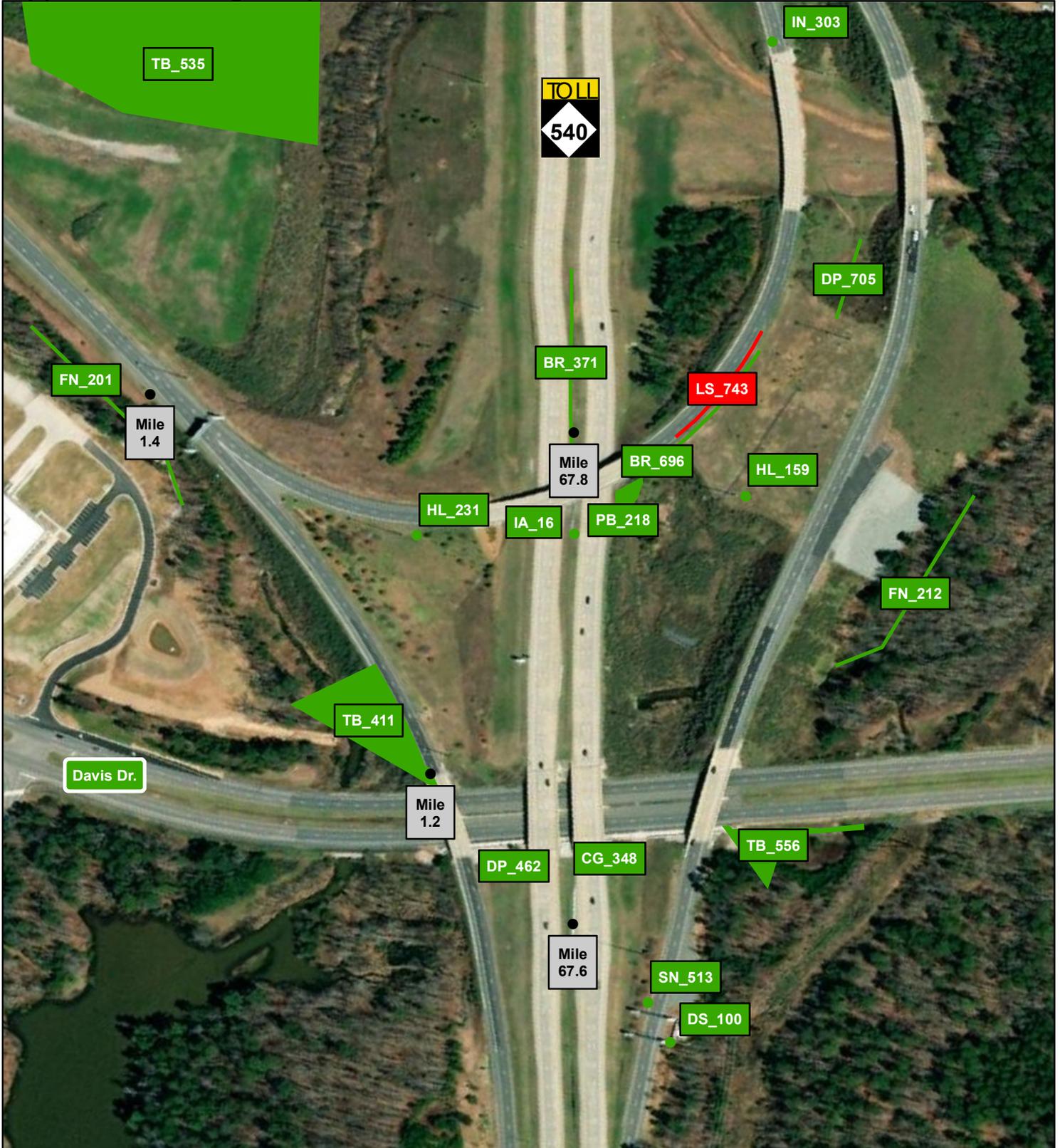


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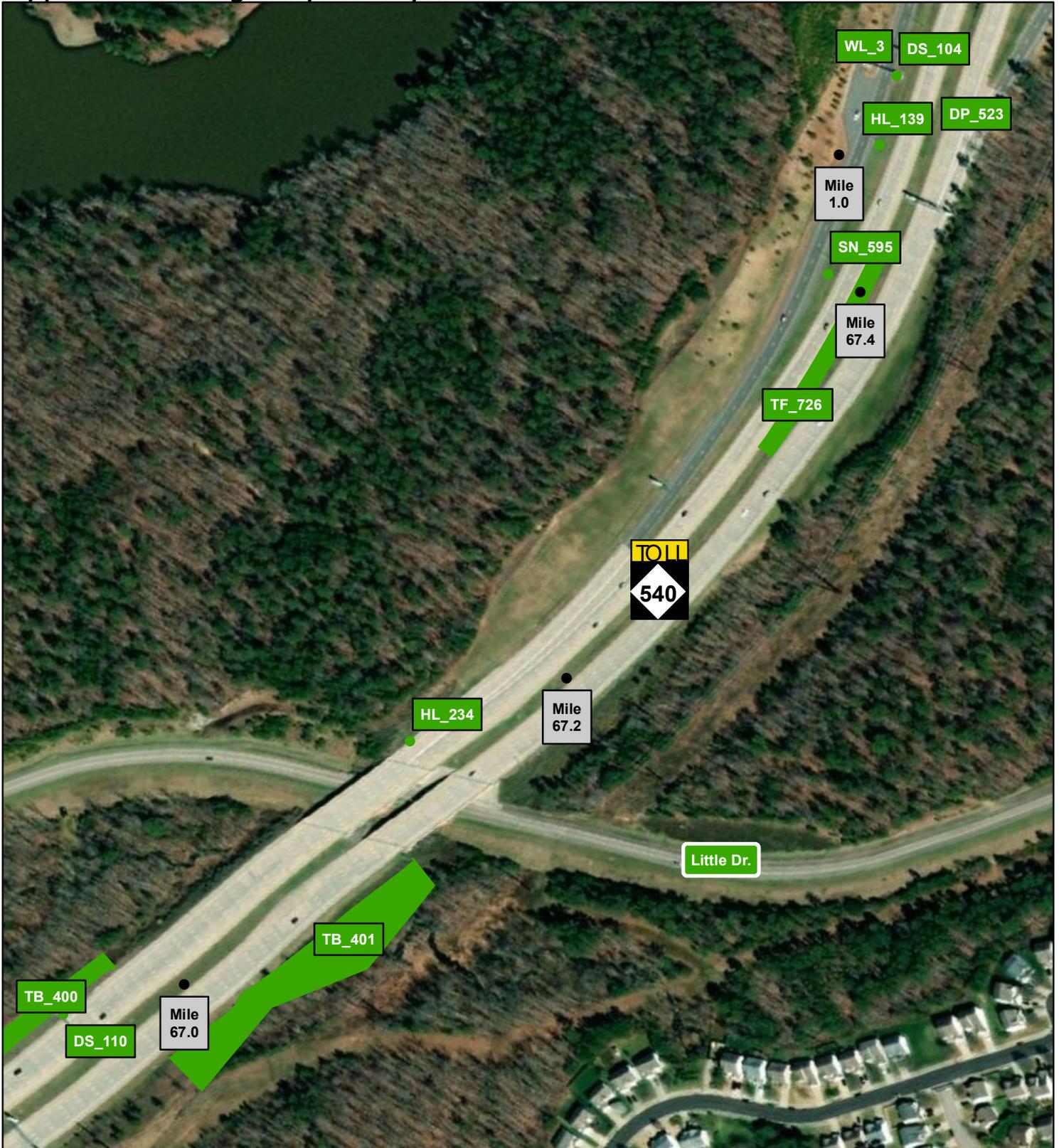


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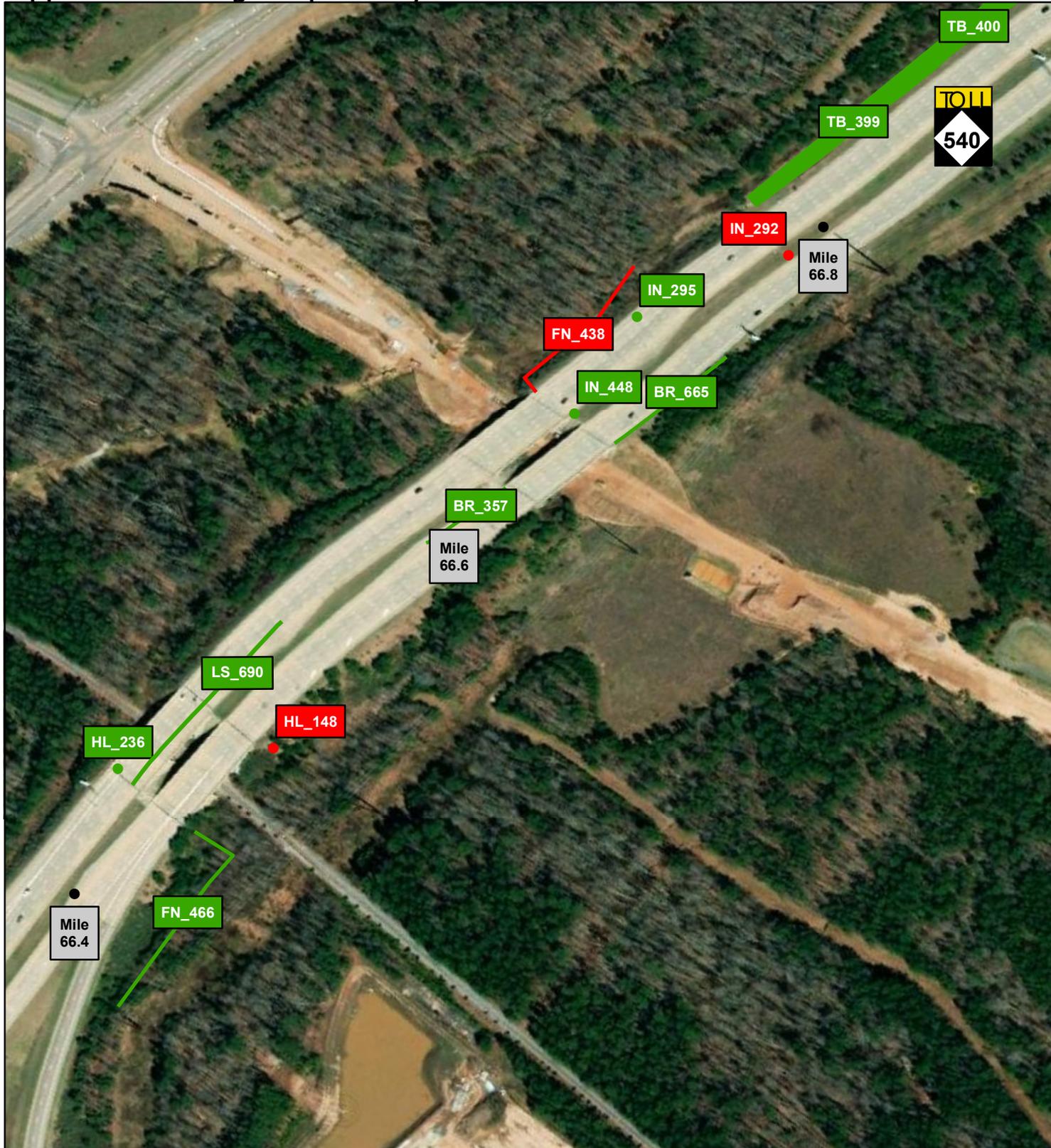


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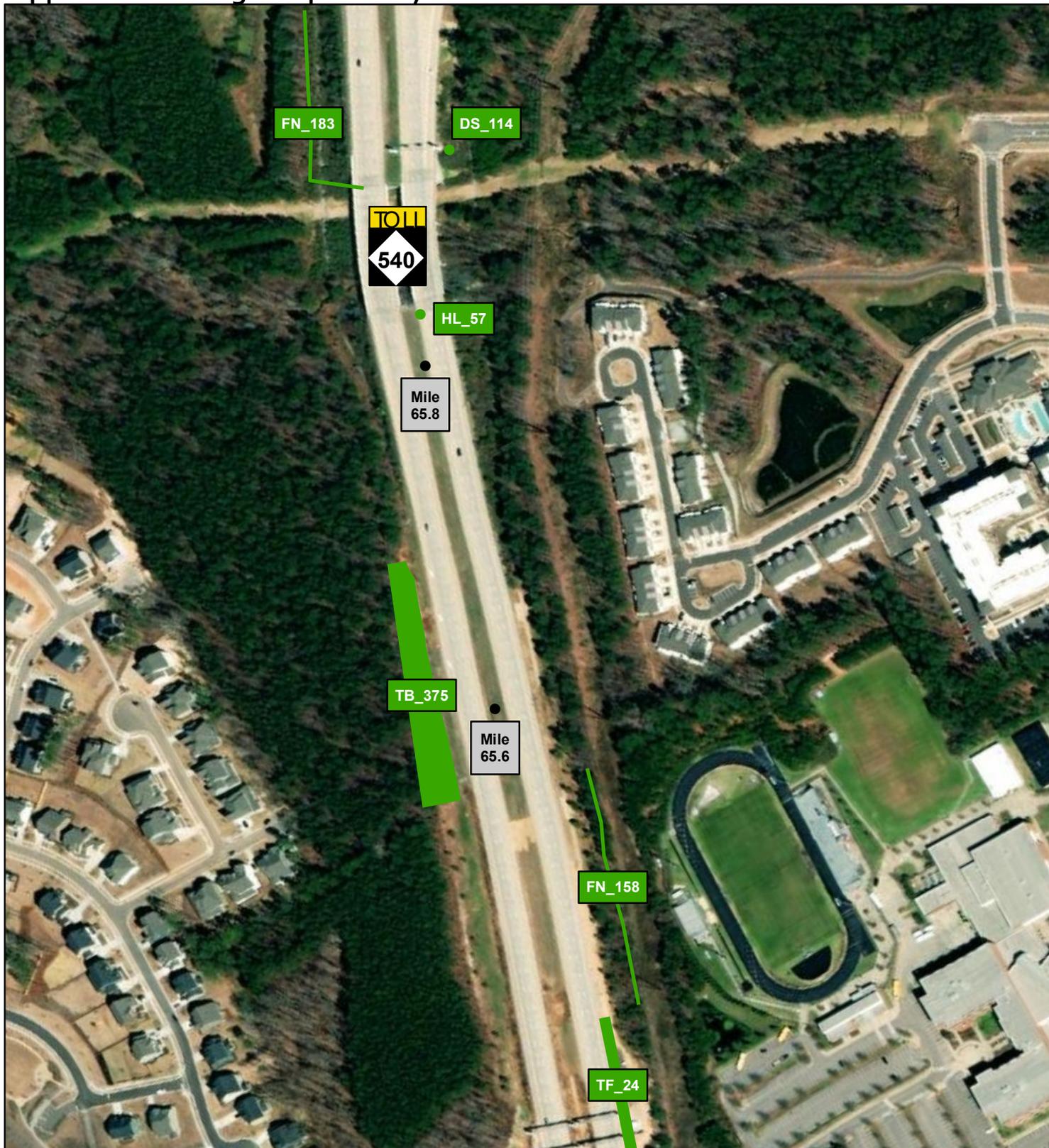


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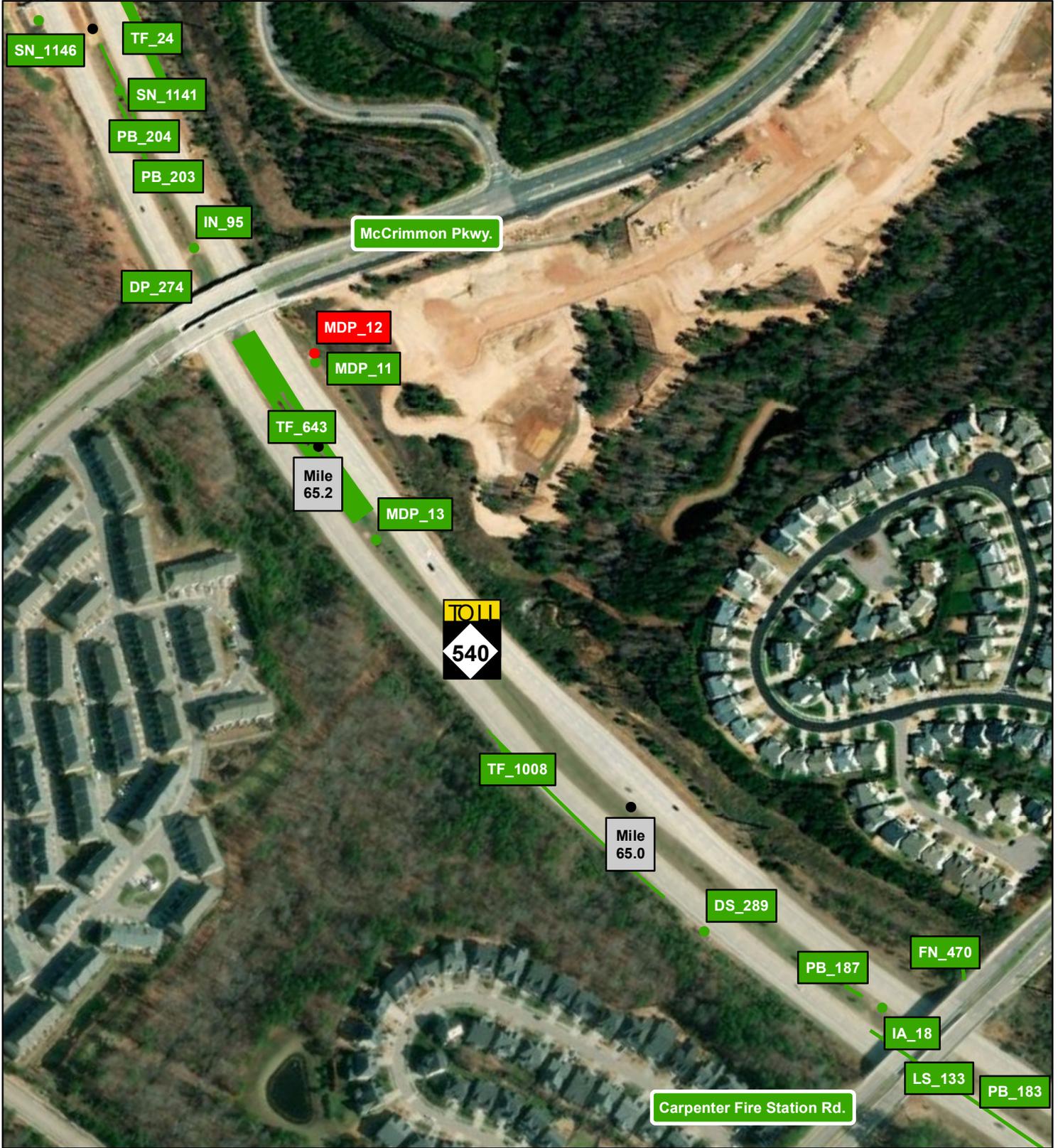


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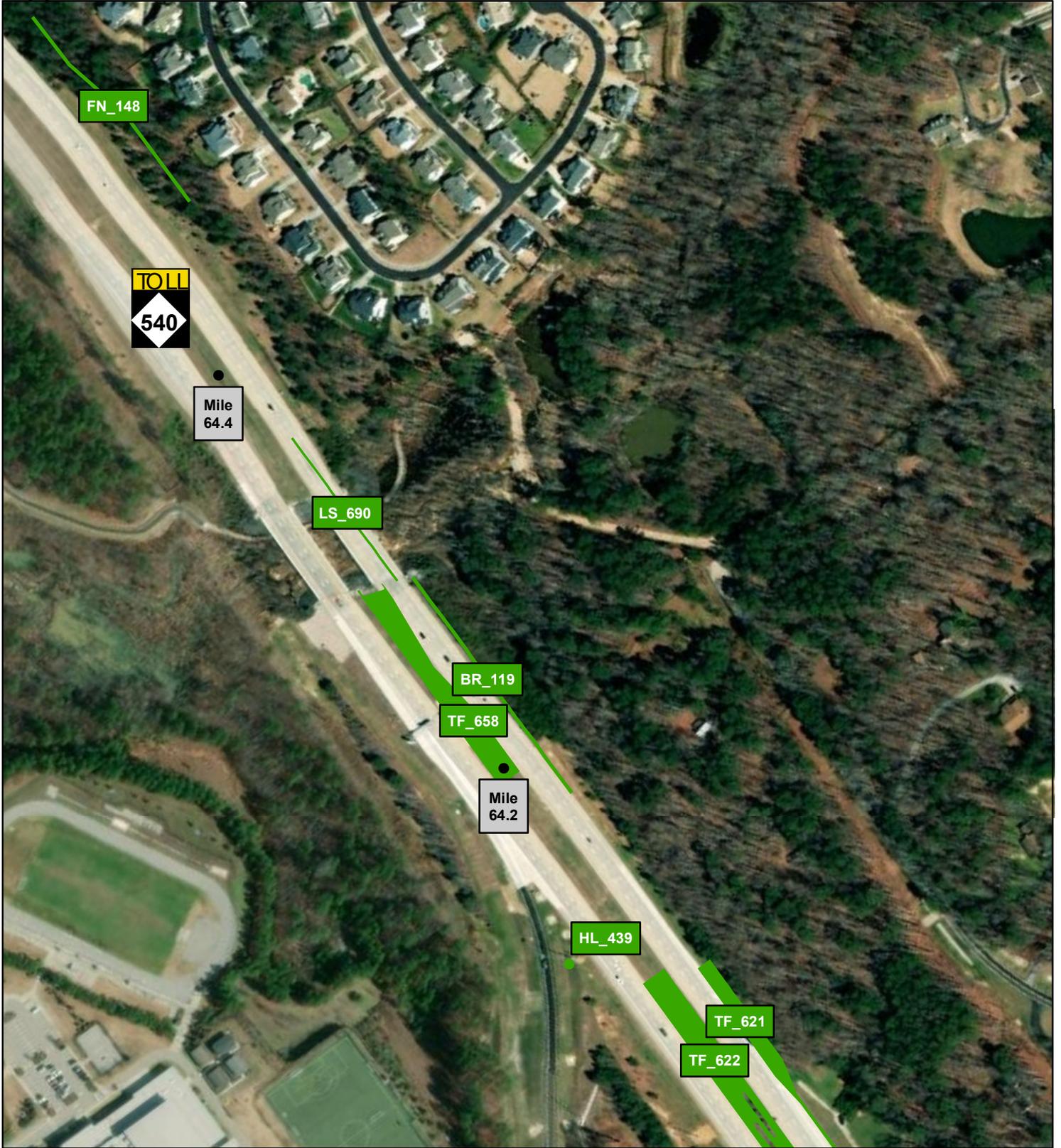


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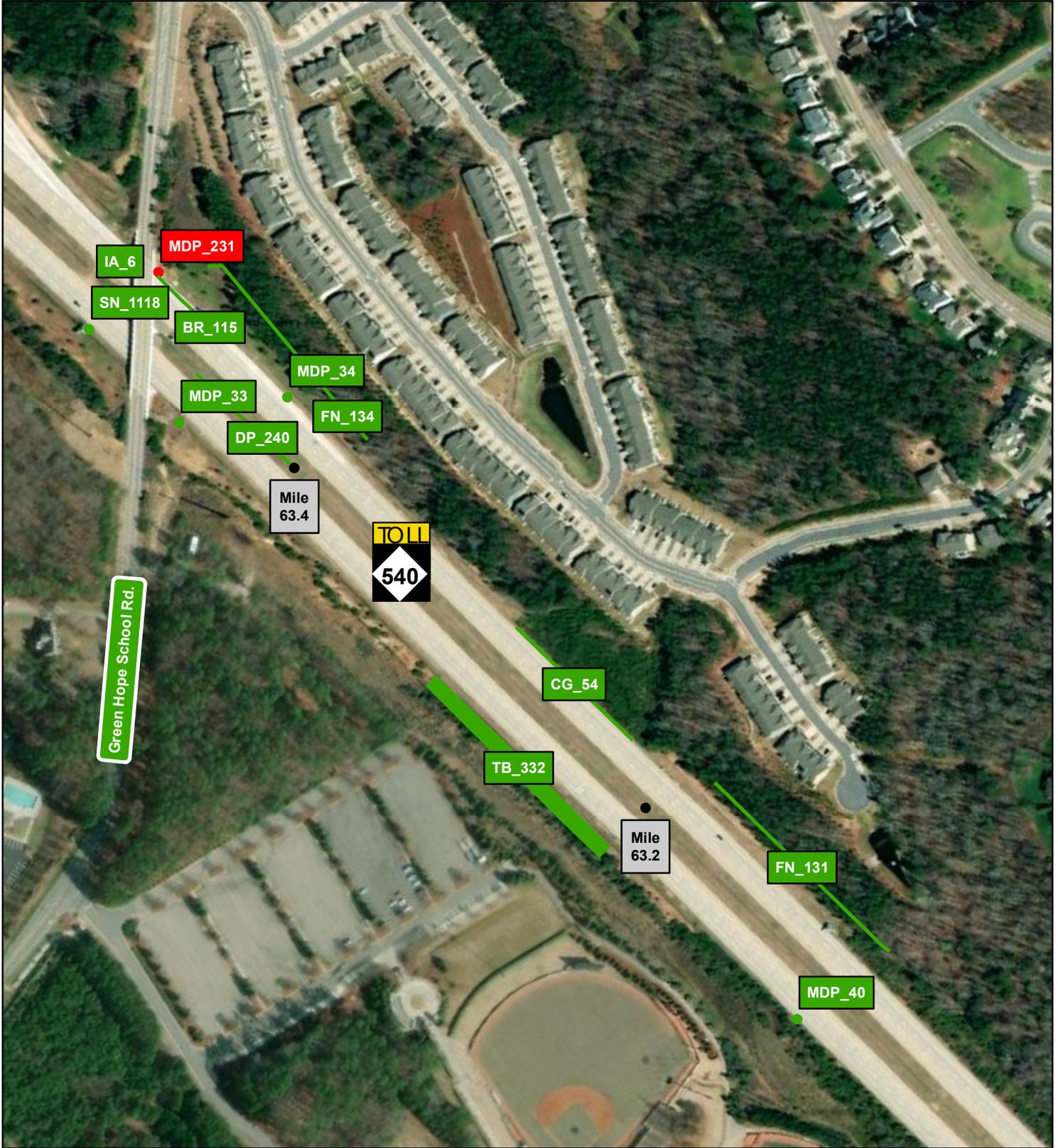


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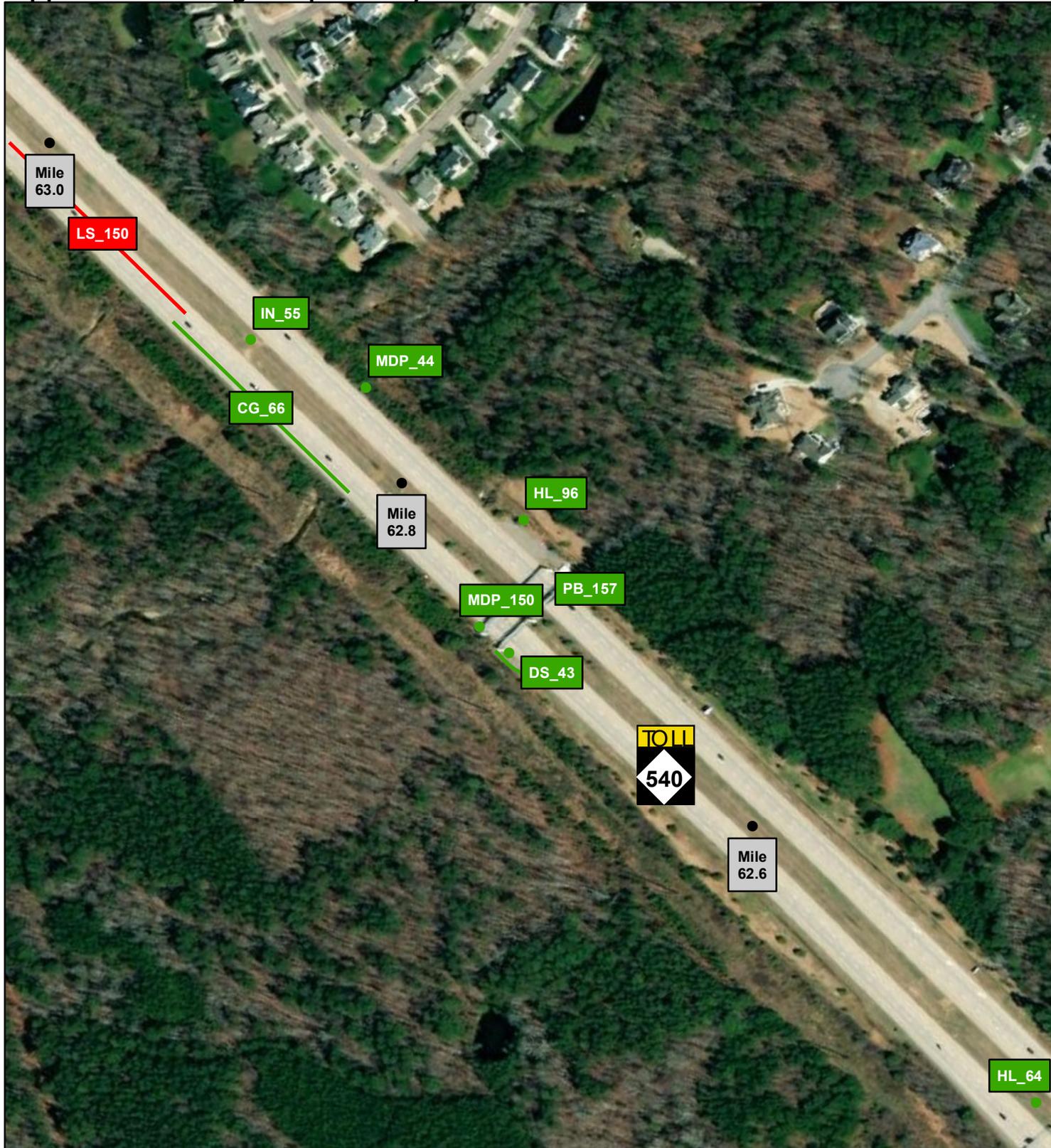


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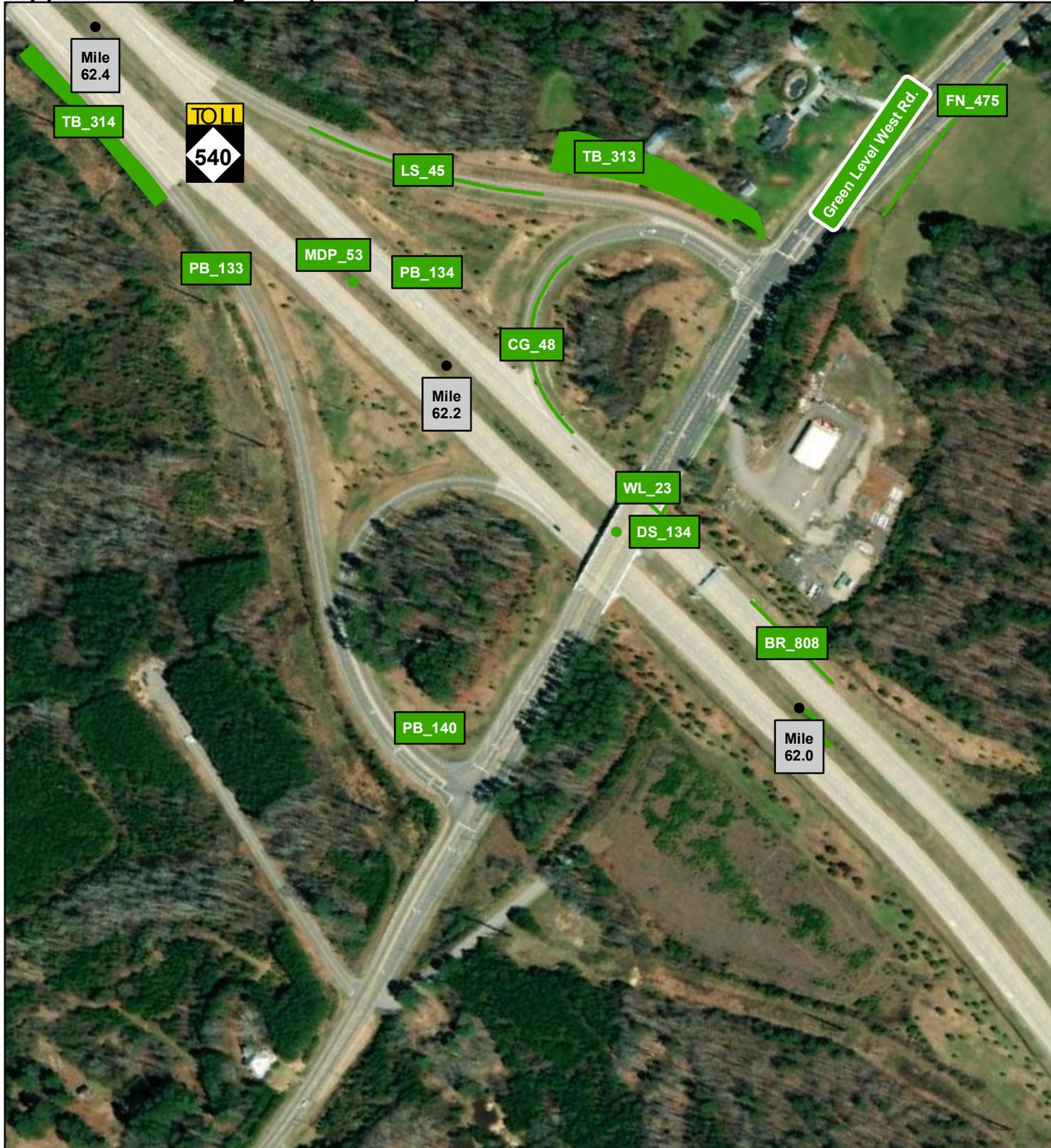


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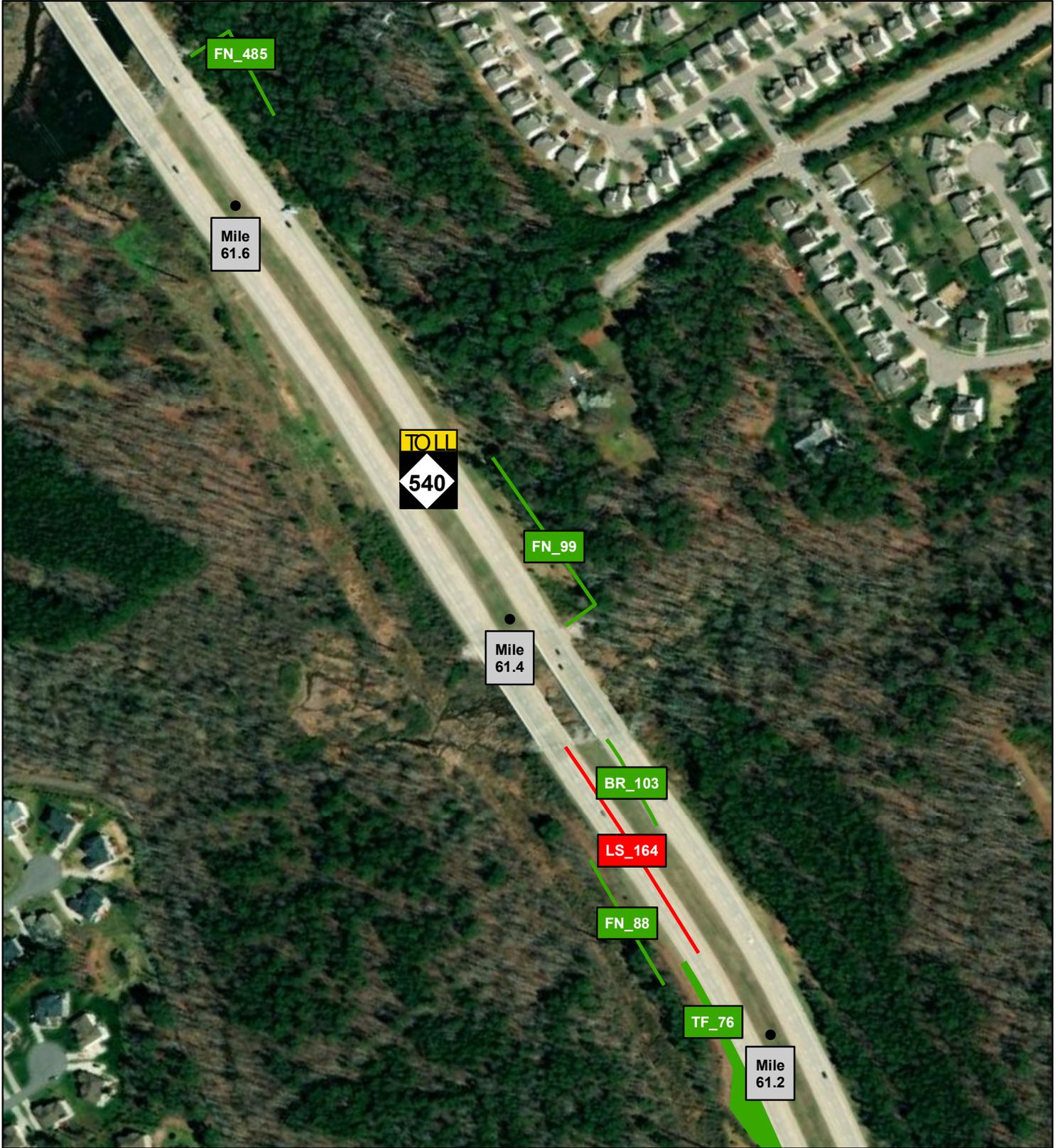


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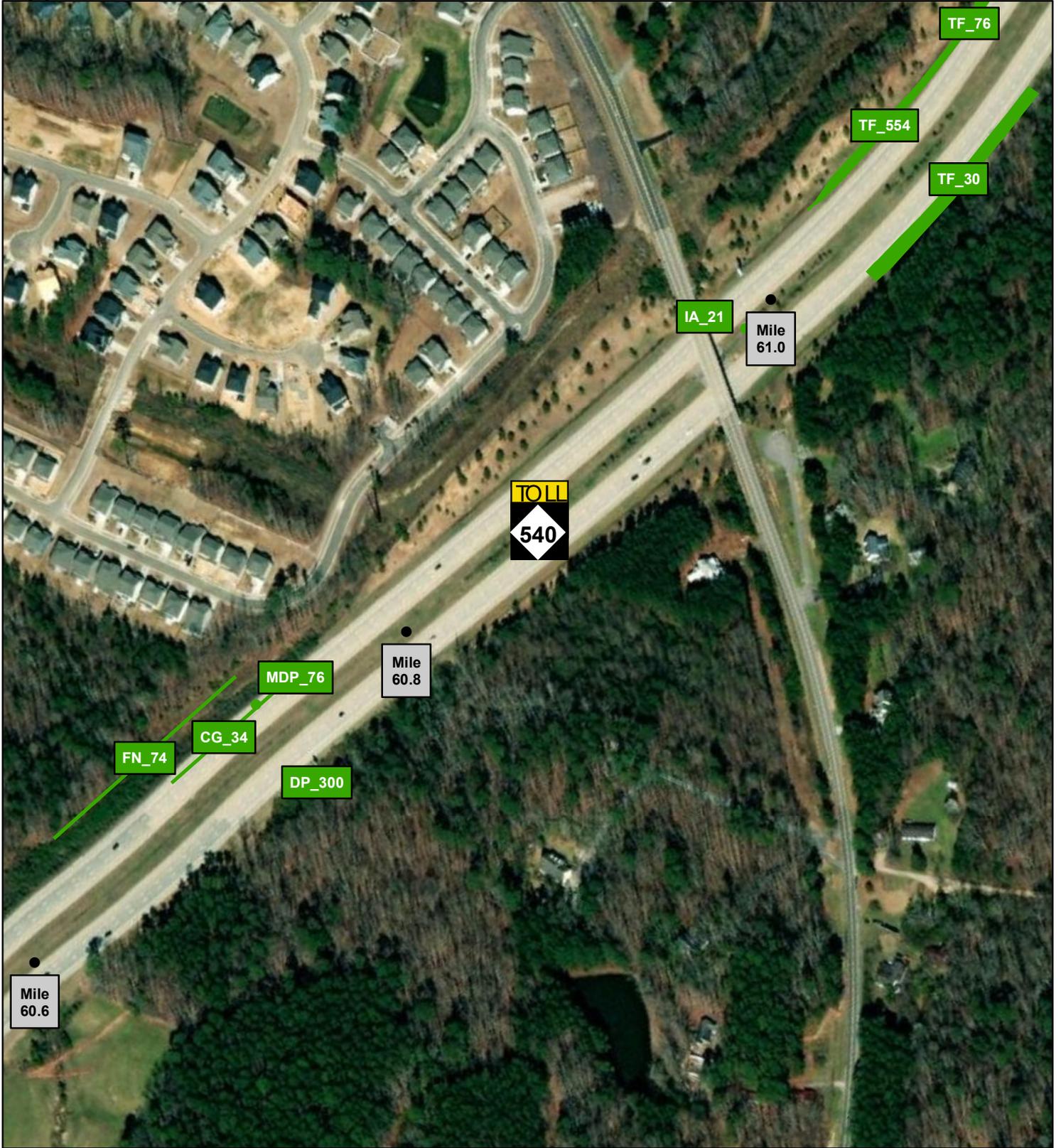


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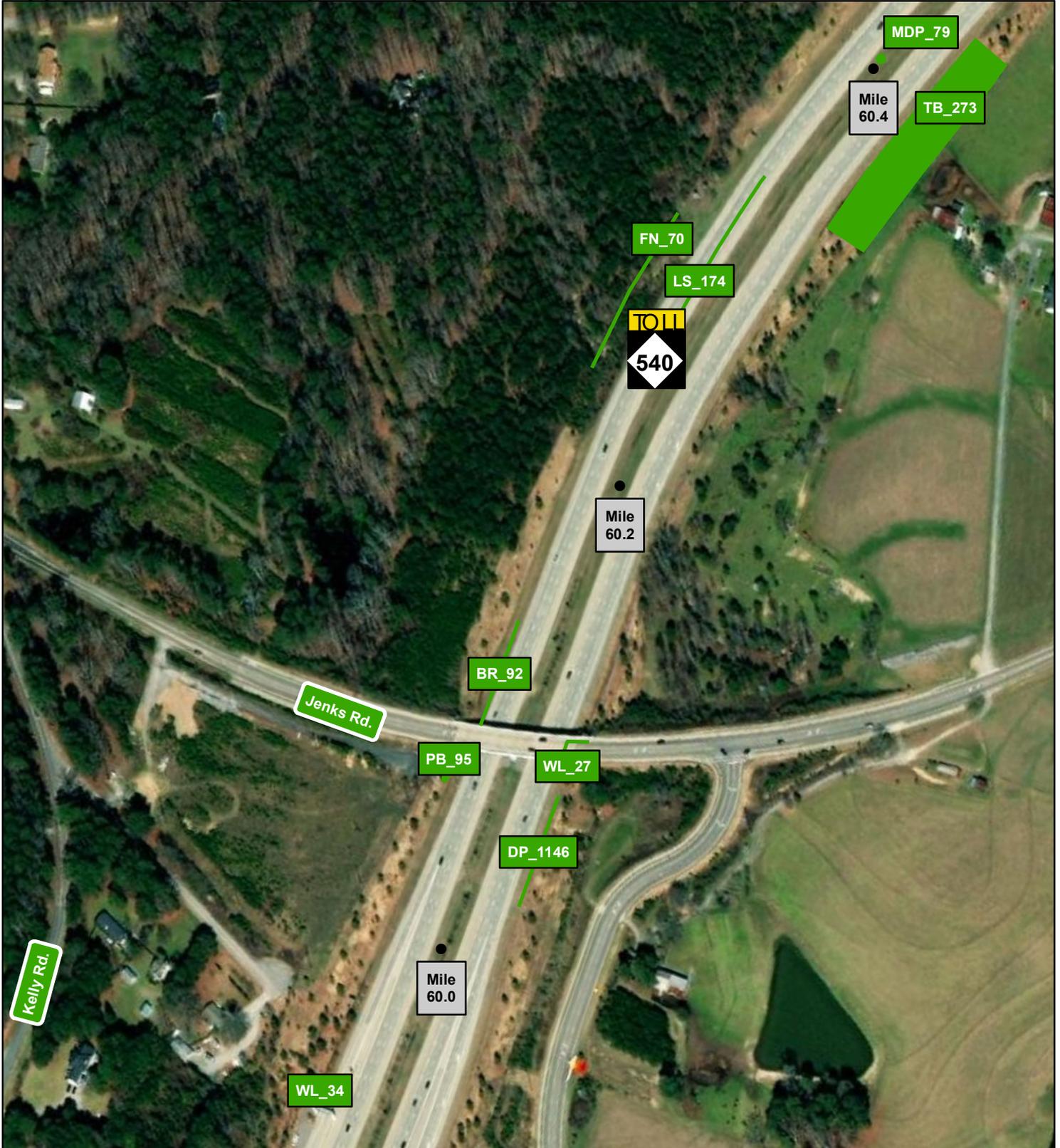


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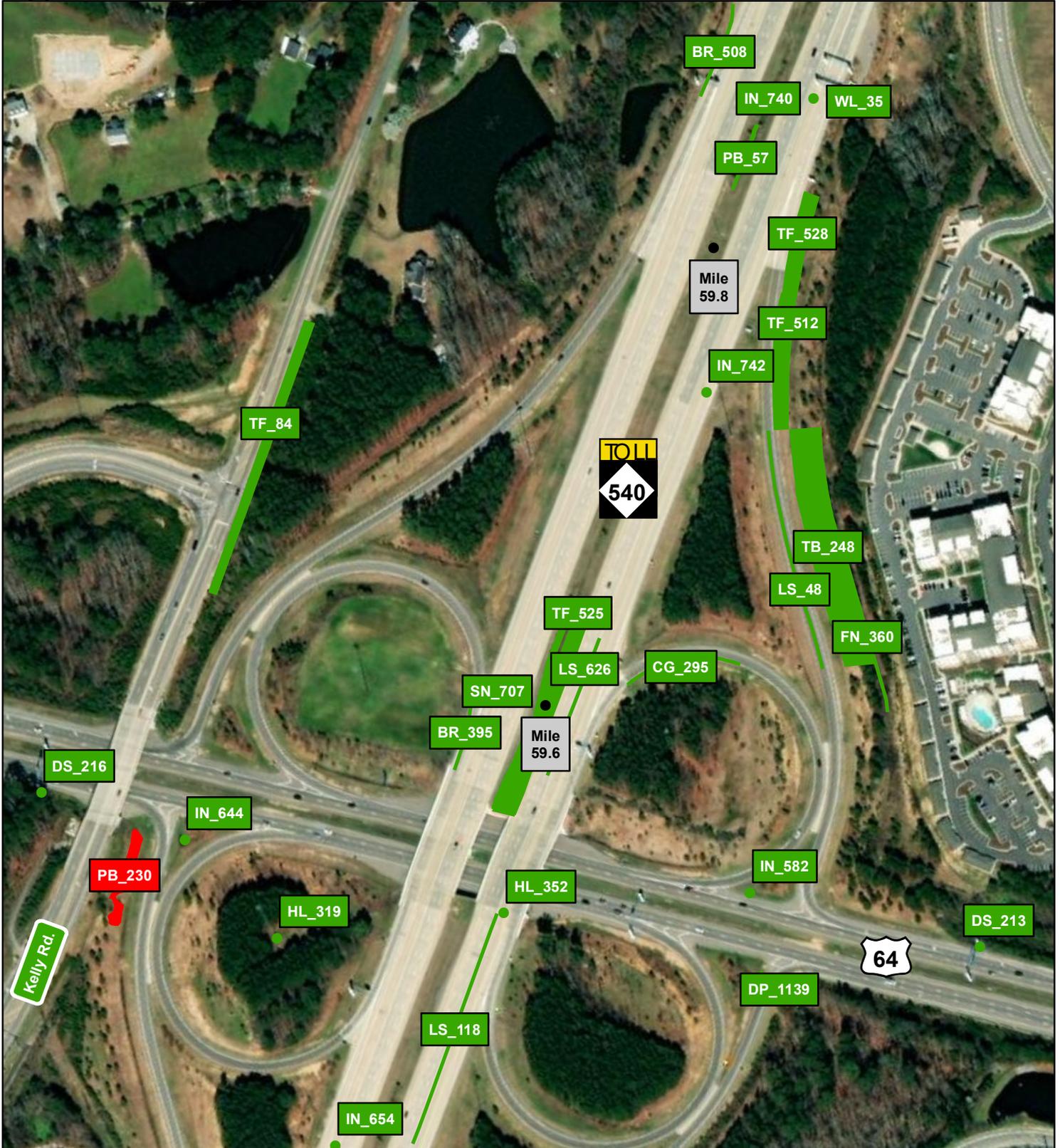


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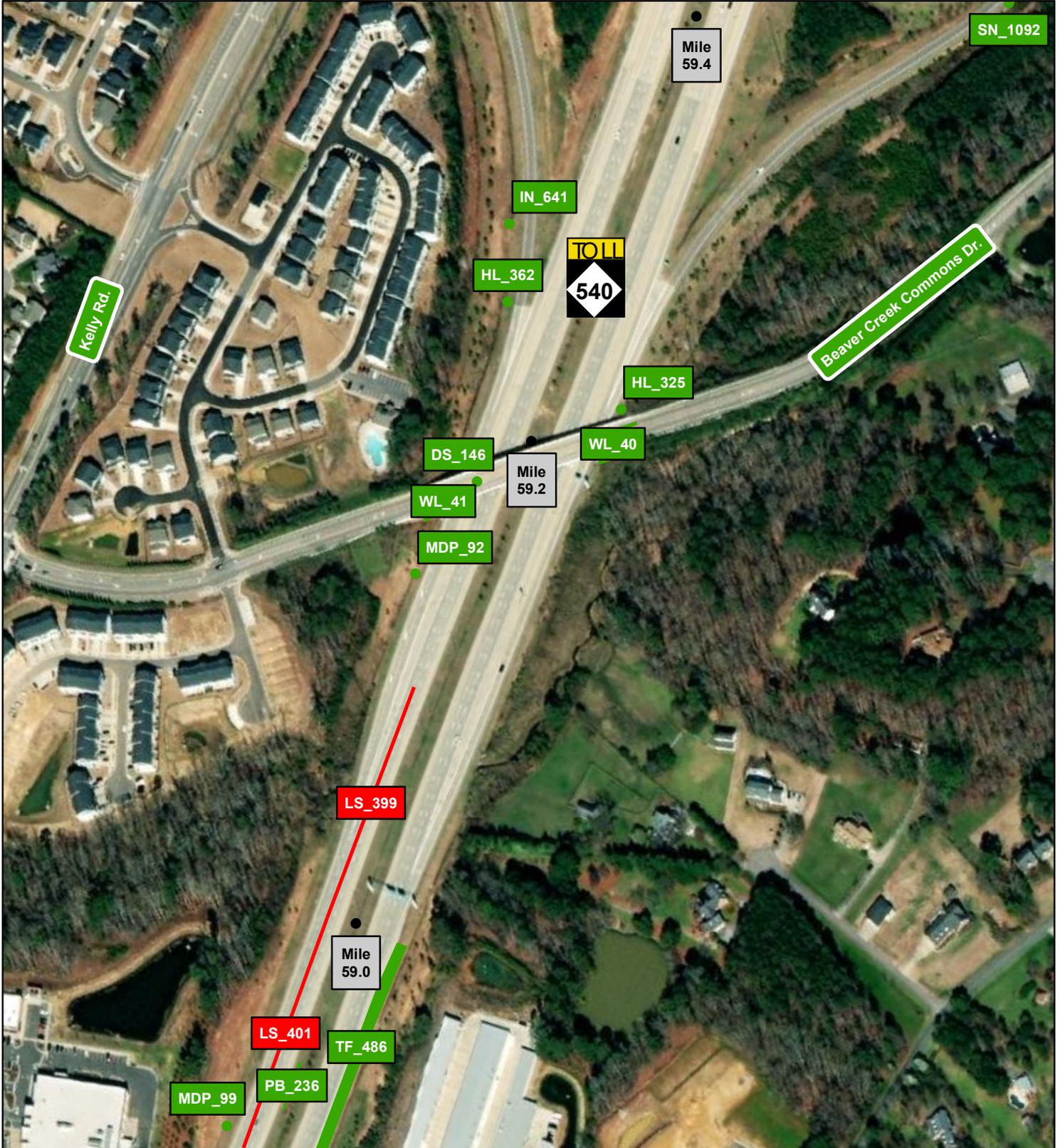


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- Passing Asset



Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations

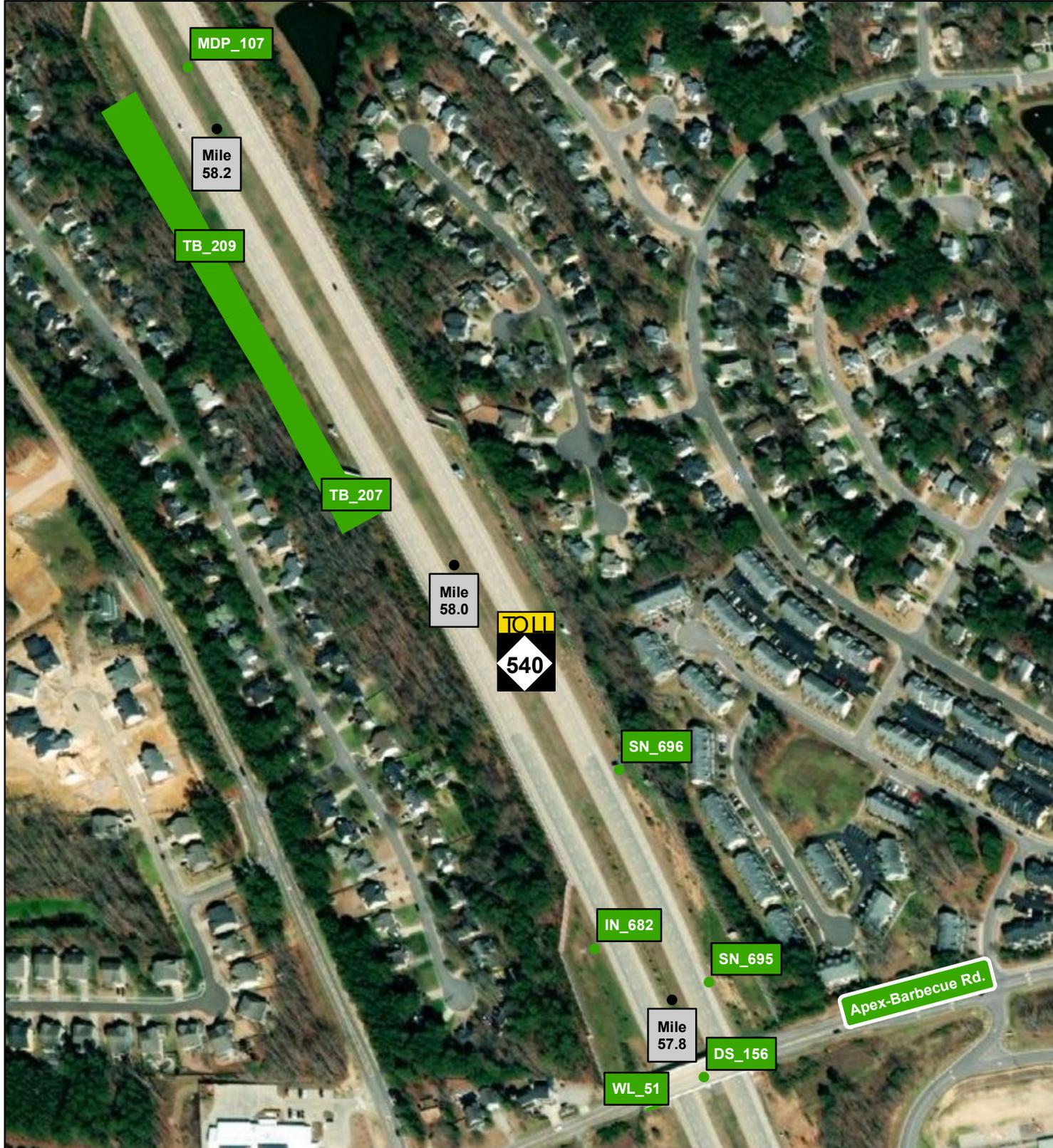


Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations

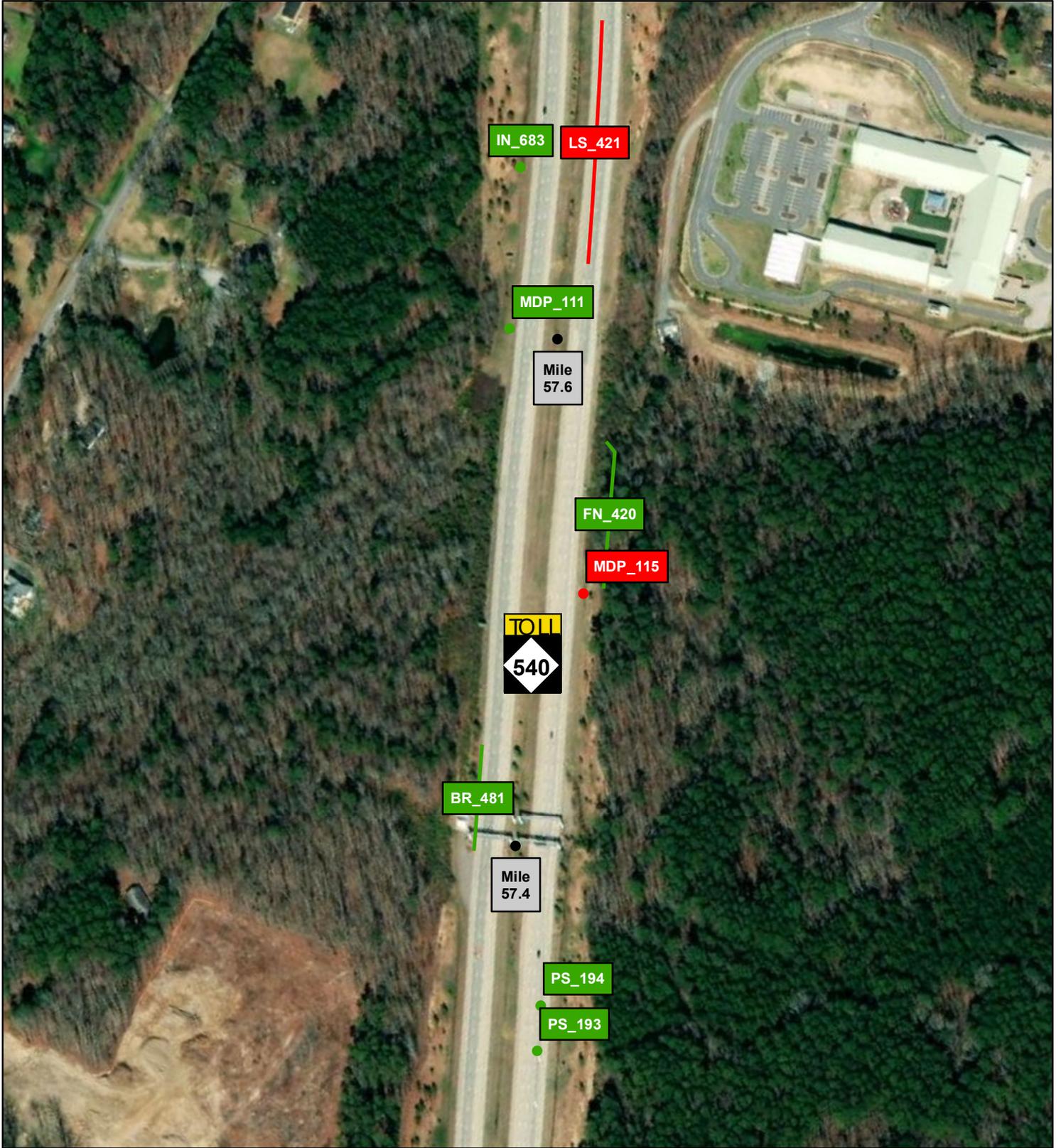


Legend

-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations

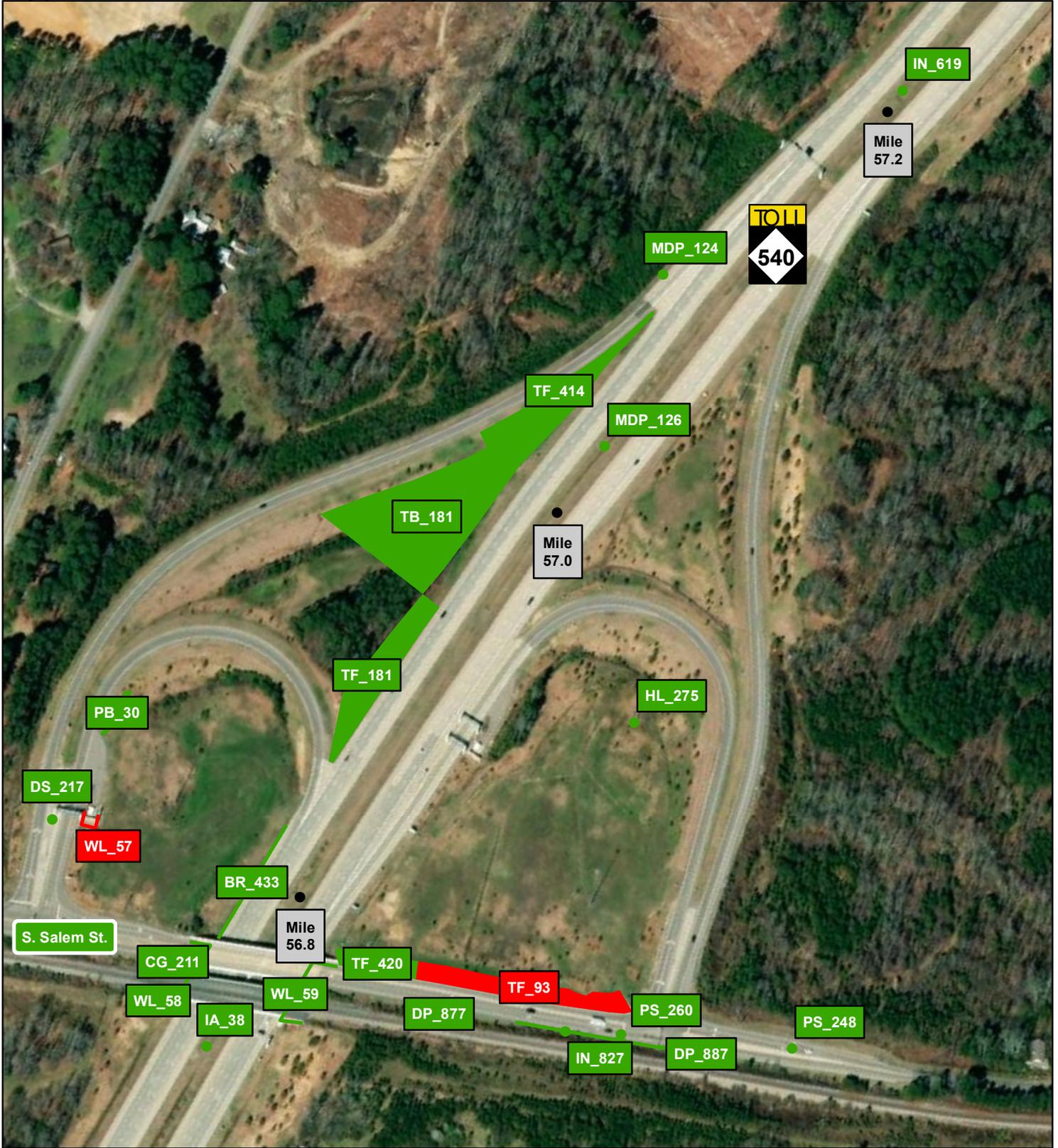


Legend

-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations

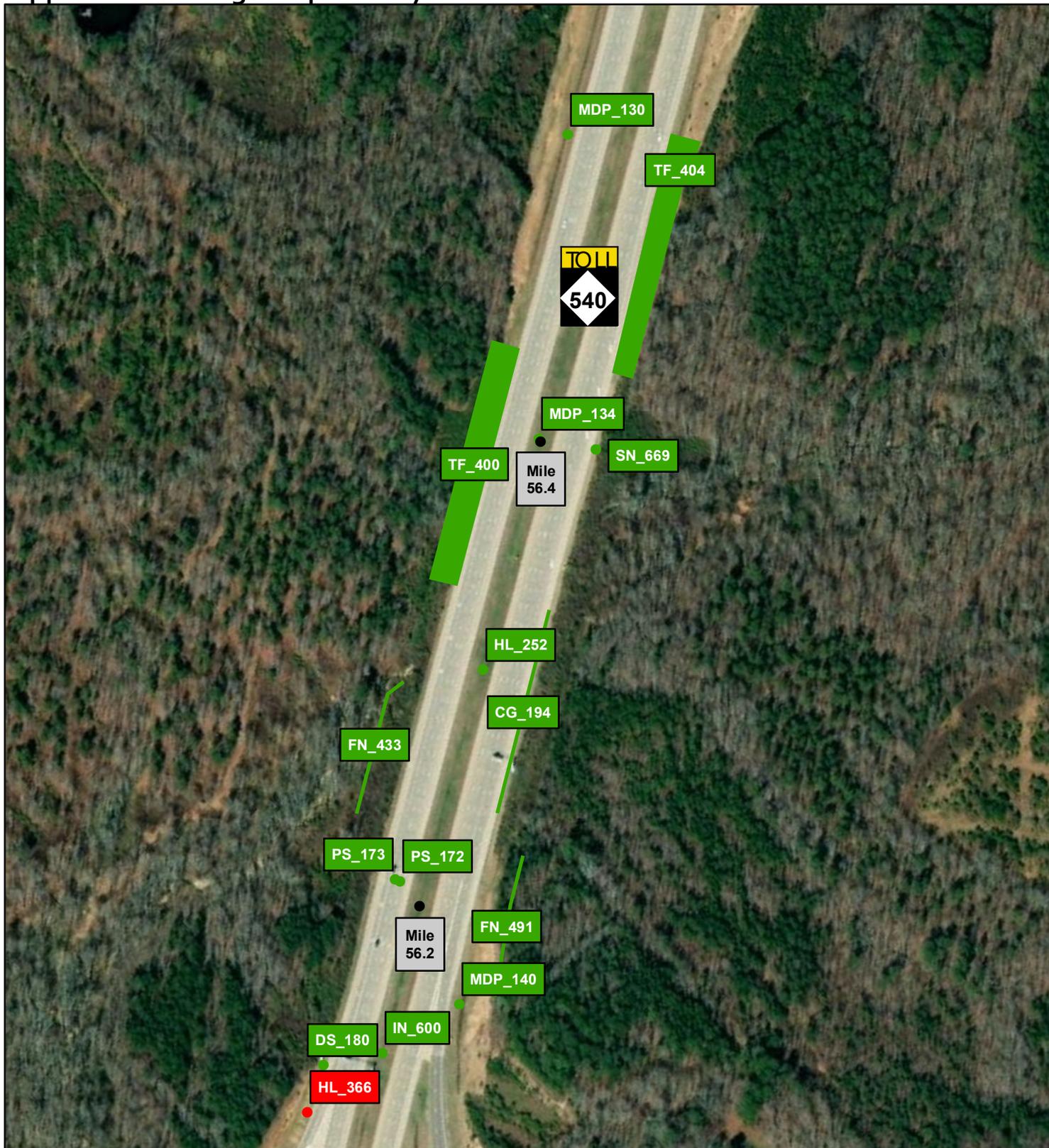


Legend

-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset

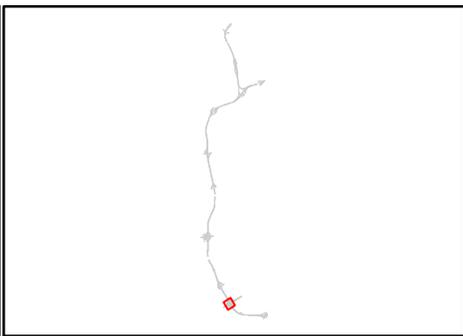


Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset



A24

Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations

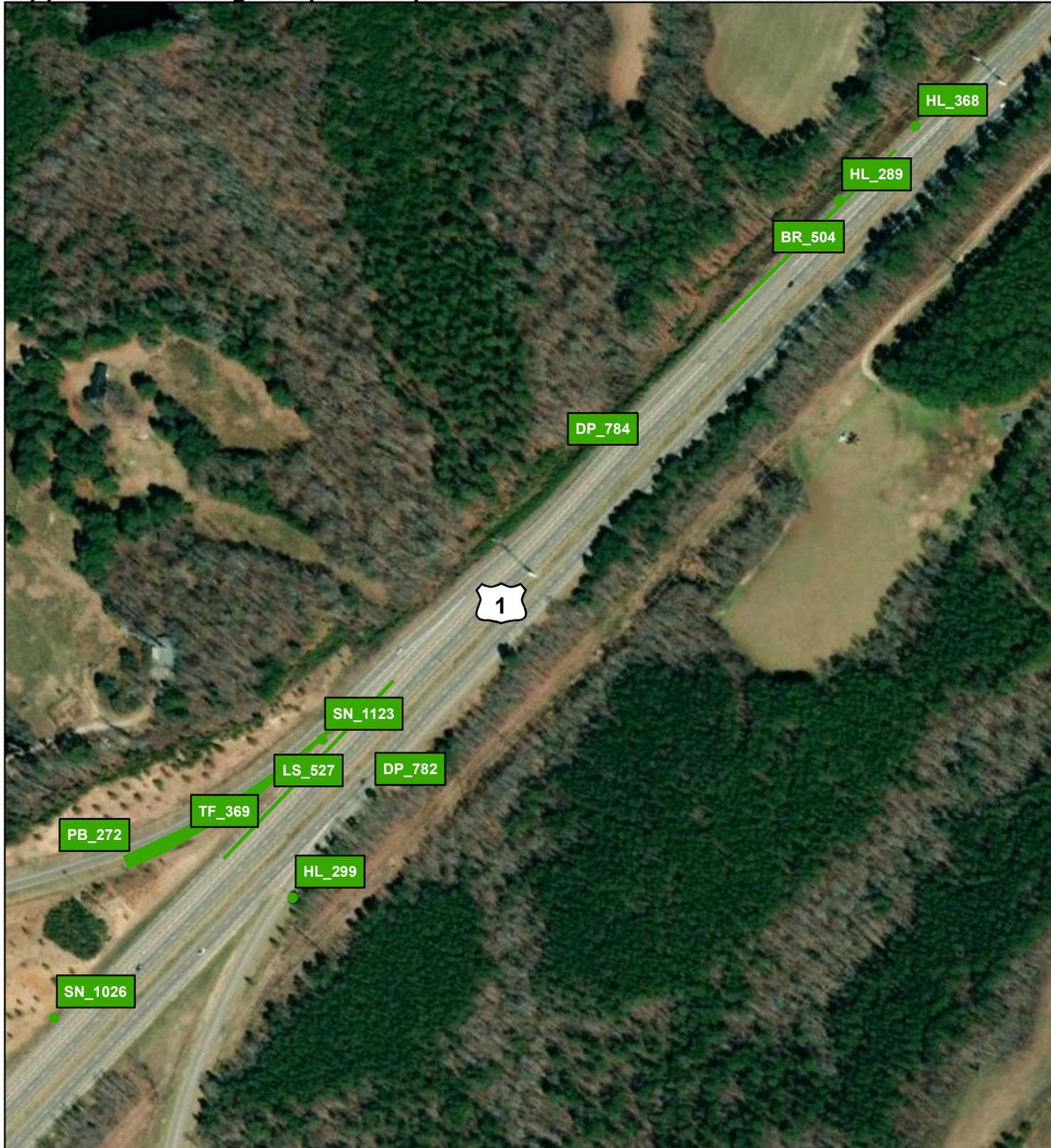


Legend

-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations

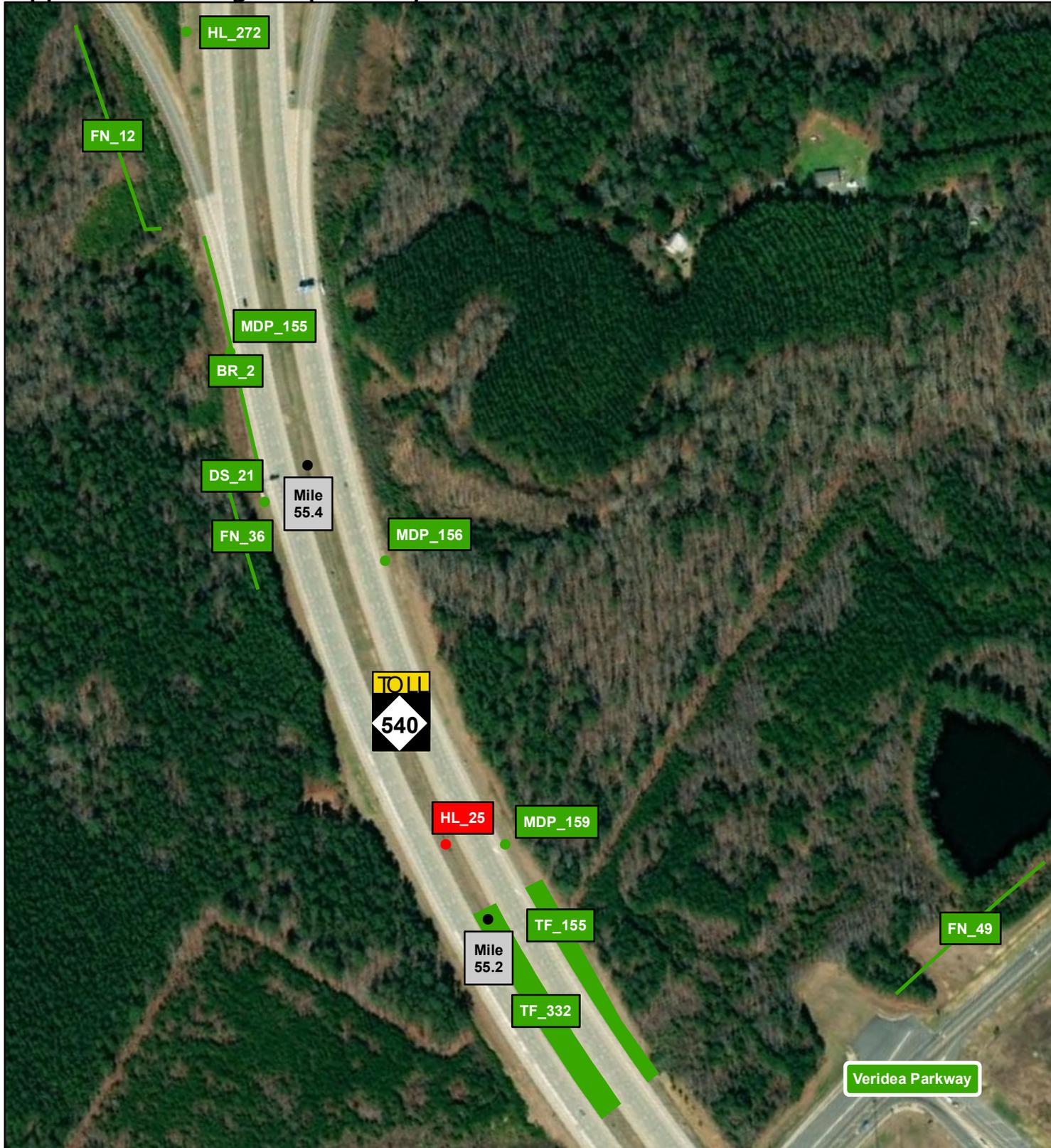


Legend

-  Failing Asset
-  Passing Asset



Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset

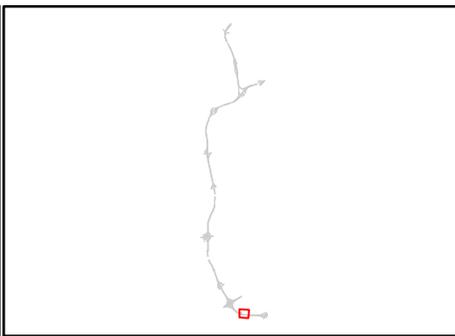


Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations

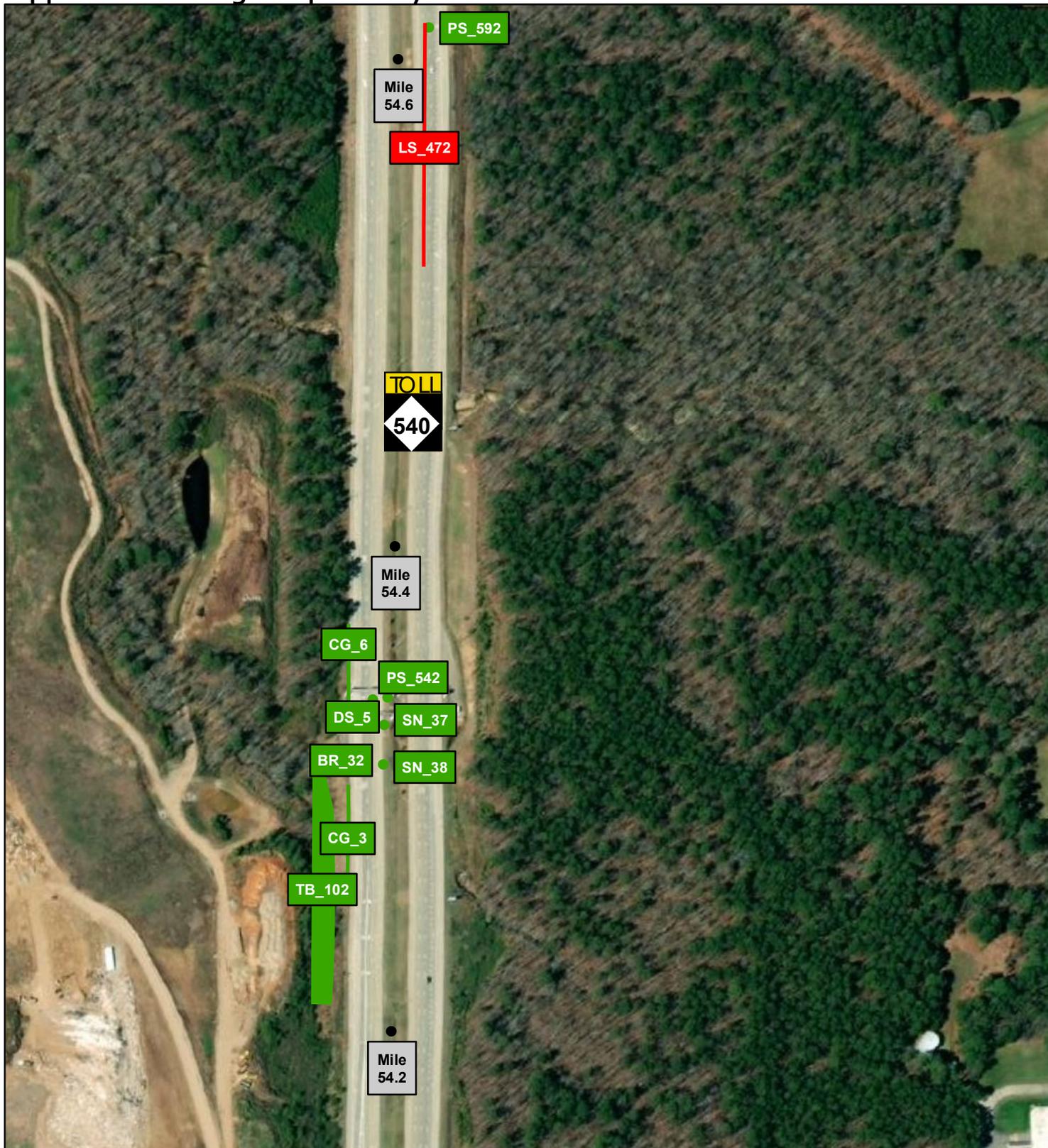


Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations

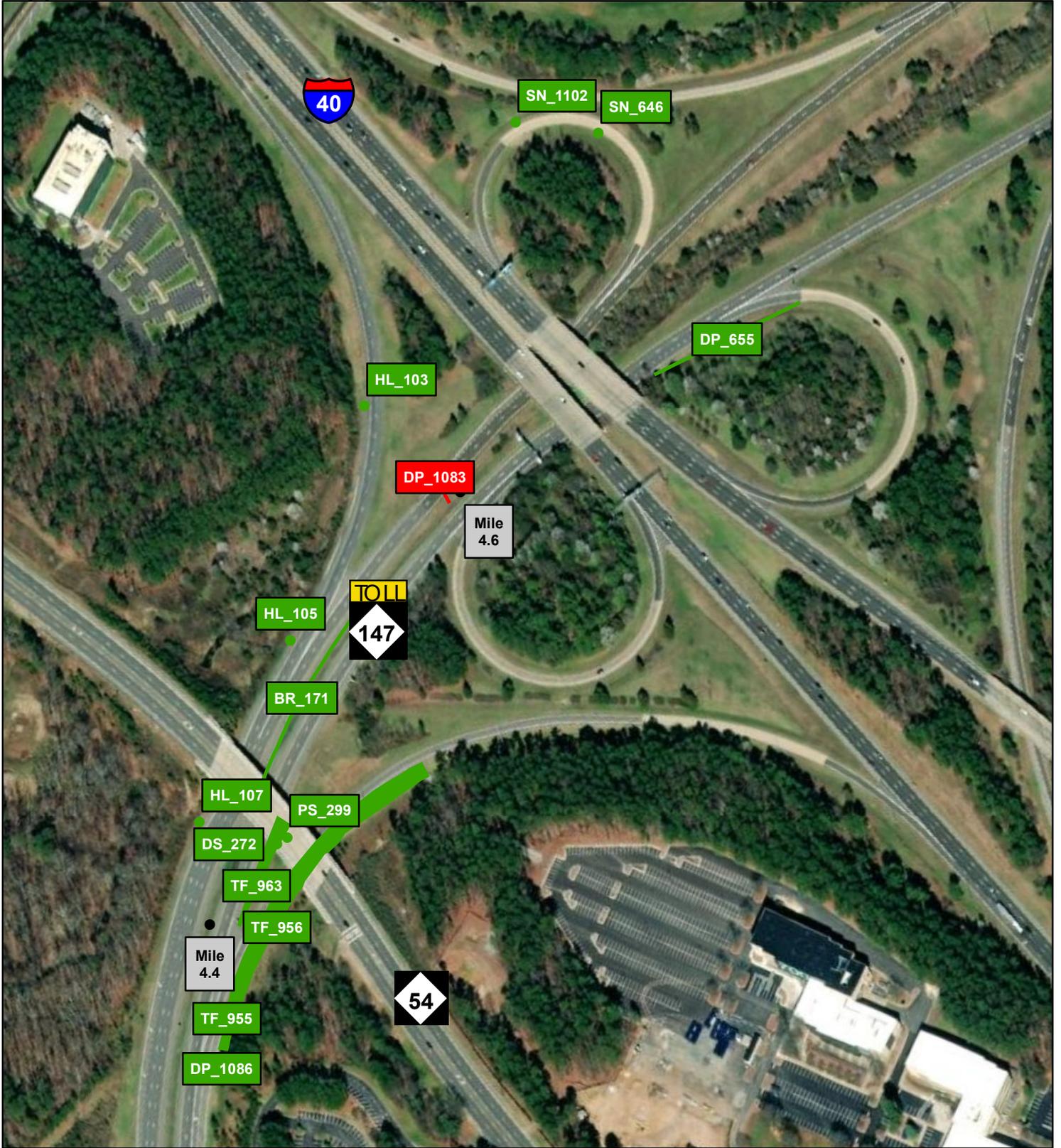


Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations

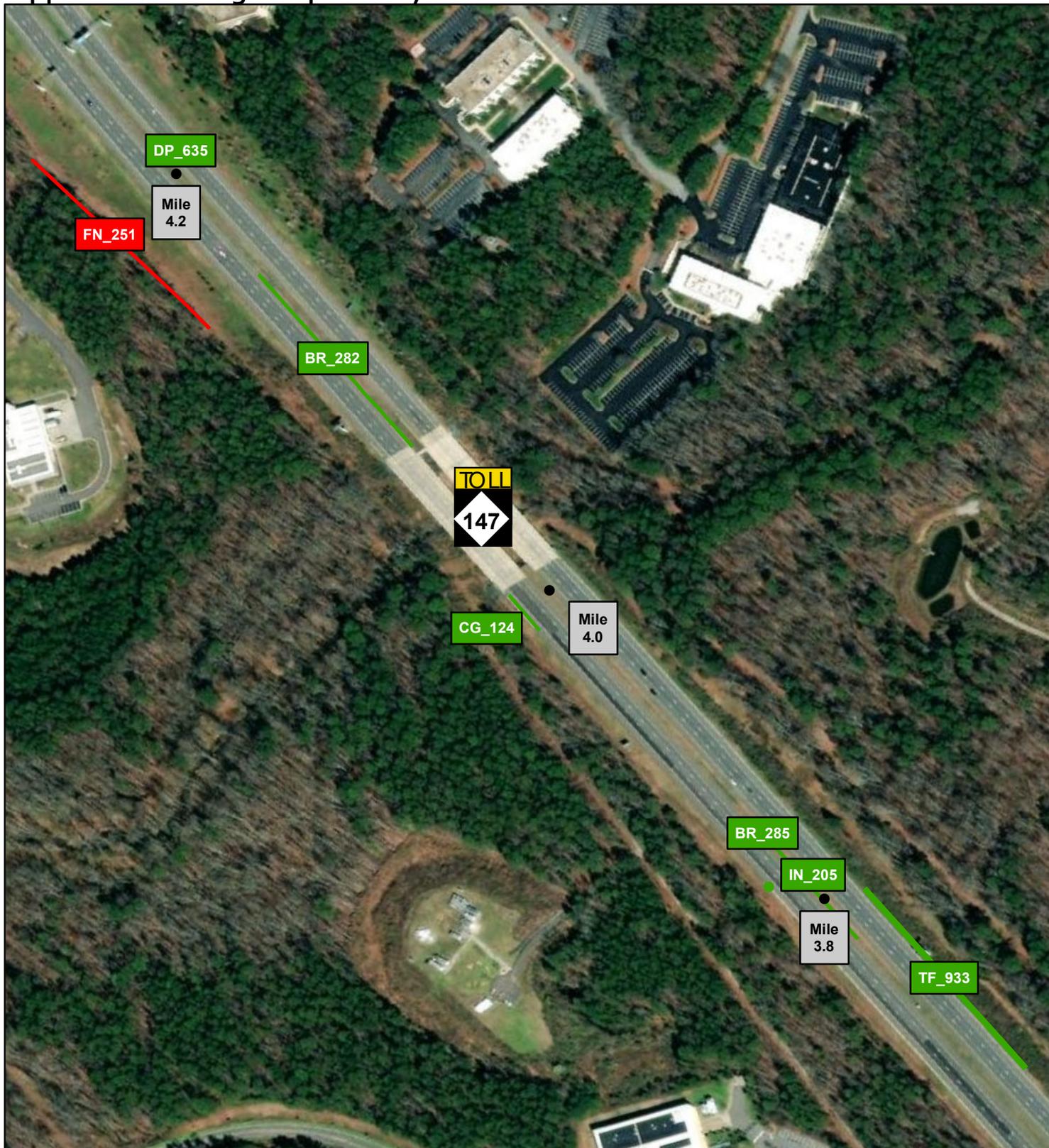


Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset

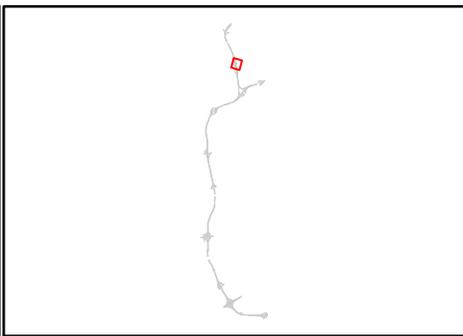


Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations



Legend

- Failing Asset
- Passing Asset

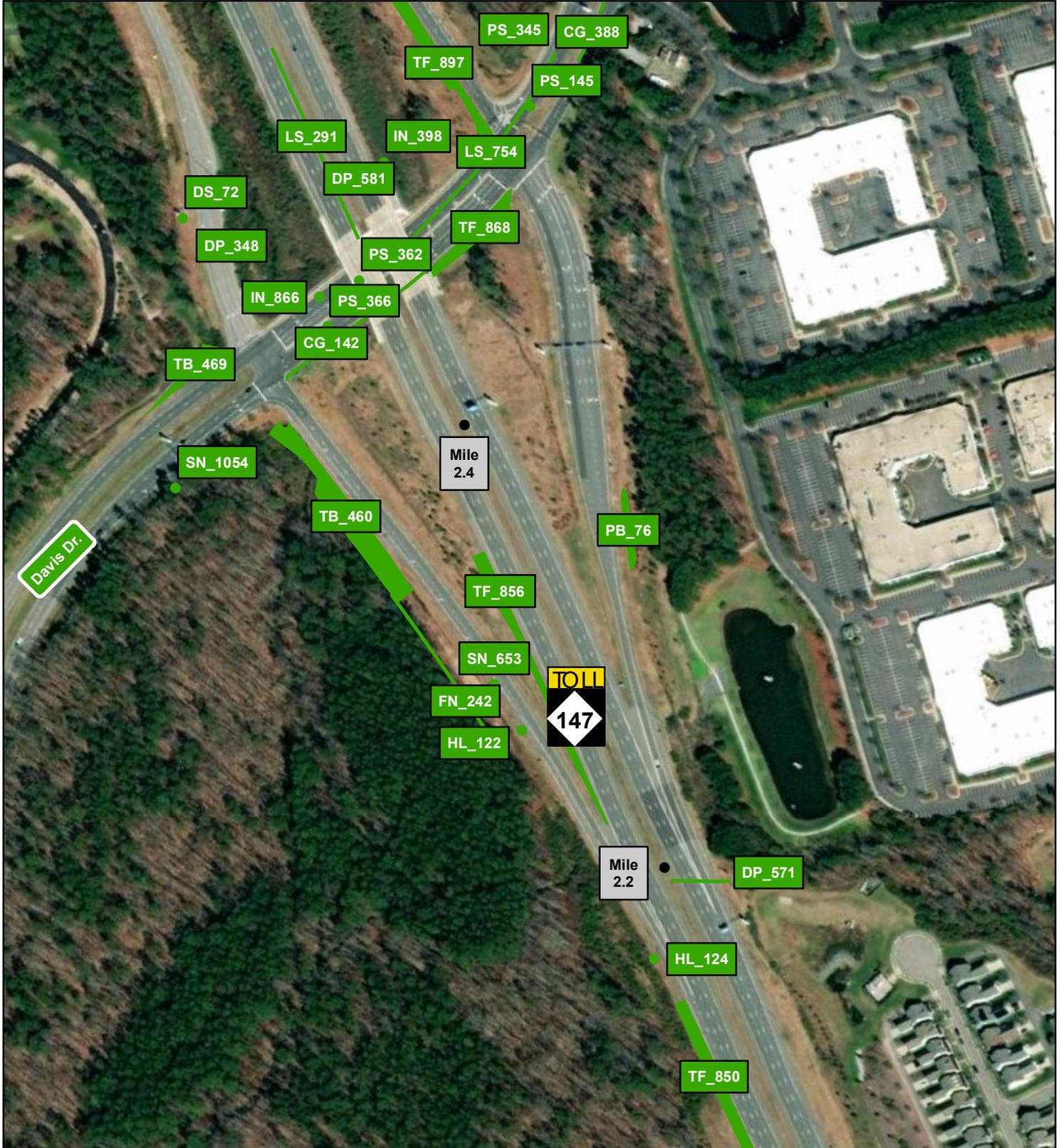






A33

Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations

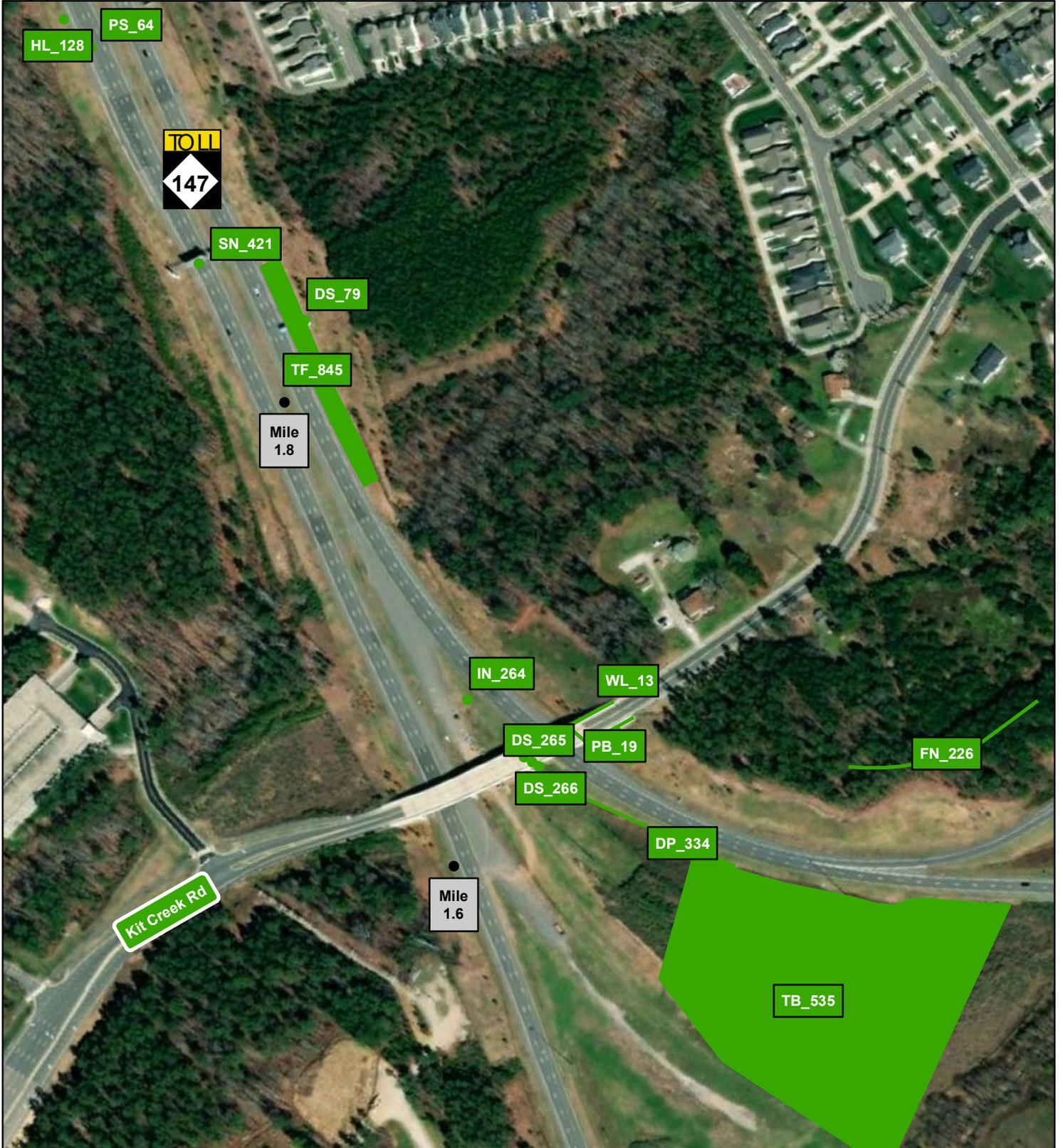


Legend

- Failing Asset
- Passing Asset



Appendix A: Triangle Expressway 2021 Second Quarter Asset Assessment Locations



Legend

-  Failing Asset
-  Passing Asset



Appendix B

**Triangle Expressway 2021 Second Quarter Table Results of Assets Failing
MRP**

Appendix B: Triangle Expressway 2021 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).....	5
Fence and Control of Access (FN).....	7
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).....	13
Unpaved Shoulders (LS).....	14
Front/Back Slopes (LS).....	14
Unpaved Lateral and Outfall Ditches (LS).....	14
Litter (LS).....	15
Roadway Sweeping (LS).....	15
Pavement Striping (LS).....	16
Pavement Markers (LS).....	17
Delineators (LS).....	18
Paved Ditches (PD).....	19
Pavement Words and Symbols (PS).....	20
Signs (SN).....	22
Tree and Brush (TB).....	23
Turf Condition (TF).....	24
MSE/Retaining Walls, Sound Barrier Walls and Screen Walls (WL).....	26

Guardrail, Concrete Barrier and End Anchors (BR)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Guardrail	BR_313	Twisted Blocks		A2
2	Guardrail	BR_452	Functional Damage		A24

Curb and Gutter (CG)

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

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_295	Obstruction		A6

Misc. Drainage Structure (MDP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Shoulder Drain	MDP_12	Obstruction		A8
2	Shoulder Drain	MDP_30	Rodent Screen		A10
3	Shoulder Drain	MDP_115	Rodent Screen		A21
4	Shoulder Drain	MDP_225	Obstruction		A10

Misc. Drainage Structure (MDP)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Shoulder Drain	MDP_231	Obstruction		A11

Fence and Control of Access (FN)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Woven	FN_215	Fence Hole		A2
2	Woven	FN_251	Fence Height		A31
3	Woven	FN_438	Fence Height		A5

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	High Mast	HL_25	Part Damage		A27
2	High Mast	HL_148	Missing Parts		A5
3	High Mast	HL_366	Missing Parts		A23

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
1	Inlet	IN_3	Surface Damage		A6
2	Inlet	IN_292	Eroded Area		A5
3	Inlet	IN_552	Grate Damage		A1

Landscaping (PB)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Plant Bed	PB_230	Health		A17

Paved Lanes – Asphalt (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Asphalt	LS_721	Unsealed Cracks		A6

Paved Lanes – Concrete (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_396	Joint Malfunction		A19

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
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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_421	Obstruction		A21

Litter (LS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Concrete	LS_472	Litter – 3CF		A29

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	Concrete	LS_164	Line Missing & Nighttime Reflectivity		A14
2	Concrete	LS_399	Line Missing & Nighttime Reflectivity		A18
3	Concrete	LS_401	Line Missing & Nighttime Reflectivity		A18
4	Concrete	LS_421	Line Missing		A21

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_150	Missing & Nighttime Reflectivity		A12
2	Asphalt	LS_252	Missing & Nighttime Reflectivity		A32
3	Asphalt	LS_743	Missing & Nighttime Reflectivity		A3

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_398	Nighttime Reflectivity		A1
2	Right Turn	PS_413	Daytime Assessment & Nighttime Reflectivity		A1
3	Thru Lane	PS_442	Daytime Assessment & Nighttime Reflectivity		A6
4	Thru Lane	PS_459	Daytime Assessment & Nighttime Reflectivity		A6

Pavement Words and Symbols (PS)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Only	PS_509	Daytime Assessment & Nighttime Reflectivity	 A photograph showing a white pickup truck parked on an asphalt road. In the foreground, there is a faded white arrow symbol painted on the pavement, pointing towards the truck. The truck has some text on its side, including "Virginia Utilities & Energy".	A6

Signs (SN)

#	Sign Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Merge	SN_778	Height Requirement		A24
2	Yield	SN_1173	Height Requirement		A10
3	Curve	SN_1194	Lateral Clearance		A10

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_93	Bare Ground		A22
2	Turf	TF_1014	Bare Ground		A28
3	Turf	TF_1018	Bare Ground		A28
4	Turf	TF_1056	Bare Ground		A10

Turf Condition (TF)

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
5	Turf	TF_1069	Bare Ground		A10

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

#	Material Type	Object ID	Failure Type	Photo	GIS Reference Page
1	Screen Wall	WL_57	Vegetation		A22